



ORTHOPAEDICS

Practice in Nepal

Dr. Pramod Lamichhane

MBBS, MS (Ortho)

AO Trauma Fellowship (Netherlands)

Department Head, Orthopaedics

Chairman, Alive Hospital and Trauma Centre

Bharatpur, Chitwan, Nepal

Dr. Anil Bhattarai

Consultant Orthopaedic Surgeon

MS Orthopaedics (IOM, TUTH)

Alive Hospital and Trauma Centre

Bharatpur, Chitwan, Nepal

Forewords by:

Prof. Arjun Lamichhane

Prof. Ramesh P. Singh

Prof. Ashok K. Banskota

Prof. Jwala R. Pandey

ORTHOPAEDICS

Practice in Nepal

Published by:

Dr. Pramod Lamichhane
Bharatpur, Chitwan, Nepal
E-mail: drpramod131@gmail.com
Tel : 056-515428

Author

Dr. Pramod Lamichhane

Edition

First : 2023 (2080)

Copyright

Author

Layout & Design

Choongshin Craft & Media Pvt. Ltd.
Bharatpur, Chitwan, Tel: 056-493750

FOREWORD

Dr. Pramod Lamichhane trained in orthopaedic surgery with me qualifying with a Master's Degree from Kathmandu University. He had earlier graduated in medicine from college of Medical sciences under Kathmandu University in Nepal in 2006. His school and pre medical records are additional testimony to his excellent academic caliber.

After completion of his compulsory internship, Dr. Pramod Lamichhane joined me in March 2006 as a house officer at the Hospital and Rehabilitation Centre for Disabled Children (HRDC). At this unique paediatric orthopaedic hospital and rehabilitation center, he was introduced to a wide variety of musculoskeletal disorders and their complete management. Visiting rural locations in different parts of Nepal as a member of the mobile teams added much value to his training. Dr. Pramod was introduced to trauma and adult orthopaedic work after he started his academic rotation at B&B Hospital as part of his residency training under Kathmandu University. Over a period of several years he has not only familiarized himself with many faces of traumatology, but also become an accomplished surgeon capable of independently taking care of many common and uncommon problems. Critical care, polytrauma management was a routine part of the trauma work at B&B Hospital in Kathmandu.

He keeps up with his reading and I have always found him to be well informed during rounds, classes and discussions. He also takes leading roles in organizing educational and training activities at both our centers. Dr. pramod Lamichhane has very pleasant manners and a wonderful smile all the time, even in challenging circumstances. He is very hard working and gets along well with all his colleagues.

Dr. Pramod Lamichhane has to be congratulated on his well done job. I have had the personal experience of observing his steadily improving skills in orthopedic surgery. I have no doubt that Dr. pramod will continue his endeavors to further orthopedic medical education.



Prof. (Dr.) Ashok Kumar Banskota, MD, FACS

Chief of Orthopaedic Surgery & Medical Director, B&B Hospital

Hospital and rehabilitation Center for Disabled Children (HRDC), Banepa, Kavre

Professor and Clinical Program Director, Kathmandu University

FOREWORD

It is with great pleasure that I write this foreword for the book titled "Orthopedics: Practice in Nepal," authored by Dr. Pramod Lamichhane and Dr. Anil Bhattarai. As a fellow orthopedic surgeon, I have had the privilege of observing their dedication, expertise, and commitment to the field.

Orthopedics is a constantly evolving specialty, and it requires a strong foundation of knowledge and skills to navigate its intricacies. This book, meticulously compiled by Dr. Lamichhane and Dr. Bhattarai, serves as a valuable resource for medical students, offering them a comprehensive guide to understanding and practicing orthopedics in the context of Nepal.

The authors have skillfully presented the essential concepts, techniques, and principles of orthopedics in a clear and concise manner. From basic anatomy and diagnostic approaches to advanced surgical procedures and rehabilitation, the book covers a wide range of topics that are crucial for aspiring orthopedic professionals.

Furthermore, "Orthopedics: Practice in Nepal" goes beyond the theoretical aspects by providing practical insights, clinical case studies, and evidence-based guidelines. This integration of theory and practice ensures that readers develop a holistic understanding of orthopedics and are well-prepared to address the challenges they may encounter in their medical careers.

I commend the authors for their efforts in creating a valuable educational tool that fills a significant gap in the literature. Their dedication to promoting excellence in orthopedics education is evident throughout the book. I am confident that medical students, residents, and practicing orthopedic surgeons will find this book immensely beneficial in enhancing their knowledge and skills.

I extend my sincere congratulations to Dr. Pramod Lamichhane and Dr. Anil Bhattarai on the successful publication of "Orthopedics: Practice in Nepal." Their contributions to the field of orthopedics and medical education are highly commendable. I have no doubt that this book will be a valuable asset for anyone seeking to excel in the field of orthopedics in Nepal and beyond.



Prof. Arjun Lamichhane, MS (Ortho)

President, Nepal Orthopaedic Association

Chief, TU Teaching Hospital Maharajgunj Medical Campus, Institute of Medicine,
Tribhuvan University, Nepal

FOREWORD

I have had the privilege of knowing Dr. Pramod Lamichhane since 2008, when he embarked on his journey as a young and enthusiastic orthopaedic resident at Kathamadu University. Over the years, I have witnessed his growth both as a dedicated professional and as a skilled orthopedic and sports surgeon. During our collaboration in the Department of Orthopedics, it was evident that his passion for learning and teaching students was unwavering. Therefore, it comes as no surprise that he has produced an excellent book.

"Orthopedics: Practice in Nepal," a meticulously compiled handbook tailored for medical students, is poised to become a valuable companion for both undergraduate and postgraduate students alike.

This book strikes a fine balance between conciseness and comprehensive coverage, presenting complex concepts in a clear and accessible manner. It elucidates the fundamental approaches to various questions, elucidates the characteristics and functions of implants, instruments, orthoses, and prostheses, and delves into several other chapters that are crucial knowledge for any student preparing for examinations.

I have high hopes that Dr. Pramod Lamichhane's endeavour will prove immensely beneficial and exceed the expectations of students. I wholeheartedly congratulate Dr. Pramod and extend my best wishes for all his future endeavors.



Prof. Ramesh Prasad Singh

HOD Department of Orthopaedic Nepal Medical College & Teaching Hospital
AO Alliance, Aisa Chairman

FOREWORD

Dr. Pramod has been closely associated with me continuously for the past four years. After graduating from College of Medical Sciences under Kathmandu University in February 2006, he worked as a house officer for one year in Hospital and Rehabilitation centre for Disabled Children (HRDC). He was one of the three residents selected into the Orthopaedics Residency Training Program of Kathmandu University in 2007. Having already spent one year in the department of orthopaedics, it was an easy transition for Dr. Pramod Lamichhane into the demanding schedule of the orthopaedic residency. The residency program was completed through structured rotation between B & B Hospital (trauma and adult disease) and HRDC (complete spectrum of Paediatric Orthopaedics and Rehabilitation).

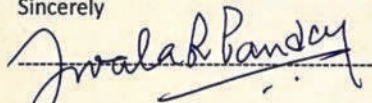
Dr. Pramod Lamichhane has very diligently worked his way through the residency program. He has able to put in long hours of work as and when required and developed a disciplined professional approach to his work and studies. He has participated in almost every type of orthopaedic surgical procedure and in his senior year of residency and registrarship, a lot of independent patient care responsibility was awarded to him. His practical skills are steadily maturing and he is able now to independently perform most of the common procedures in trauma as well as for reconstructive orthopaedic disorders. For the very strong emphasis that our residency training program provides in Paediatric orthopaedic disorders, Dr. Pramod has a large plus point in his favour.

Dr. Pramod is a very keen student and he has been adequately trained to analyse and assimilate data. He has a number of publications to his credit, and I have found his response to educational tasks signed to him most positive.

He also provided inputs to the spine program of HRDC and attended the weekly grand rounds and teaching training conference of orthopaedic residents.

I have found it a very pleasant experience to work with and train this fine young surgeon. I am convinced that he will retain the warmth and honesty and sincerity that is such an important part of his character. I have no hesitation in strongly recommending Dr. Pramod Lamichhane for any job or training opportunities any where in the world.

Sincerely



Prof. (Dr.) Jwala Raj Pandey, F.R.C.S, M.Ch

Professor and Preceptor of Kathmandu University Post Graduate Training Program in Orthopaedics at B&B Hospital, Lalitpur and HRDC, Banepa.

PREFACE

From my childhood, I used to be engaged in something extra activities and in new thoughts in addition to my regular studies. During my short and long term vacations, I used to compile or make something in a different way, which seemed like a new invention. I made a table fan using the motor of tape recorder which was appreciated in one of the national programs organized locally. During my medical schools, I wonder why cannot we formulate our own methods and protocols of treatment for the patients? During my residency I compiled some interesting books like looking behind, stating all my past history, compiled all the power point presentations at my post graduate school into a book called (Quick Review in Orthopaedics) and some more collections related to orthopaedic scientists and famous surgeons.

From my residency, I used to wonder why we cannot formulate our own way or protocol of treating trauma patients, since we have a diverse geography and facilities in all part of the country is not the same? Remaining the basic principle same, the treatment of patient at Dolpa district and the Kathmandu valley may vary depending on the resources and manpower available. So I was keen on formulating such protocols and developing our own way of treating the orthopaedic patients. I realized that it is not possible with working under others as a junior surgeon. I established a hospital immediately after my graduation and started my practice. We presented different paper in different national and international forums, stating our protocol. During my AO trauma Fellowship in Netherlands, I could see lot of differences in managing trauma patients, there and here in Nepal.

During these 11 years we treated and rehabilitated huge number of patients with fairly good results. We thought, it is high time now to share our experience about our treatment protocol so that patients living at the remote areas and even the people with low socioeconomic status get the same quality of treatment as in urban areas.

This book is a combination of basic principles of treatment of orthopaedics and trauma patients with illustrations, statistics and case series from Alive Hospital & Trauma Centre, Bharatpur, Chitwan. We are sharing our own experiences, key to success, stating the tips and tricks whenever we are in difficulty while treating the patients, wherever we practice even with limited resources.

Chitwan, Nepal, 2023

Dr. Pramod Lamichhane

drpramod131@gmail.com

Dedication

With deepest gratitude and respect,
I offer this book as my humble gift,
May it serve as a beacon of knowledge,
To all who uplift and uplift.

Contributors



Dr. Santosh Kamar
Consultant Orthopaedic Surgeon
MS Orthopaedics (WMU, KMU)
Alive Hospital and Trauma Centre



Dr. Dipak Raj Tiwari
MBBS. MD
Anesthesiologist
Anesthesiologist & Intesivist



Mrs. Sarina Chudal
Director
Alive Hospital and Trauma Centre

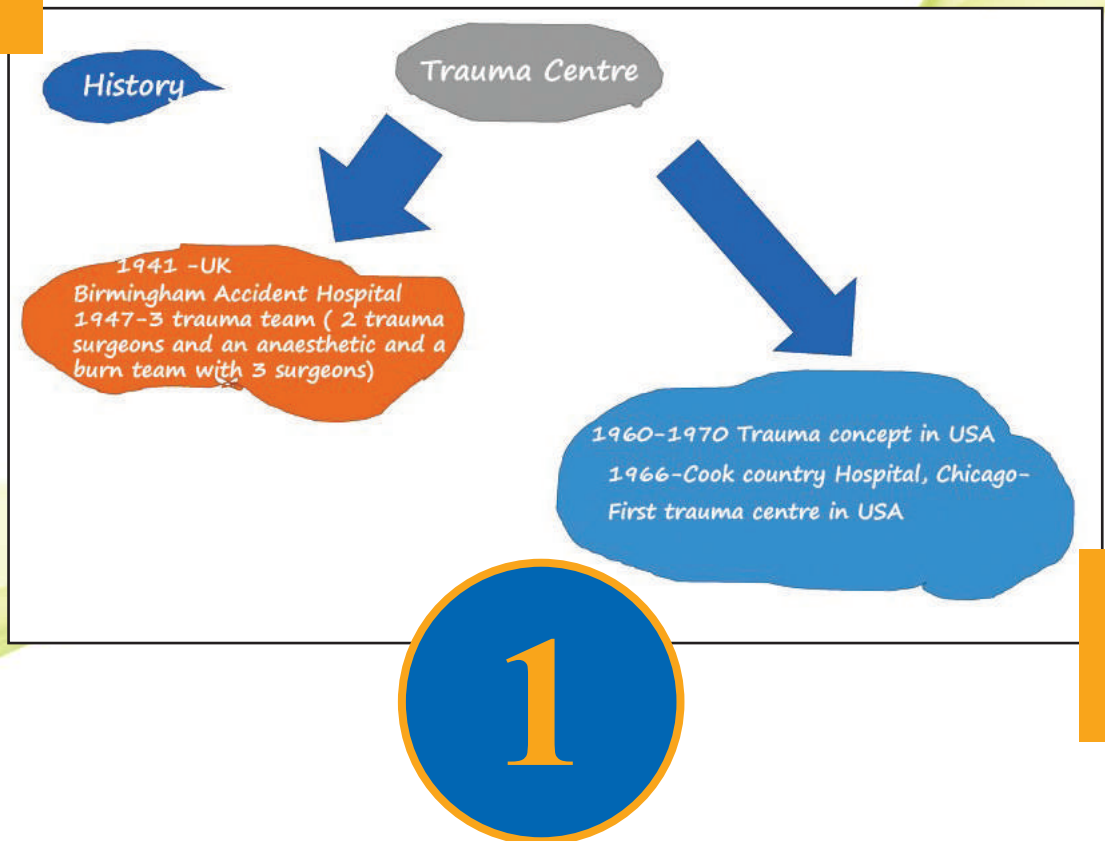


Dipak Mahaseth
MSc. Microbiology
laboratory Incharge
Alive Hospital and Trauma Centre

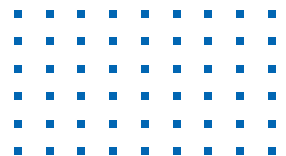
Table of Content



Chapter	Title	Page
Chapter 1	Background	1
Chapter 2	General Principle of management of Trauma Patients	9
Chapter 3	Principles of Management of Fractures	17
Chapter 4	Early v/s late surgery	25
Chapter 5	Early Rehabilitation	31
Chapter 6	Minimization of radiation hazards in Orthopaedics	35
Chapter 7	Cost effective treatment in the context of Nepal	39
Chapter 8	Unanticipated complications	45
Chapter 9	Recent advances and guided treatment	49
Chapter 10	Implant Removal	53
Chapter 11	Implant failure	57
Chapter 12	Malunion and complications	61
Chapter 13	Nonunion and delayed union	65
Chapter 14	Osteomyelitis	75
Chapter 15	Spine	81
Chapter 16	Upper limb	85
Chapter 17	Lower Limb	95
Chapter 18	Paediatric Trauma	103
Chapter 19	Physical Disabilities	111
Chapter 20	Implants	117
Chapter 21	Arbitrary term & time for fracture union	121
	AO Trauma Fellowship	
	Similarities and differences in treatment of trauma patients between western world and our setup	123
	Research and publications controversies and our opinion	133



BACKGROUND



The Concept of trauma centres originated only during the era of world war II, from the United Kingdom and it was started in America in the year 2060s only. There are two concepts regarding the modalities of trauma centres. There are three level of trauma centres , for example Level I, Level II and Level III trauma centres in the united Kingdom. There are five levels of trauma centres starting from Level I to Level V trauma centres in the united states. Nowdays there are different separate trauma centres for the treatment of children

and for the treatment of adult populations. Level I trauma centres are the highest level of centres with highest level of care for the severely injured patients. Whatever the type of trauma centre, the main aim of it is to treat the trauma victims in a comprehensive way . In Nepal we have one national trauma centre which started operating just less than a decade ago. Still there are certain barriers and we are sort of proper laws and regulations to establish a trauma centres in the private sector.

The top 11 “killers” as published by WHO	
Causes of death	Percentage
Heart disease	12.6
Stroke	9.6
Lower rep. infection	6.6
HIV/AIDS	4.9
Lung disease	4.8
Perinatal conditions	4.3
Diarrhea	3.1
Tuberculosis	2.8
Trachea and Lung cancers	2.2
Malaria	2.1
ROAD TRAFFIC ACCIDENTS	2.1

Fig 1.1- Leading cause of death

The leading cause of death after trauma falls within top ten causes in the world. The incidence is more severe in developing and low income countries as compared to developed countries.

Principles of Trauma

The Principle of management of trauma patients is changing with time and with newer innovations. Now days the management of orthopaedic trauma is vast different than that it was practiced in the past years. We follow the modalities of treatment formulated mostly by the international community.

There is a vast difference in the people in national and international society in terms of socioeconomic status, intelligence, living and demand of the people. Geography and development is also not the same everywhere.

So the treatment modalities also differ a lot in different places. For example the use of C-arm or image intensifier is not the same in Kathmandu and in Dolpa district hospital for treatment of fracture cases . Level of physical development, availability of skilled manpower, available overall facilities of sound maintenance system of the equipments and cost of the treatment may play a great role. In this variation. If there is no proper road access to the hospital, or if the hospital rooms are not adequate to accommodate the machine, then it is not possible to use

a C-arm in the remote areas. This is just a symbolic example and there are many more things that we cannot equally make available to all the places.

So far till date, some districts in Nepal have no orthopaedic surgeons (February 2023). With these problems and many more the treatment modalities may also differ at different places. We will discuss the different modalities of treatment in details in successive chapters. We mean to say that basic principle of treatment remaining the same, the management of the same trauma patient may differ at different places.

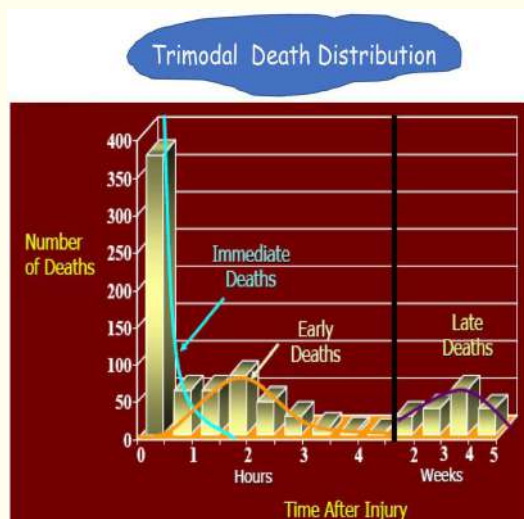


Fig. 1.2 - There are three modes of death after injury. Immediate, early and late. Most of the deaths occur immediately after injury even before they reach the hospital. We can reduce the early and late deaths with good management in well equipped trauma centres and hospitals.

Modality of trauma care

There are two modalities or systems of management of trauma patients globally. The usual modality, practiced by majority of hospitals and countries and traditionally is to treat the patients in coordination of different departments including orthopaedics, neurosurgery, general surgery, general medicines ect. with the department of anaesthesia as the team leader.

The second modality as practiced by Netherlands and some other countries is that the concept of “trauma team” or the “trauma surgeons”. This is another department just to see after the trauma patients in coordination with other supportive departments. The primary treating team is the trauma surgeon and all other departments are the supporting ones. Trauma surgeons even do the laparotomy, thoracotomy as well as the femur fracture.

We will give two examples why the second modality is important from our own experience. Once we received a patient with bear bite over the cheek, with a huge skin loss on one side of face, involving the eyelid, nose, maxillary cavity, buccal mucosa and the saliva driveling out from the cheek. At that time there were no maxillofacial surgeon in the city and the patient was referred from departments to department from Ophthalmology, ENT, Dental and Plastic. Departments just stating that, it was not their

systematic treatment system here in Nepal especially in the rural areas. This necessitates the need of trauma surgeons in certain situation, so the second concept of trauma surgeons treating the trauma patients also sounds sensible. In Nepal where there are no facilities of all the respective departments and we get such cases then it is very difficult for the patients to get a comprehensive care. We are lagging this system and we follow the first system in Nepal.



- Injuries are the leading cause of death between age groups 1-44 years.
- Leading cause of trauma are –Road Traffic Accident, Falls & Assaults.
- Comprehensive management in trauma centres, increase chances of survival of the patient by 20-25%
- 1 in 3 deaths that occurs in the hospital as a result of an injury could have been prevented with comprehensive treatment in trauma centres.
- Deaths of the patient occur due to failure of simple management in the early stages (“GOLDEN HOUR ”), rather than a failure of complex, definitive treatment
- But, the operation of a trauma centre is extremely expensive. There are only few institutions operating in this model in Nepal.

The second case was the case with pelvic fracture with vaginal laceration with perineal laceration extending the laceration upto the thigh. Again the same scenario was developed and we as a trauma surgeon, fixed the pelvis and addressed all the lacerations successively taking opinions from the respective departments whenever required. The patient did excellent and was discharged happily.

Till date there is no provision of running a trauma centre in private sector in Nepal. Laws are yet to be made by the government

for establishing and running a trauma centre in the private sectors as well in Nepal.

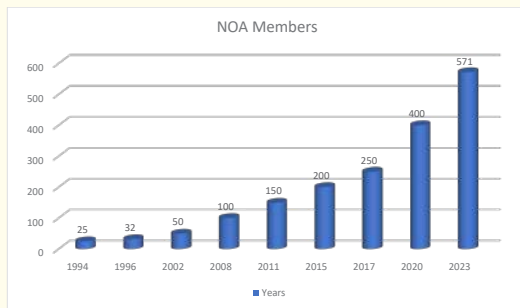


Fig. 1.4 : No of total orthopaedic surgeons in Nepal

There were hardly few orthopaedic surgeons in Nepal before 1990s and all of them were trained from abroad. After the establishment of orthopaedic training programs in 1998 in Nepal, the number of orthopaedic surgeons started increasing exponentially and there are now 571 orthopaedic surgeons in Nepal till early 2023AD. Please refer to the figure for yearly increase in number of orthopaedic surgeons in Nepal.

Still 27 districts out of 77 districts in Nepal are deprived of orthopaedic surgeons as of end of 2022 AD. Because of diverse geography, and lack of facilities and development these remote districts are lacking orthopaedic surgeons in Nepal.

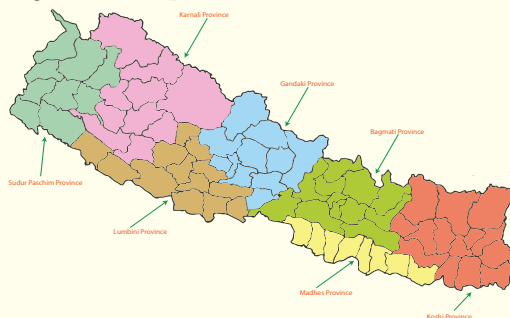


Fig 1.5 : Now 27 Districts out of 77 districts are without orthopaedic surgeons in Nepal.

Miracles in trauma Surgery

The saying that “ The art of medicine consists of amusing the patient while the nature cures the disease. Nature cures the disease we are just the actors in between.” By Voltaire Proves somewhat true. The fracture or trauma that we are intervening may have healed by its self, just not doing or just with minimal intervention, instead of our invasive interventions. Patient may adapt to some form and maintain their everyday living. Here are two examples.



Fig. 1.6 - This case presented to the hospital by walking with full weight bearing on his both legs after 2 months of injury. He wanted to consult with the non healing ulcer on the dorsum of his foot. Surprisingly in radiograph we saw a fractured calcaneum with wide separation and patient was unaware of it and was walking without any medical treatment. Had he been to the hospital immediately, we would have advised him some form of treatment with intervention. Is it really needed now since he is walking normally?



Fig. 1.7 - This lady had injury to her leg during her childhood and she was walking with this nonunion for the last 25 years and with normal activities. She got married and even have children but still she was comfortable. I mean to say that it should have been addressed as fracture distal tibia and treated accordingly and if there was nonunion, then should have been addressed for nonunion. In spite of this , she is still comfortable with her daily activities. So sometimes I wonder, are all the interventions we are doing nowadays in treatment of patients really worthwhile?

Treatment in trauma and orthopaedics should be individualized to the individual patient. The treatment may be different in different patients depending on the resources available, personality of the patient and the fracture and the experience of the team. This statement does not sound scientific but this is the truth and reality. Due to different constraints as in contest of Nepal, the treatment modality in Bajura district may vary with that the treatment in national

trauma center in Kathmandu. We all agree on this statement. Treatment also vary according to the patients personality like his demand, age, activity level, consciousness , built and the severity and personality or type of injury he sustained. These all practical aspects like the geographical variation and social constraints of the patient are not mentioned in the book which is very important from the prospective of treating surgeon. There should be plenty of rooms for the concerned surgeon or team to apply their sensible common sense, intelligence and their own experience in the management of trauma patients which is equally important as the general principle.

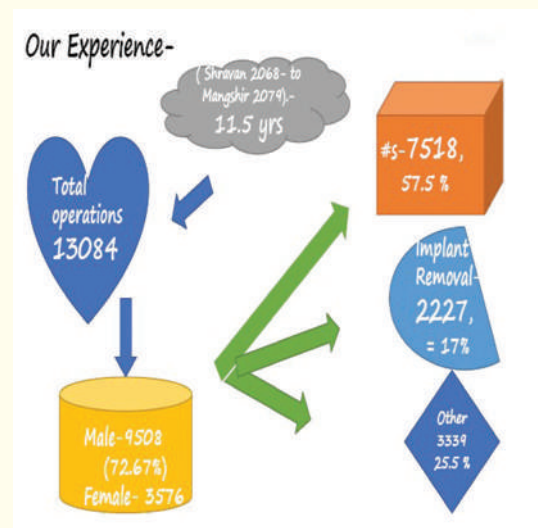


Fig. 1.8- Chart showing total number of operations at our centre since July 2011 to Dec. of 2022.

With all these things in mind, we realized that we Nepalese people need a separate treatment protocol to our own patients, which may differ from that of the western world. In this book we are highlighting the important and salient features and methods and modalities

that we have followed in our hospital in treating orthopaedic patients sticking to the standard basic principle of management of the orthopaedic patients.

Changing concept of management of trauma patients

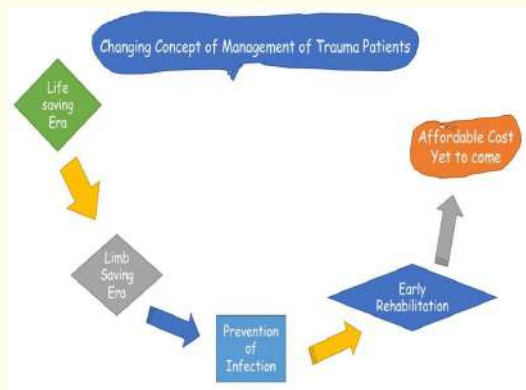


Fig. 1.9 - Flow chart - in the evolution of management of trauma patients

Life Saving Era

In the early days, the main aim of treatment of trauma victims was to save the life of trauma patients. There were very limited facilities and very less opportunities for the trauma victims. This was practiced in the war victims.

Limb Saving Era

With further innovation and advancement in medical field with more skilled manpower, the aim of saving the injured limb in the injured victim was practiced.

Prevention of infection

In case of surgery especially in open injuries,

the challenge was to prevent infection, the more the surgery, the more was the prevalence of infection especially in war wounds and in open fractures. With the invent of proper antibiotics, this was greatly achieved.

Early return to preinjury status

This is very important. Everyone wishes to return to preinjury status with less morbidity despite the severity of injury and the treatment cost and with less morbidity. This is another challenge and it is an important indicator of the outcome of the hospital and the treating team. In this era of modernization and era with maximum invention, no one want to stay in the hospital or as a patient going through a lengthy procedures. For example in case of shaft of femur fracture patients want early up and about rather than to wait for the surgery day to commence in tractions or external supports. This is the main principle we are focusing and following in our centre which ultimately rewarded us by the patients results.

Affordable cost

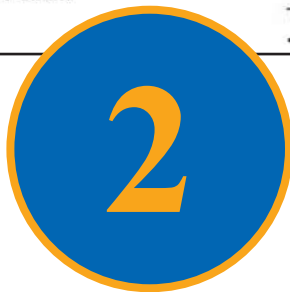
The another challenge in the present days is to cut short the cost of treatment all over the world. It is a burning issue and even in developed countries the cost of treatment is very high. Though paid by the insurance companies, the investment of the government or the country is escalating high which has become a major problem in most of the countries. All the people do not have health

insurance facilities and some treatment are so expensive that the companies face difficulty and patients do not afford for their treatment. In Nepal less than one fourth people just have a health insurance facilities, that also covers a minimum amount and the patients have to spend a lot for their health annually. The socioeconomic status and the per capital income of the people is very less

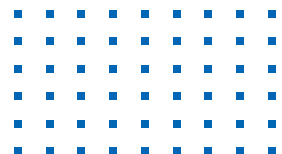
and this principle of treating the patients with low cost with the same result will be the main focus of the world in coming decades. We are focusing our treatment in these two points, that is to make the patient up and above early with minimal morbidity with less cost. This is another positive sign for us, that more and the patients are trusting us.



Fig. 1.10 - Emergency room for management of trauma patients with X-Ray & USG in the emergency room with other facilities.



GENERAL PRINCIPLE OF MANAGEMENT OF TRAUMA PATIENTS



1) Pre-Hospital Care

This care is not fully developed or is very primitive or sometimes there is no treatment at all until the patient reaches the hospital in Nepal. Sometimes patient loose their limbs or even loose the life and sometimes become life long morbid because of lack of proper prehospital care of the injured patients.



Fig. 2.1 - Because of delay in treatment and development of compartment syndrome, this boy lost his right upper extremity. This happened just near to the capital city.

a) Traditional beliefs

Still in most of the rural areas there are traditional beliefs and somewhere there is prevalence of unethical practices of treating patients not only the trauma but also all the diseases. Traditional bone setters apply different materials and devices to the injured part, irrespective of the severity of the injury. Sometimes they get cured in case of soft tissue injury and in cases of undisplaced or displaced fractures with anatomical alignment. Most of the times patients land to hospital with complications like with compartment syndrome, allergy to the materials used, infection, VIC, stiffness, malunion, nonunion, and also sometimes with gangrene of the limb



Fig. 2.2 - Photos of gangrene, modalities of management and complications in the rural areas.

It is still very difficult to eradicate that traditional and social beliefs of the people. Lack of awareness and education also plays a major role. In some villages, societies and in certain ethnicity it is widely spread and even intellectual peoples are strongly occupied with this beliefs.

b) Public involvement

In other cases, general people just face the initial accident site, just pick the patients and send them to the health centres and hospitals without any preliminary treatment and assessment, in any of the vehicles or in traditional carriage modalities where there is no transport or road facility.



Fig 2.3 - Doko & Jholi used as ambulance in rural area.

c) Trained staffs and Paramedics

Sometimes ambulance drivers who are trained somehow or with their experience, are the first persons to face the patient at the accident site and they do something than do nothing before bringing the patients to the hospitals. To some extent they apply measures to stop bleeding and provide oxygen to the serious patients. They also coordinate with the patient party as well as the security personals and sometimes with the health personals and to the hospitals where they are taking the patient. This one step is very important in management of trauma patients and it plays a great role in outcome of the patient too.

In other mass casualty, security personals play a major role in rescuing the trauma victims and channeling the patients to the hospitals.



Fig. 2.4 - Data published by Private Hospital Association of Nepal.

Statistics show that in the developed countries, like in Netherlands whenever there is trauma, a mobile trauma team reaches the incident site within minutes, and carry the injured to the hospital after necessary primary treatment. During the transport they pass all the information to the recipient hospital which is then circulated to the

whole hospital. The trauma team with all the facilities is ready before the patient arrives to the emergency and all other necessary treatment is done at the recipient hospital as a standard protocol.



Fig. 2.5 - Leading Causes of RTA & Death in Nepal.

2) Emergency Management



Fig 2.6 - Chart showing management protocol in emergency.



Fig 2.7- Emergency room of a level 1 trauma centre with all facilities for the management of critically traumatized patient in a western setup.

a) Pre-Hospital Treatment

This is very important and vital in the outcome of treatment but this system is very poor in Nepal and there is hardly any practice in Nepal. Most of our cases are brought by the ambulance drivers and sometimes they communicate with the hospital and treating team about the case and severity in layman term. There are hardly any paramedics in the injury site and during transportation. Sometimes security persons and the police pass the information to the hospitals about the mass casualty.



Fig 2.8- Picture showing a child with hip spica carried by her mother on her back with the support of hip spica.

This part of management of trauma patients is very important. The management at the incident site determines the over all outcome of the patient. For example immobilization of the spine, splinting the injured limb straight, first aid for the wounds and stopping the bleeding with bandages or tourniquet over all increases the survival of the patient, decreases short term and long term complications and even the need for amputations.

This part is very much lagging in our country.

b) In Hospital Treatment

General Care

I) Advanced Trauma Life Support

Primary Survey (Examination)

- 1) Airway with Cervical spine protection
- 2) Breathing and Circulation
- 3) Circulation with hemorrhage control, - look for chest injury if any which may impade the normal ventilation
- 4) Disability and neurological status
Glasglow Coma Scale
- 5) Exposure to the environment




Behaviour	Response
 Eye Opening Response	4. Spontaneously 3. To speech 2. To pain 1. No response
 Verbal Response	5. Oriented to time, person and place 4. Confused 3. Inappropriate words 2. Incomprehensible sounds 1. No response
 Motor Response	6. Obeys command 5. Moves to localised pain 4. Flex to withdraw from pain 3. Abnormal flexion 2. Abnormal extension 1. No response

Fig 2.9 - Glasglow Coma Scale

Resuscitation

- 1) Airway- Establish a definitive airway- Positioning, ET tube, Tracheostomy
- 2) Breathing and Ventillation- Verify that the tissue oxygenation is being achieved.
- 3) Circulation

Stop bleeding

IV line- Minimum of two large bore IV lines should be established.

Fluid Resuscitation- Hypovolumic shock is suspected, Ringer Lactate, 2-3 Liters initially infused. IF no response

give blood. The best indicator of fluid resuscitation is Urine output.



Fig 2.10- Burn injury manage locally in the remote area for 18 months with traditional method. There was non healing ulcer with infection for 18 months. This reflects the treatment of trauma patients in remote rural areas in Nepal.

Other Studies and Investigations

ECG

Urine Output

NG tube

ABG analysis

Pulse oximetry

Trauma series - X-ray of C spine AP and Lateral View, AP chest and Pelvis X-ray

B) Secondary Survey

Done once the vital signs are stable and look for neurological involvement. Take a proper history and examine the patient thoroughly.

II) Management of Shock

1) Haemorrhagic shock

Blood volume is 7% of the body weight, In children it is 8-9% of their body weight.

Fluid Challenge – Initially give 1-2 litres of fluid and up to 3 litres are given, 20 ml/ kg

in children. Colloid best is ringer lactate. Second choice is normal saline which may cause hyperchloremic acidosis if given in excess amount

2) Non Haemorrhagic shock-

- 1) Cardiogenic shock, Hypotension with Trakicardia
- 2) Tension Pneumothorax,
- 3) Neurogenic shock, Hypotension without tachycardia, vaso constriction and responds to fluid resusciation
- 4) Septic Shock

III) Injuries by location

Examine the patient and investigate thoroughly and involve the respective Department.

Emergency Orthopaedic treatment

The emergency treatment may be definitive or temporary. In most cases when the patient is stable and the patient with open fractures with grade Gustillo IIIB or less we can go for definitive fixation in the initial setting. We will elaborate the principles and methods in the respective topics.

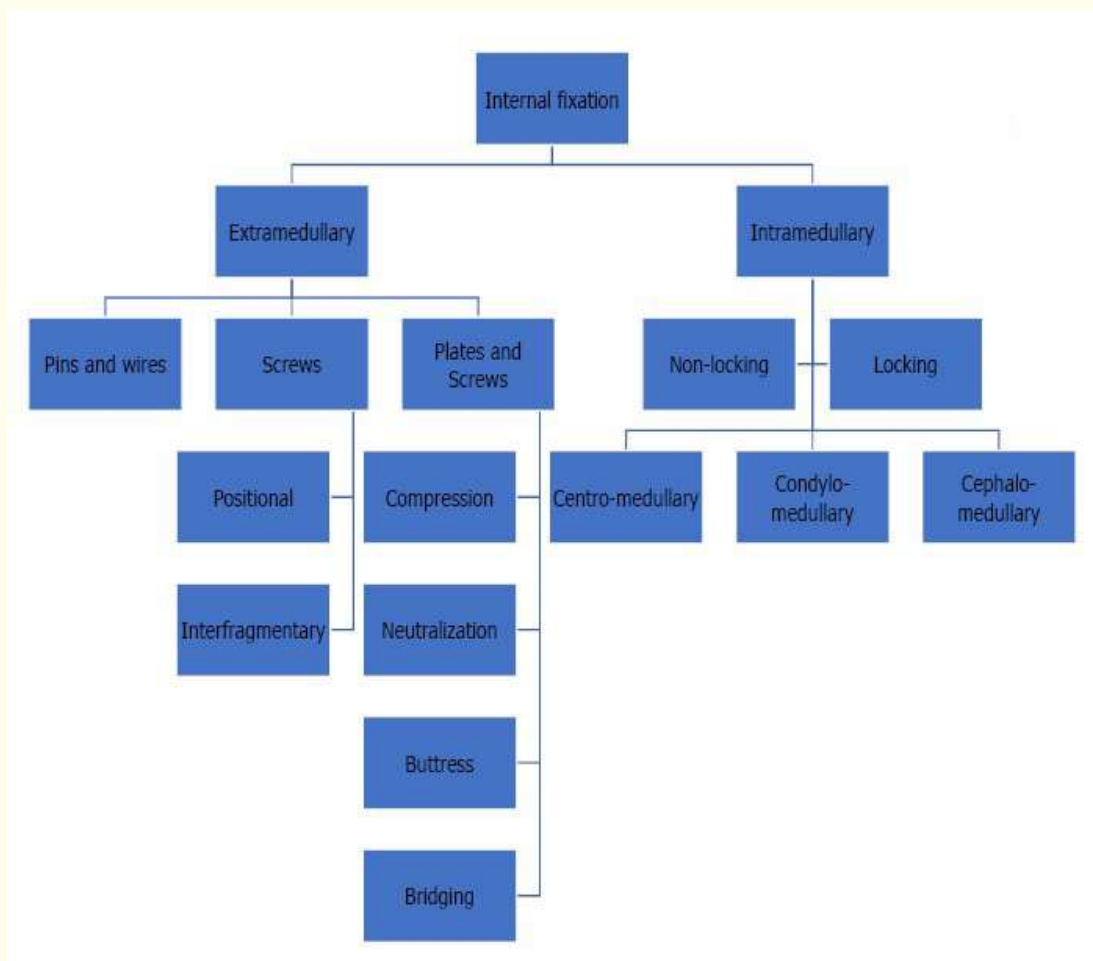


Fig 2.11 - Flow chart showing internal fixation of fracture

Temporary Stabilization-

In case of very high risk cases, cases with severe injury like polytrauma, multiple trauma and Gustillo IIIB and above, we may have to go for quick surgery. Irrigation, debridement, and quick external fixation with or without primary closure of the wound. Time is another important factor, and we should choose the easiest mode of emergency fixation. We choose AO external fixator which can be applied within minutes over ilizarov methods which may require even hours.

Definitive fixation

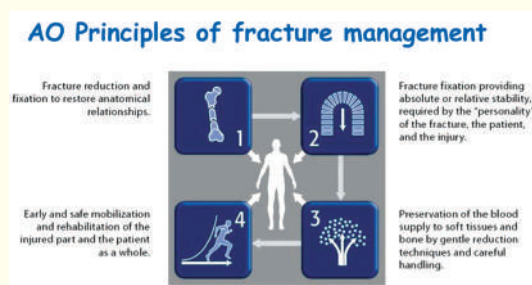


Fig 2.12- Flow chart of updated AO Principles

Definitive fixation is done once the patient is stable and once the wound is clean. Timing of surgery and modalities will be discussed in the respective chapters.

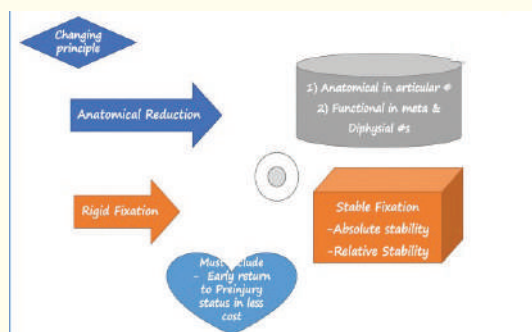


Fig 2.13 - Flow chart showing changing pattern of AO principle of management of trauma patients.

Referral-

We have to refer the patient to the institution he desires or to the surgeons he wishes. It is their right and without hesitation, with all the necessary counselling we should do that after the patient is stable and whenever required with a medical team or a doctor- to the destination hospital and transfer his or her responsibilities to the new team. In Nepal we do not practice this culture, which is also very important. Sometimes arguments arise

and even we face legal issues regarding this practice. If we are referring to the higher centre for better and super speciality or better facility, we should clearly mention all the treatment given and then mention the reason to refer the patient. If patient wants referral by their own, again we should mention all things along with "Discharged on Request"

LAMA-

It is not accepted legally. Legally, it is the duty of the treating doctor to transfer his or her duties and responsibilities of the patient that he has examined or managed. In Nepal there is tendency to write LAMA, i.e. left against medical advice which sounds unethical. Instead we can write patient is discharged on request or patient is referred to other center on request, sounds more sweet and legal, since patient has the right to choose the doctor and the hospital.

Sometimes in case of third party payment, patients party want to take the patient to the other cities or hospitals where they are comfortable irrespective of the care and cost of treatment in the recipient hospital. In such cases, we should also refer the patient with respect and with all the arrangement.

Our Practice in Nepal

In our practice, whenever there is a severe injury like open fractures, multiple injury or polytrauma, we get a call from ambulance driver on the way to the hospital mentioning the mode of injury, severity of injury in a lay man term, and estimated time of arrival.

We circulate the same message with some modifications to our hospitals social group so that all the concerned department involving the administration will be kept in attention. Our trauma team, most of the time with orthopaedic surgeon as the team leader will access the patient initially and channelize the patient accordingly. Rest of the management is done as mentioned, and triage is done accordingly.

We have presented a free paper in orthocon 2023 held in butwal. Regarding the treatment of trauma patients in Nepal. The abstract of which is as follows.

Management of trauma patients, Where do we stand ?

*Dr. Pramod Lamichhane, Dr Anil Bhattarai,
Dr Santosh Kamar*

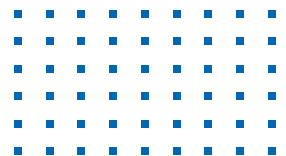
Abstract

Principle of management of trauma patients is changing time and again and not a single procedure is ideal for management throughout the decades. The so called gold standard protocol at one time sometimes becomes absolute later on. The management of trauma, is changing and advancing so rapidly that if we look back retrospectively, we may find the previous treatment protocol, more appropriate than the current trend. We have to realize and turn back at one point to formulate the treatment plan.



3

PRINCIPLES OF MANAGEMENT OF FRACTURES



Principles of Management of Fractures

Introduction

The incidence of trauma, fracture and complications of treatment is increasing world wide. Issues of nonunion, infection and implant failure are the results after primary treatment of trauma and fractures. We can reduce and address the complications and morbidity if we plan the primary management in a proper way.

History

In the early days, the treatment aim and modality of trauma patients was very primitive. The principle of treatment with the due course of time with the introduction of newer technology and modalities, changed from the era of saving life of trauma patient to the era of saving limb and to the era of preservation of the function of the injured limb. Some of the data are presented below.

- **Volkmann 1878** - mortality rate in open fractures was upto - 38.5%
- **Billroth 1866** - Out of 96 open tibial fractures - there were 36 deaths and 28 amputations.
- Before 1916, the percentage of death after open femoral fractures in World War I - was upto 80%.
- Incidence reduced to 15.6 after more aggressive management, including use of the Thomas splint.
- **Hippocratic** - Adequate debridement with wound left open has good outcome.
- **Galenic** - Appropriate antibiotic introduced at the proper time has good outcome..

- Two major schools of thoughts brought together - wound with best prognosis

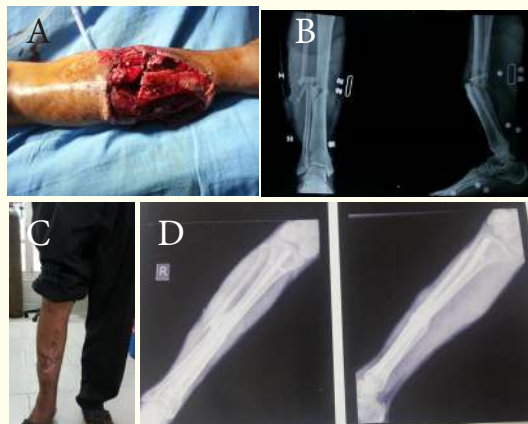


Fig 3.1- Picture A , B shows GIIIB fracture of Tibia at presentation, picture C, D shows complete recovery after 12 months with primary internal fixation.

Early total care Vs Damage control orthopaedics

There has been a change in concept of treatment of multiple trauma, polytrauma and open injuries time and again. During the 1950s and 1960s, surgical stabilization of long bones fractures after multiple trauma was not advocated early-thinking that early manipulation was unsafe. The principle of early total care developed in the early 1970s with the idea that early stabilization of the long bones fracture within 24 hours of injury will reduce the pulmonary complications and over all morbidity and mortality of the patient. Early total care (ETC) became the gold standard of trauma surgery then after. In the 1990s the principle of ETC was highly criticized by different studies saying that this modality of treatment of trauma patients was unsafe and increased the pulmonary complications and mortality especially in cases with thoracic injury. Then came

the era of Damage control orthopaedics (DCO). It is the approach that helps to stabilize orthopaedic injuries in minimum possible time with minimal possible further injuries or with over all improvement in patient physiology. Its main aim was to avoid worsening of the patient condition by “second hit” of major orthopaedic procedure.

Middle path Principle

There is always a controversy, we follow a middle path principle. This method of management of trauma patients follows the principle of selective care which may not be early total care nor damage control. On the basis of severity of injury, condition of the patient & comorbidities, we select the principle of management. We often perform surgery within 6-12 hours of injury which prevent the further complication.

Golden hour

This is defined as the initial 6 hours of injury which is very important in the treatment of open fractures, multiple trauma and polytrauma. We also slightly modify this as surgery time. Maximum surgery output with the minimum time, is very crucial for the successful outcome of the injury. Ilizarov ring application and hours of vascular surgery in multiple and polytrauma patients may protect the limb in cost of loss of the life of the patient. We should not forget the basic principle again, first the life and the limb. This is the common and frequently done mistake which we should be careful of before going for early surgery.

Oestern and Tscherne Classification of Closed Fracture Soft Tissue Injury	
Grade 0	Injuries from indirect forces with negligible soft-tissue damage
Grade I	Superficial contusion/abrasion, simple fractures
Grade II	Deep abrasions, muscle/skin contusion, direct trauma, impending compartment syndrome
Grade III	Excessive skin contusion, crushed skin or destruction of muscle, subcutaneous degloving, acute compartment syndrome, and rupture of major blood vessel or nerve

Fig 3.2- Oestern and Tscherne Classification

Management of open Fractures

This is one of the most important and challenging injury to deal with . There are different views of treating these injuries. Primary definitive management of open injury is still a controversy. Nowadays there are several papers published in its support.

Usual trend of Open Fractures Treatment	
<ul style="list-style-type: none"> Debridement Antibiotics coverage Usually temporary stabilization initially by external fixators or sometimes internal fixation Definitive fixation and wound coverage after soft tissue healing 	<ul style="list-style-type: none"> For the war wounds No proper antibiotics coverage Fixation techniques, surgical techniques and soft tissue surgery were not that advanced Importance of timing of surgery was not that known

Fig 3.3- Treatment of open fracture

Gustilo classification

- **Gustilo I** - Less than 1 cm, low energy, often simple fractures
- **Gustilo II** - Greater than 1 cm, often comminuted fractures with some crushing component
- **Gustilo III** - Greater than 10 cm wound or significant soft tissue injury or fracture comminution, high
- **G III subdivided based on management required**
 1. **Gustilo IIIA** - Extensive soft tissue damage but has adequate periosteal bone coverage and usually does not require major reconstructive surgery
 2. **Gustilo IIIB** - Extensive soft tissue damage with periosteal stripping that leaves bone exposed, requires flap placement for soft tissue coverage
 3. **Gustilo IIIC** - Vascular injury to a named artery requiring repair

Fig 3.4- Gustillo Anderson Classification

The department of orthopaedics and traumatology has been dealing with severe open fractures, multiple trauma and polytrauma with degloving injuries. All the patients are definitely treated primarily at presentation. GIIIA and GIIIB fractures are definitely fixed initially after thorough irrigation and debridement, provided the patient came early within golden hour and are fit for surgery from anaesthesia side.

During long and short term follow up, there was no infection, and the patients are doing well. The overall hospital stay, treatment period and the cost of treatment is markedly reduced. Early return to pre-injury status with less cost and morbidity is our principle of treatment in open fractures and multiple trauma. Early anatomical alignment of fractures reduces ongoing adverse physiological changes in tissues, decreases patient deterioration decreases ARDS, FES, SIRS, and multiple organ dysfunctions and death.

We have not seen a single case of ARDS, FES, in our hospital in 10 years period. It reduces the rate of infection if surgery is performed within 6-12 hours of injury. Patient undergoes less number of surgeries,

We have presented this protocol of management of open fractures with case series in different forums around the world. We presented in BITs 3rd world orthopaedic conference in Seoul South Korea in 2016, in 38th SICOT in Cape Town, South Africa in 2018, ORTHOCON in 2013 and 2020 and in different CMES.

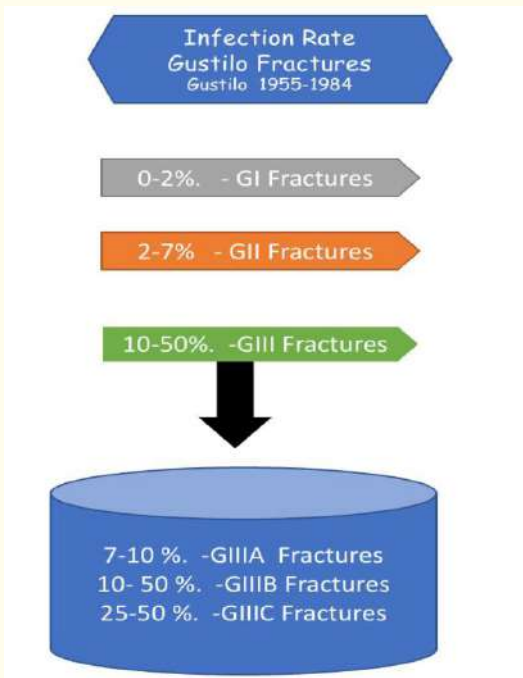


Fig 3.5- Flow chart showing infection rate in Gustilo series.

1. Abstract (Orthocon-2012)

Results of Primary Definite Fixation of Gustilo IIIA and IIIB fractures at Alive Hospital & Trauma Centre.



Fig 3.6- Picture A & B Show side swept injury of the elbow at presentation. Picture C&D shows complete recovery at 24 months with primary internal fixation.



Fig 3.7- Picture A & B Show GII comminuted proximal tibia fracture at presentation. Picture C&D shows complete recovery at 18 months.

Introduction

Initial definitive management of Gustilo III injuries is still controversial. The current trend is debridement, temporary primary stabilization initially and definitive fixation of the fracture later on once the wound is under control.

Materials and Methods

From July 2011 to December 2012, we treated 24 patients with Gustilo III open fractures, 10 fractures with Gustilo IIIA and 14 fractures with Gustilo IIIB wounds. Patients were between 3 years to 70 years old. Follow up period was between 6 weeks to 18 months. Definitive treatment was done within 12 hours of injury. There were 8 shaft of tibia fracture, 3 shaft of femur fracture, 4 open knee injury, 1 open ankle injury, 5 forearm injury, 3 open supracondylar humerus fracture.

Results

The overall results were good in terms of infection, morbidity, time and cost of treatment and patient satisfaction. There were

three low grade infection which required early implant removal.

Conclusion

Thorough debridement and primary definitive fixation of Gustilo IIIA and Gustilo IIIB fractures have good outcome in terms of early return to pre injury status, morbidity (which is less) and cost effectiveness. It is a preliminary study which requires a larger series and a long term follow up for the final outcome .

Key words-Open fractures, definitive primary fixation, good outcome

Level of evidence-Level III (Prospective Study)



Fig 3.8 - Picture A & B Show G3A fracture tibia managed with external fixator primarily elsewhere. Picture C&D shows complete recovery after 3 years with internal fixation after healing of the soft tissue.

2. Results of Early Definitive Internal Fixation of Closed Tibia Fractures. Orthocon-2022, BIT World Congress of Orthopaedics, Korea

Abstract

Early surgery in acute trauma with huge swelling is still controversial presuming that there will be infection and it will be difficult to close the skin. It is advisable to delay the surgery and manage by tractions, posterior slabs or external fixators for few days or even weeks for definitive surgery until the swelling subsides. We treated definitively with internal fixation all the cases of tibia fractures including tibial plateau (126), shaft (222) and distal tibia fractures (145), irrespective of swelling presenting to our hospital within twelve hours of injury from 2011 AD to 2021 AD. There were 493 cases from 3 years to 105 years old, 353 male and 140 females. During this period of ten years none of them had deep infection and all of them united without complications. There were 11 superficial infections which healed after implant removal after fracture union. Early reduction and definitive internal fixation of the fracture reduces the fracture volume, decreases further long term soft tissue stretching, development of huge swelling and helps in decompressing the swelling caused by hematoma and prevent further complications. We have promising results and patient satisfaction with early definitive internal fixation of closed tibia fractures. Further studies are required for the justification of the study.



Fig 3.9 - Picture A & B Show G3A fracture tibia managed primarily with intramedullary nail. Picture C&D shows complete recovery after 18 months.

3. Primary Definitive Internal Fixation of Gustilo IIIA and IIIB Fractures 2013 Orthocon, Wcort 2017, Sicot 2018

Abstract

Open fractures are surgical emergency but the initial definitive management of Gustilo III injuries is still controversial. The current trend is debridement, temporary primary stabilization initially and definitive fixation of the fracture later on whenever required once the wound is under control. We treated 107 patients with Gustilo III open fractures, 58 fractures with Gustilo IIIA and 59 fractures with Gustilo IIIB wounds. Patients were between 3 years to 79 years old. Follow up period was between 3 months to 3 years and definitive treatment was done within 12 hours of injury. The overall results were good in terms of infection, morbidity, time and cost of treatment and patient satisfaction.

There were five low grade infections which required early implant removal. Thorough debridement and primary definitive fixation of Gustilo IIIA and Gustilo IIIB fractures have good outcome in terms of early return to pre injury status, morbidity (which is less) and cost effectiveness.

Discussion (Paper)

Introduction

Open fractures are surgical emergency that should be thought as incomplete amputation. (Campbells) Tscherne described four eras of open fracture treatment. Life preservation or preantiseptic era which lasted until early 20th century. Era of limb preservation (during world war I and II) during which there was high rate of amputation and prosthetic fitting. Era of infection avoidance until mid 1960S with use of antibiotics. And the era of functional preservation with aggressive debridement, definitive fracture stabilization and delayed wound closure. (Campbells)

Fractures should be stabilized adequately with a minimum further damage to the vascularity of zone of injury and associated soft tissue injury. (campbells) Gustilo I fracture is treated like closed fractures. Treatment of Gustilo Type II and Type III fractures is more controversial with proponents of traction, external fixation, non reamed IM nails and occasionally plate and screws. (Campbells)

Metaphysial and diaphysial fractures are fixed with external fixators with occasionally limited internal fixation with screws. Upper extremity fractures are fixed with casting, external fixator, plates and screws. Lower extremity open tibial and femoral diaphysial fractures are fixed with intramedullary nailing for Gustilo I,II, IIIA fractures . (Campbells)

Materials and Methods

Results

Discussion

Open fractures represent approximately 3% of all limb fractures and most frequently occur as a result of high energy trauma. Coexisting multiple injuries are common. The severity of injury can be classified and is the most important factor affecting outcome. The ultimate goal is the early return of normal function of the limb and is dependent on the adherence to the basic principles of prevention of infection, early soft tissue and fracture healing, restoration of the anatomy and functional recovery. Management protocols should follow the sequential steps of careful initial assessment, staged meticulous wound debridement, fracture stabilization, soft tissue and bone reconstruction and rehabilitation. (AO)

Results of Campbell's open tibia and femoral fractures at Elvis Presley Regional trauma centre with unreamed intramedullary nails showed that, out of the 125 of open femoral fractures fixed with reamed and unreamed nails there was infection rate of 4%. Out of 50 open tibial fractures (3 GI, 13 GII, 22 GIIIA, 12 GIIIB) There was union in 48 (96%), infection in 4(8%), malunion in 2(4%), dynamization, bone graft or both required in 18(36%). In GIIIB and GIII C injuries that are salvageable, external fixation is the primary method of treatment. (Campbells)

Most commonly infection follows contamination after arrival at hospital with pathogenic staphylococcus aureus, enterococci or pseudomonas. Once the critical inoculum of 10 power 5 organisms per gram of tissues is reached, the immunological defence mechanism become overwhelmed and risk of infection becomes high(AO).

Surgical debridement of the contaminated wound is urgent before bacterial proliferation approaches the critical inoculum. It has been suggested that this point is reached in six hours from the time of inoculation but it is likely that many factors influence this, including the early administration of IV antibiotics. (AO). There is experimental evidence to suggest that bacterial proliferation is influenced by fracture stability(AO). Infection remains the major risk and follows poor surgical technique, inadequate debridement or delay in skin closure. (AO)

The ultimate goal in the management of the open fractures is the early return to normal function of injured limb. And the principle of management is prevention of infection, soft tissue healing and bone union, restoration of anatomy and functional recovery. (AO) Tschernie and Colleagues demonstrated a four fold reduction in infection rate by adhering to these principles.

Prehospital wound protection with sterile dressing reduces the infection rate and is very crucial. (AO)

Stable and anatomical fixation prevent further damage from mobile bone fragments, dampen the inflammatory response, reduce the exudates and edema and encourage tissue revascularization (AO).

The principle of return to pre injury status helps in restoration of length, prevent deformity, realignment and tensioning of soft tissues, and reduce dead space and hematoma volume and helps to produce optimal environment and condition for tissue repair and recovery. (AO)

The benefits of stable fixation must be balanced against the pitfalls of further damage to local blood supply and risks of complications. (AO) Implants should whenever possible be applied through the wound, while respecting the need to cover metal with soft tissue.(AO)

Results of reamed versus unreamed nails are intramedullary interlocking nailer but implant failure is more in unreamed nails. (AO)

Skin closure greater than 7 days increases the risk of infection.

Immediate primary skin closure in type-III A and B open fractures

RESULTS AFTER A MINIMUM OF FIVE YEARS

S. Rajasekaran,
J. Dhennadhyalan,
J. N. Babu,
S. R. Sundararajan,
H. Venkatramani,
S. R. Sabapathy

*From Ganga
Hospital,
Coimbatore, India*

Between June 1999 and May 2003 we undertook direct primary closure of the skin wounds of 173 patients with Gustilo and Anderson grade-IIIA and grade-IIIB open fractures. These patients were selected from a consecutive group of 557 with type-III injuries presenting during this time. Strict criteria for inclusion in the study included debridement within 12 hours of injury, no sewage or organic contamination, no skin loss either primarily or secondarily during debridement, a Ganga Hospital open injury skin score of 1 or 2 with a total score of ten or less, the presence of bleeding skin margins, the ability to approximate wound edges without tension and the absence of peripheral vascular disease. In addition, patients with polytrauma were excluded.

At a mean follow-up of 6.2 years (5 to 7), the outcome was excellent in 150 (86.7%), good in 11 (6.4%) and poor in 12 (6.9%). A total of 33 complications occurred in 23 patients including superficial infection in 11, deep infection in five and the requirement for a secondary skin flap in three. Six patients developed nonunion requiring further surgery, one of whom declined additional measures to treat an established infected nonunion.

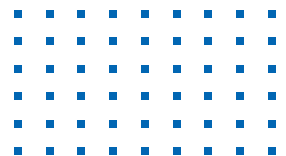
Immediate skin closure when performed selectively with the above indications proved to be a safe procedure.

Fig. 3.10- literature review



4

**EARLY V/S LATE
SURGERY**



We have already described about the principle of management in case of open injury, multiple trauma and polytrauma cases about the timing of surgery and about our practice in Nepal. In-case of closed fractures and huge swelling, there is again a controversy.

This is another hot and controversial topic and there are different schools of thought. Usual practice that the majority follow is the definitive management of the fracture is done once the soft tissue heals and the swelling subsides. This is regarded as safe practice by most of the treating surgeons. On the otherhand if we think in case of talus fracture which is a fracture of necessity, waiting for the swelling to subside may affect the long term outcome of the patient after treatment with complication like avascular necrosis, or nonunion and disability. We practice the principle of early surgery in case of fracture irrespective of the swelling and if the soft tissue is viable. This procedure is still controversial.

Why Controversy ?

- They say that the rate of infection is high
- It is difficult to close the skin primarily
- There will be further damage to the soft tissue with immediate surgery.

The current trend to manage such fractures is to

- Delay the surgery
- Temporarily manage the fracture by
 - Traction
 - Posterior Slabs
 - External Fixators, initially and convert at safe and suitable time to the definitive fixation if required lateron.

Current trend



Fig. 4.1 - Conservative management of fracture with swelling ...

We have presented free paper in Orthocon-2022, the abstracts is as follows: Results of Early Definitive Internal Fixation of Closed Tibia Fractures.

Dr Pramod Lamichhane,

Dr Anil Bhattarai,

Dr Santosh Kamar

Abstract

Early surgery in acute trauma with huge swelling is still controversial presuming that there will be infection and it will be difficult to close the skin. It is advisable to delay the surgery and manage by tractions, posterior slabs or external fixators for few days or even weeks for definitive surgery until the swelling subsides. We treated definitively with internal fixation all the cases of tibia fractures including tibial plateau (126), shaft (222) and distal tibia fractures (145), irrespective of swelling presenting to our hospital within twelve hours of injury from 2011 AD to 2021 AD. There were 493 cases from 3 years to 105 years old, 353 male and 140 females. During this period of ten years none of them had deep infection and all of them united without complications. There were 11 superficial infections which healed after implant removal after fracture union. Early reduction and definitive internal

fixation of the fracture reduces the fracture volume, decreases further long term soft tissue stretching reduces development of huge swelling and helps in decompressing the swelling caused by hematoma and prevent further complications. We have promising results and patient satisfaction with early definitive internal fixation of closed tibia fractures. AO principles also supports our treatment protocol. Further studies are required for the justification of the study.



Fig 4.2 - Picture A & B Show fracture of proximal tibia with huge swelling at presentation. Picture C&D shows early surgery within 6 hours of presentation with internal fixation.

What we do

- Early definitive Surgery
- Irrespective of swelling

Within 6-12 hours of injury



Fig. 4.3 - X-Ray & Figure showing huge swelling with blister after terrible knee injury.

AO Principles

- Stable anatomical fixation
- Reduces inflammatory response
- Reduces further damage by fracture Fragments
- Reduces exudate and edema
- Reduces dead space and hematoma
- Increases revascularization.....

Our Study (2011-2021)

- 493 cases
- Age-3 years-105 years old
- Male : 353, Female : 140

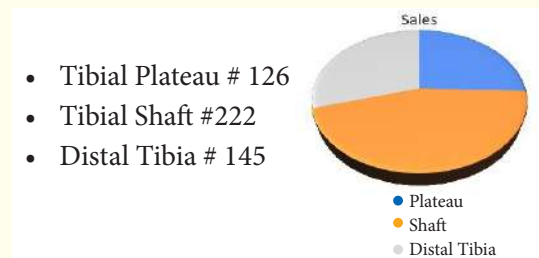


Fig. 4.4- Chart shows 10 years study of Tibia fractures patients presenting to Alive Hospital & Trauma Centre.

- Infection
Superficial-11
Deep- none
- No nonunion
- No other complications

Early implant removal after fracture union and infection subsided in case of superficial infection.

Early versus late surgery for closed ankle fractures

Rohit Amol Singh,^{1,2} Ryan Trickett,² Paul Hodgson²

¹ Department of Trauma and Orthopaedics, Robert Jones Agnes Hunt Orthopaedic Hospital, United Kingdom

² Department of Trauma and Orthopaedics, University Hospital of Wales, United Kingdom

ABSTRACT

Purpose. To compare the outcome after early versus late surgery for closed ankle fractures in terms of the length of hospital stay and infection rate.

Methods. Records of 95 men and 119 women aged 14 to 92 (mean, 46) years who underwent open reduction and internal fixation for ankle fractures during three 6-month periods in 2004, 2007, and 2010 were reviewed. 82 and 132 patients underwent surgery <24 hours and >24 hours after presentation, respectively. The most common reason for delayed surgery was unavailability of the operation theatre, followed by delayed admission to the fracture clinic and excess soft tissue swelling.

Results. Patient and injury characteristics of the 3 study periods were comparable ($p=0.399$). The early and late surgery groups were comparable in proportions of various fracture patterns but not in patient age (40 vs. 49 years, $p=0.002$). The mean postoperative length of hospital stay was shorter in the early surgery group (2.9 vs. 5.5 days, $p=0.009$). The

2 groups did not differ significantly in the infection rate (7% vs. 11%, $p=0.589$) or the need for additional surgery (3.7% vs. 5.3%, $p=0.63$).

Conclusion. Patients with delayed surgery for ankle fracture had a longer postoperative length of hospital stay. Surgery should be performed within 24 hours of injury to minimise the length of hospital stay.

Key words: ankle fractures; length of stay; time-to-treatment

INTRODUCTION

The incidence of ankle fractures is approximately 0.01% per year.^{1,2} Indications for surgical fixation include severe displacement and unstable fracture pattern.³ The treatment goal is to maintain accurate reduction for bone healing. Restoration of fibular length and rotation together with accurate reduction of the ankle mortise prevents abnormal contact pressure and early post-traumatic degeneration.^{4,5} Despite advances in treatment techniques, most patients still experience persistent functional limitation.⁶

Address correspondence and reprint requests to: Rohit Amol Singh, Department of Trauma and Orthopaedics, Robert Jones Agnes Hunt Orthopaedic Hospital, United Kingdom. Email: rohitamolsingh@hotmail.com

Fig. 4.5 - Literature review

Conclusion

- No significant difference in infection rate
- Hospital stay was less in early surgery cases

They recommend surgery within 24 hours of injury

Orthopaedic Proceedings, Vol. 93-B, No. SUPP_II |

EFORT - European Federation of National Associations of Orthopaedics and Traumatology (11th Congress)

ANKLE FRACTURES: IMPACT OF SWELLING ON TIMING OF SURGERY, LENGTH OF HOSPITAL STAY AND THE ECONOMIC BURDEN

 Free Access

Mohamed Sukeik, Mohamed Qaffaf, Gail Ferrier

Published Online: 21 Feb 2018

Fig. 4.6 - Literature review

Conclusion

- Recommends surgery prior to swelling develops
- Less morbidity and less cost
- Conclusion
- Less no of surgery
- Decreases the length of hospital stay
- Less morbidity and increases patient satisfaction

Overall decreases the cost of treatment



Fig. - Picture A & B Shows comminuted proximal Tibia fracture with huge swelling and blisters at presentation. Picture C,D,E shows post operative result and complete recovery after 18 months.

Management of soft tissues injury

Conservative treatment

Current trend of management of soft tissue injury is immobilization of the injured part with some type of support for around 3 weeks to 6 weeks of time with analgesics. The principle behind this is to let the injured skin muscles, tendons or ligaments heal, let the swelling subside before returning the normal function. According to the severity of injury this immobilization may extend further after reassessing the injured part at 3 to 6 weeks time. Spinal injuries are advised for bed rest, use of spinal braces and analgesics. Serial radiographs are also made. Plaster of paris casts or fiber casts are applied in upper and lower limbs even in hairline, and undisplaced fractures.

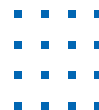
Dreaded complications may occur in cases with casts and light bandages. Compartment syndrome, Volkmann ischaemic contracture or even gangrene of the limb may occur with circular casts. It is better to do remanipulation rather to face the serious complications. We have seen osteopenia, Sudek dystrophy, stiffness of the joints and reflexly more pain in cases with prolong immobilization. We recommend early supervised mobilization and weight bearing of the limb after injury as tolerated irrespective of the swelling in 1 to 3 weeks time. We just immobilize in a posterior slab in case of injury of the limbs. They are safer than the circular casts and there is room for swelling or expansion which helps in preventable complications as mentioned.

In case of spine injury, we do not recommend prolonged immobilization and best rest. In thoracic injury mobilization as tolerated from the day of injury without braces.

In thoracolumbar and lumbar injury mobilization with the braces for short time and with analgesics. Prolonged recumbency will lead to altered physiology and takes more time to return to pre-injury status. Some times altered comorbid parameters may lead to seriousness. Everyone wants to return to their pre-injury status early and this should be the priority of treatment. Our patients are satisfied with this modality of treatment

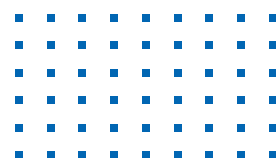
We see a lot of cases for months and months on braces and following different doctors due to disuse complications and prolonged immobilization.

Counsellings is another very important part. Short period of immobilization with or without braces and support with analgesics with good counsellings about the injury and treatment modality will give a good outcome. We will describe the treatment method region wise in the respective topics. This principle of treatment is becoming practiced more nowadays.



5

EARLY REHABILITATION



It is very crucial and important to make the patient mobilize early to maintain the normal physiology. We believe that it is the most vital tool for measuring patient satisfaction and overall outcome of the treatment. We have already stated in the previous chapters that the principle of treatment also involves the principle of early return to pre-injury status with less cost. This protocol applies for both the group of patients managed conservatively or managed by surgery.

The usual trend in Nepal is to manage the the injured limb in support or keep the leg in non weight bearing or graded weight bearing for around 4-6 weeks or even for longer time depending on the severity of the injury. In contrast this management protocol is changing and the surgeons are more aggressive nowadays. We follow the principle of early rehabilitation with short duration of rest and make the patient up and above and return the patient to normal activities early. This is one of the reason why most of the patient are satisfied with our treatment.

1. Spine fractures-

a) Conservative treatment

Usually in case of minor injuries not requiring surgery, patients are advised for bed rest for 6-8 weeks and the mobilize with braces. We usually donot immobilize and keep the patients in bed rest for more than 1-2 weeks. We then ask them to mobilize as the pain tolerated with or without the braces. Prolonged recumbency may lead to UTI or chest infection, deep vein thrombosis and

alteration of the pre existing comorbidities. Depending on the level of fracture, instability and age of the patient this protocol is guided. In elderly despite the fracture personality, we mobilize them early as the pain is tolerated. Bracing is done initially and we ask to wear off the brace once the pain subsides. We do not immobilize the fragility fractures unless and until the pain is in-tolerated.

C spine fractures are taken seriously and immobilized carefully. The patient is investigated thoroughly and definitive management is planned.

Spinous process or transverse process fractures of the spine also do not require bracing and immobilization unless there is unbearable pain. Thoracic cage fractures or rib fractures also donot require bracing except for thogough counselling and good pain medications. Pathological fractures are taken seriously and we refer the patient to the cancer surgeons. The primary disease should be addressed properly.

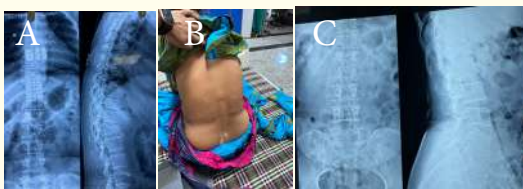


Fig 5.1- Picture A shows compression fracture of dorsal spine. Picture B & C Shows early rehabilitation of the patient without support at six weeks.

b) Surgery

We mobilize the patient early with short term use of brace.



Fig 5.2- Pictures shows early mobilization of the patient with thoraco lumbar fracture fixation post operatively.

2) Upper and lower limbs injury

a) Conservative treatment

Usually there is a trend to immobilize the part for around 3- 6 weeks depending on the severity of injury. We mobilize the limb and joint early as pain tolerated to maintain the muscle tone and joint function. Post traumatic stiffness of joints, wasting of muscles and sometimes osteopenia disable the patient more than the primary injury requiring long term physiotherapy and rehabilitation time. We see a lot of sudek osteodystrophy and shoulder pericapsulities due to prolonged immobilization which are very disabling to the patient , more than the primary injury. Early mobilization, supervised followup and proper counselling also helps to reduce such problems.

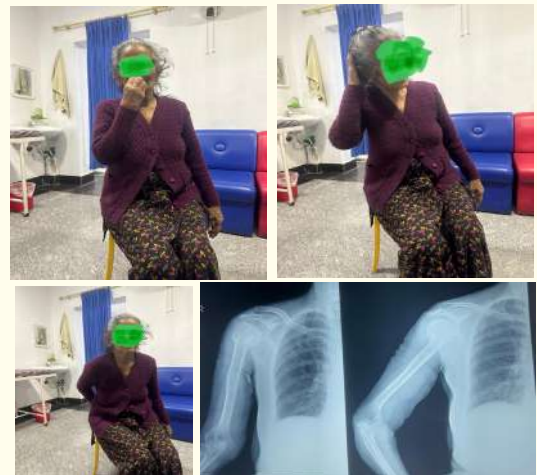


Fig. 5.3 - Pictures shows early mobilization of the shoulders after proximal humerus fracture treated conservatively.

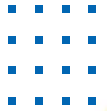
b) After Surgery

Early mobilization and weightbearing in case of lower limb as the pain tolerated is advised. This helps to maintain the physiology early, maintain the tone of the muscles and decrease wasting of the muscles. control the comorbidities and increases patient satisfaction.

We give an example of intertrochanteric fractures and their mortality. In case of elderly with intertrochanteric fractures, the mortality at one year accounts to around 30%. Outcome depends on the physiology and activity level of the patient. So early surgery, early weight bearing and early mobility increases the overall survival of the patient.

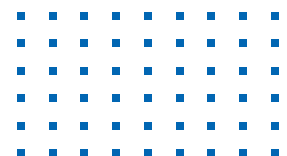


Fig. 5.4- Pictures shows early rehabilitation of the patient after lower limb surgery.



6

MINIMIZATION OF RADIATION HAZARDS IN ORTHOPAEDICS



This is a very sensible topic and very essential in the context of Nepal. We all know simpler form of treatment like closed reduction requires C-arm rather than open reduction and internal fixation. On the other hand, C-arm machine is very expensive and all the hospitals cannot afford to buy it. Though this does not sound logical but it's a reality. There are other logistic difficulties with this type of heavy and huge equipments. Most of our rural hospitals do not have road facilities. They do not have continuous electricity supply and their infrastructure are not compatible with the C arm. They may not have trained manpower and they may not have skilled maintenance team for this delicate equipment. The issues of radiation hazard is another burning issue all over the world with the unsafe use of c arm. The risk of cataract, thyroid dysfunction, skin cancers and genetic problem are supposed to be increased with the prolonged exposure to the radiation. We are very particular on it. The ideal situation cannot be created everywhere which is very essential to provide the equal treatment and opportunity to all the people regarding health services. But if we are working in a constraint facility hospital and with limited resources and manpower, we can modify the treatment modality of treatment without doing more harm to the patient, with same results as the standard protocol.

Alternative treatment modalities with same results can be obtained without the use of c-arm or image intensifier. There are alternative modalities of treatment to reduce

the effect of radiations hazards. They can be-

- 1) In spite of Intramedullary interlocking nail, or IMIL nails, non locking nail, or intramedullary interlocking nails in non locking mode can be used with same results without using C-arms. With mini opening at the fracture site or open reduction and intramedullary nail without C-arm can be done. It takes less surgery time, it is easy to insert, with less morbidity. Less morbidity means struggling a closed reduction and opening the fracture at last is not better than open initially. This modality is more useful in multiple and polytrauma and it has the same result as closed methods in terms of union (Literature). Intramedullary nailing in case of fracture of shaft of femur and tibia and plating in case of shaft of humerus fracture without using C arm can be widely practiced .
- 2) Use of rush pins in shaft of humerus, both bones forearm, femur or tibia fractures in children can be practiced with mini opening than doing further harm with a long struggle with the use of C-arm.



Fig. 5.1- Pictures shows series of shaft of tibia fracture managed with Intra Medullary Nail without distal locking. No C-arm used in all the cases. All the cases united without complication.

3) Go for open reduction and internal fixation or plating instead of intramedullary nail.

We have presented a free paper in orthocon 2015 at Kathmandu regarding the issues of radiation hazards and the alternative methods of treatment of fractures.

Abstract

Minimizing radiation hazards in orthopaedics! Is it really necessary to interlock the shaft of tibia and femur fractures ?, Orthocon-2015.

Introduction

The gold standard of shaft of tibia and femur fracture treatment is intramedullary interlocking nail. But do all those fractures really need static interlocking? By avoiding distal locking, we can greatly reduce the operation time, treatment cost and more importantly reduce the radiation hazards. This will be the turning point in orthopaedic surgery in treating shaft of tibia and femur fractures.

Methods

We studied the outcome of treatment of shaft of tibia and femur fractures with locking proximal site only . From Baishak 2071 to Ashwin 2074. There were 96 tibia out of 151 and 40 femur out of 64 with intramedullary nailing. They were between 16 to 82 years old. Closed and open fractures up to Gustilo IIIA and IIIB were included in the study. Tibia fractures around the isthmus and above femur fractures around midshaft and above

were included. Locking with locking bolts were done proximally only without the use of image intensifier. All femur fractures were opened at the fracture site.

Results

There were three nonunion out of forty femur fractures, three nonunion and two infection out of ninety six tibia fractures with intramedullary nailing. There was no malunion, no shortening and the results were comparable with the static locking of femur and tibia fractures.

Conclusion

We conclude that the stable shaft of tibia and femur fractures can be treated by intramedullary nails, locking only of the proximal side and greatly reduces the radiation hazards, surgery time and cost of treatment with good outcome.

Key words- Shaft of tibia and femur fractures, locking, radiation hazzards

Our Study :

Particulars	Total Lines	Nailing
SOT#	151	96
SOF#	64	40
Study period 3.5 years Age 16-84 years Inclusion Closed, open fractures upto GIIB, multiple and polytrauma		

- Gold standard of treatment of shaft of Tibia and Femur # in adult is intramedullary interlocking (IMIL)
- Dynamization -6 weeks to 3 months time

- Exchange nailing- is done whenever necessary

Do all such fractures need Interlocking?

- May not necessarily
- Unstable
- Comminuted
- Segmental
- Distal third, distal to isthmus require static locking

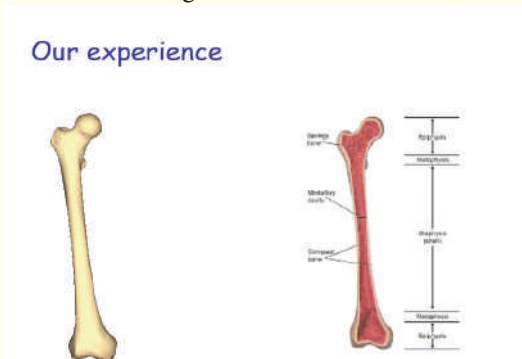


Fig. 5.2- Anatomy of femur.

Procedure

- Tibia- CR+ Proximal locking with reaming
- Femur- Open reaming, guide wire insertion from #, reduction, guide wire insertion and antigrade nailing



Fig. 5.3- Procedure of intramedullary nailing.

Benifits

- No radiation hazzard
- Less surgery time
- Especially benefit in open #, multiple trauma and polytrauma- Damage control orthopaedics
- Less chances of infection
- Staff satisfaction
- Easy procedure
- No need for dynamization

It would be revolution in orthopaedics if we can establish it as a gold standard of treatment

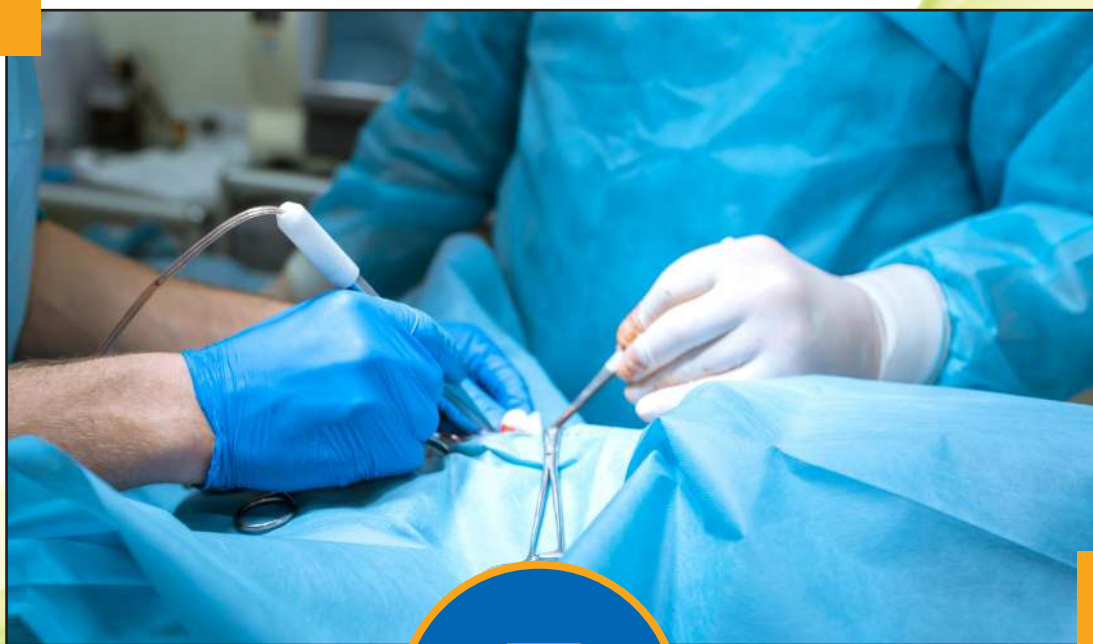
Fig. 5.4- Benifit of non locking.



Fig. 5.5 - Pictures shows series of shaft of femur fracture manage with Intra Medullary Nail without distal locking. No C-arm used in all the cases. All the cases united without complication.

Complications

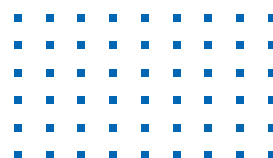
- Sometimes may lead to malunion and hypertrophic nonunion due to instability
- Criticism - until we establish it as a gold standard method of treatment of trauma patients.



7

COST EFFECTIVE TREATMENT IN THE CONTEXT OF NEPAL

Multi-Purpose use of implants



We as a developing country with limited resources, implants, finance and literacy, with no insurance coverage to most of the citizens, we should formulate our own treatment protocol. So all the patients in Nepal get the same treatment, the basic is well and up early with less cost with normal or near normal to pre-injury status.

All parts of Nepal are not equally developed and physical facilities differ in different regions of Nepal. For example road access to the hospital, electricity and water supply and structural design of the buildings may decide the facilities available for orthopaedic surgery. Availability of skilled manpower and maintenance of equipments is another untold shortcoming for smooth functioning of the hospital. Surgery and use of implants may vary according to the place and resources available.

Surgery done for the same fracture may differ in Jumla and Kathmandu. For example open reduction and internal fixation with plating for shaft of femur fracture is more preferable in remote areas over Intramedullary interlocking nail where there is every facility since C arms are not available at all places due to several reasons as mentioned previously.

All the patients cannot afford fancy and costlier implants since there is no proper health insurance coverage of all citizens.

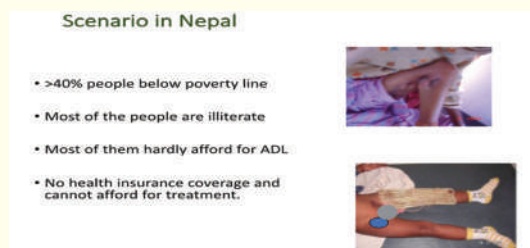


Fig. 7.1- Scenario of patients in Nepal

Till date no implant is gold standard for any fractures, and the type of implant and modality of surgery is changing with the time. There is hardly any implant company in Nepal and most of them are imported. DHS is a special type of implant used in hip fractures which still has a great role lasting for more than 50 years. We can modify the implants made for particular region and use them in different parts with the same result and rehabilitation time.

Low profile T or L plates, recon plates, AO tubular external fixator, rush nails and k-wires are very handy and may be the implant of choice when ever we are in trouble or whenever planned surgical technique or implants fail, without further harm to the patients.

We have presented a free paper in orthocon-2014. The abstract is as follows:

Cost effective treatment in the context of Nepal

Abstract

Newer technology and newer implants are emerging every year. Most of the time they are more expensive. This is of no concern for the developed countries where there is health insurance coverage for all the people and the government is looking after it. In Nepal, >40% people are below the poverty line. Most of the people are illiterate and most of them hardly afford for ADL. They have no health insurance coverage and cannot afford for treatment. We can go for cost effective methods of treatment with the same result in such scenario in Nepal with comparable results. There are various ways in different types of fractures where we can make

the treatment feasible to all the patients.

The basic standard principle of treatment remaining the same, cost effective treatment can be considered. We can consider in changing the surgical modality and implants for the patient's benefit when they can't afford for treatment

Introduction

- Newer technology, Newer implants emerging every year
- Most of the time they are more expensive
- This is not a concern in developed countries
- Health insurance of all the people, government looking after it.



Fig. 7.2 - Multiple open injury in a child managed with intramedullary rush pins with good outcome.



Fig. 7.2- Shaft of Femur fracture managed with intramedullary rush pins with good outcome.

Excellent results with flexible rush nail



Fig. 7.3- Shaft of Tibia fracture managed with intramedullary rush pins with good outcome.



Fig. 7.4- Proximal humerus fracture managed with low profile L-plate with good outcome.



Fig. 7.5 - Proximal humerus fracture managed with low profile T-plate with good outcome.



Fig. 7.6- Proximal Tibia fracture managed with low profile T-plate with good outcome.

Rush Nails- Cheap and equally effective

- Instead of flexible elastic titanium or stainless steel nails, we can go for the equally effective, cheaper rush nails with good outcome.

- Our main aim should be-

-Early return to preinjury status with minimal cost.



- Rush Pin- Rs 300NC/ Nail
- Stainless Flexible nail-
-Rs- 2500NC/ Nail
- Titanium Elastic Nail-
-Rs 5,000NC/Nail

Fig. 7.7- Stainless steel rush pin

- The basic standard principle of treatment remaining the same
- In the countries like Nepal where there is no health insurance coverage policy for the people, cost effective treatment can be considered
- Can consider in changing the surgical modality and implants for the patient's benefit when they can't afford for treatment.

Other modalities of cost effective treatment are :

- we can cut the long plate and use it at two different places.
- In case of re-fracture or fracture of the other bone with union of another bone with plate in situ, we can remove the plate from the united site and fix the fracture with the same implant. (Implant removal from one bone and fixation of the fresh fracture.)
- We can bend the K-wire and use as staples.
- We can use K wire as intramedullary rush pin.

Multi-purpose use of implant

Due to various reasons like intraoperative complication, fracture personality, scarcity of implant and other unavoidable circumstances we can modify the implant or use the implant in other place rather than the anatomical place where it is meant for. We present some of the examples below :



Fig. 7.8- Long recon plate can be cut and use it as two plates in different places.



Fig. 7.9 - Proximal femur fracture fixed with distal femur locking plate of opposite leg with good outcome.



Fig. 7.10 - Proximal femur fracture in child fixed with proximal humerus locking plate with good outcome.

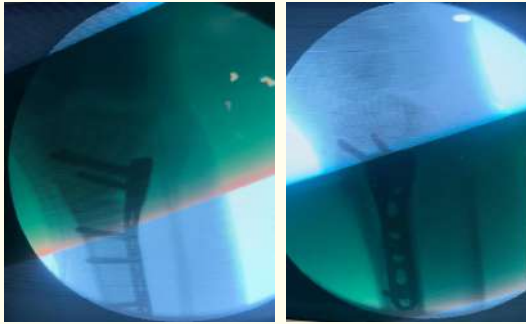


Fig. 7.11 - Proximal Tibia fracture fixed with proximal humerus locking plate.



Fig. 7.13 - Distal humerus fracture fixed with low profile T-Plate with union. It was done abroad and we do not recommend this sort of fixation.



Fig. 7.12 - Sterno clavicular joint dislocation fixed with distal radius locking plate.

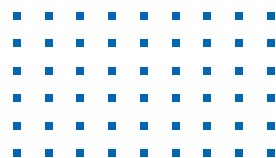


Fig. 7.14 - Proximal Third humerus fracture fixed with distal tibia locking plate with good outcome.



8

UNANTICIPATED COMPLICATIONS



We come across a variety of unanticipated complications during surgery and individualizes expertise has to be applied in such cases. There is very little time to decide and sometimes we are left with minimal help during the operation. Some examples are sometimes the bones are brittle and it is very hard to ream or drill, there is narrow medullary canal and difficult to ream. Sometimes there is comminution of the fracture more than expected or seen on x-rays and sometimes iatrogenic comminution and unexpected difficult reduction and instability with the planned technique and implants. This may happen to anyone and even to the experienced surgeons. So before starting the surgery we should be ready with all types of implants or at least one alternative method of fixation. For example if we fail with intramedullary interlocking nail, we should have plating system and or external fixator system in hand. AO external fixator, kuncher nails, rush pins, and k-wires are some of the rescue implants. These implants should be available in the operation theater throughout



Fig. 8.1 - Distal third femur fracture fixed with distal femur locking plate. This fracture was planned to fix with locking plate but intraoperatively there was comminution of the fracture more than seen on X-Ray and our preoperative plan was failed and we were shortage of long locking plate. We have to change the fixation plan with long distal femur locking plate which we had in stock.

whenever possible.

Implant mismatch, implant scarcity and the solution

Sometimes, the surgery goes smoothly but implants may mismatch inspite of the plan done pre-operatively. Sometimes it is difficult to ream the bone smoothly and sometimes it is difficult to insert the pre-planned sized nail or it is difficult to reduce the fracture and insert a preplanned plate. The cause is unknown and we have to sort for an alternative method. We have encountered burst tibia or femur during reaming or insertion of the nail. We sometimes encounter serious complications like vascular injury, anaesthetic complication like unstable patient and we have to modify the fixation modality to cut short the operation time and alternative method of fixation should be available. This also happens in developed countries where there are all facilities and also occur in our set up. The aim of the surgery is to achieve the union of the fracture and restore the function of the part and it does not matter for what the particular implant is made for. Here we present some of the illustrations of case examples of some problems and how we overcomed it. Here we are presenting some of the case examples of complication that we have seen in our practice.



Fig. 8.2 - Shoulder dislocation with greater tuberosity fracture. There was fracture dislocation of the humeral head migrated to the chest. Open reduction and internal fixation of humeral head was done later on.



Fig. 8.3 - Distal tibia fracture fixation with intramedullary interlocking nail. There was brusting of the proximal fragment of tibia due to over compression. There was dilemma either to leave or to go for re-surgery. We left it as it is and the fracture united with good outcome at one year.



Fig. 8.4 - Segmental femur fracture fixed with proximal femoral nail with unacceptable proximal femur fracture reduction. We revised the nonunion with contralateral distal femoral plate with good outcome.



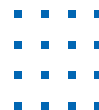
Fig. 8.5 - This was a case of dislocation of shoulder. There was fracture of the humeral neck and migration of the head to the thorax. open reduction and internal fixation with plating was done. Due to fulminant infection both the implant and the humeral head has to be removed. Now the patient is doing fairly good with some range of motion at the shoulder joint with no infection. We adviced him for shoulder arthroplasty.



Fig. 8.6 - Shaft of femur fracture in child fixed with intramedullary rush pin. Unacceptable angulation post operatively due to re-trauma. Fracture remodeled with time. There was dilemma either to go for osteoclasia during the treatment.

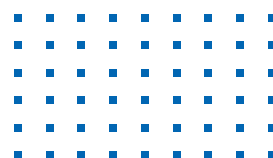


Fig. 8.7 - There is migration of K-wire from AC joint to the arm.



9

RECENT ADVANCES AND GUIDED TREATMENT



The treatment modality and principle of treatment are frequently changing and once thought gold standard treatment modality becomes substandard or absolute with the passage of time. So if we think retrospectively, was the procedure once thought to be gold standard of treatment ethical procedure once it become absolute? It means that we should not do more harm to the patient by our procedures. For example anterior and posterior decompression with anterior and posterior fixation in thoracolumbar fracture was practiced in the past. Now we do anterior and posterior procedure from the posterior side. If we think retrospectively, were we doing justice with the procedure that is suboptimal now. We believe that there is no any ideal procedure for any fractures, for examples postero medial release. Postero medial release is totally replaced by the ponseti method of club foot treatment. Sometimes the treatment methods are

guided by the medicine and implants/ prosthesis companies. For examples though the outcomes are the same in case of both bones fracture with DCP or locking plates, we are shifting towards more expansive and fancy implants. Locking plates and locking systems of implants are more expensive as compared with simple DCP with the same outcome. We still prefer reconstruction plates for fixation of clavicle fractures over anatomical locking plates.

From these discussion we come to the conclusion that we should always stick to the time tested procedures and principles of treatment of fracture. We should stick to the established principles and believe in our own experience and results. We also believe that personal experience of the surgeon is a great guide in the treatment. DHS introduced in 1970s for the fixation of intertrochanteric fracture is also an implant of choice for most of the surgeon. It is easier to use and is cheaper with excellent result.



Fig. 9.1 - Low profile T & L plates can steel be used in place of locking plates. Rush pins can be widely and safely used instead of TENS. They are cheaper as compared locking plates and TENS.



Fig. 9.2 - Proximal humerus fracture fixed with low profile L plate and locking plate with similar result.



Fig. 9.3 - Tibial plateau fracture fixed with low profile T-plate.

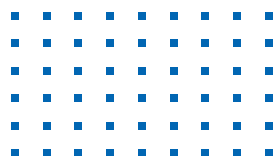


Fig. 9.4 - Clavicle fracture fixed with reconstruction plate. Clavicles can be fixed with reconstruction plate with equally good result as compare to clavicular anatomical locking plate.



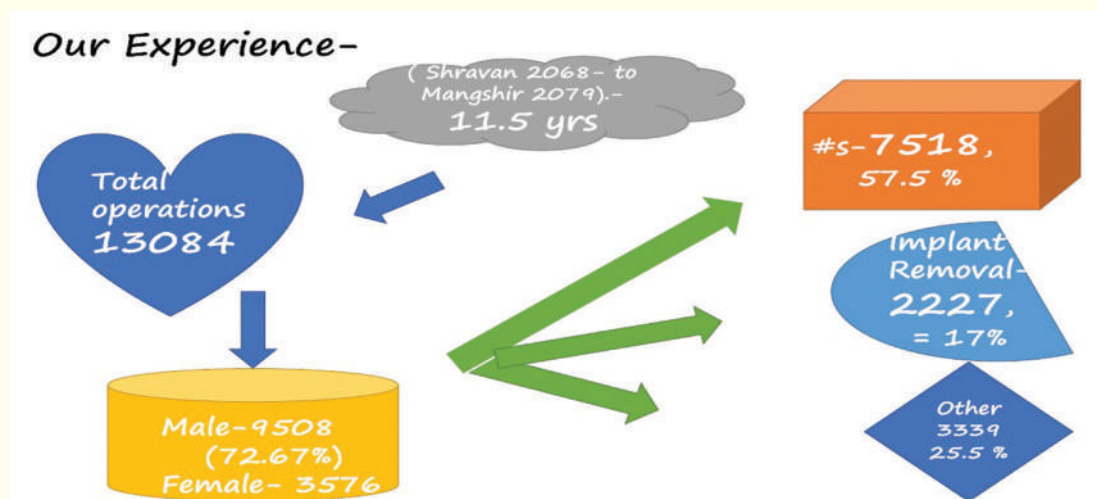
10

IMPLANT REMOVAL



There have been debates in implant removal. The big and unanswered question is that is it really necessary to remove the implants? This controversy and debate is all over the world. Generally it is said that titanium implants need not be removed. They are patient friendly and compatible to MRI scanning. With the stainless steel there are options. If we just apply the common sense, if implant is inserted at 16 years of age and *"is it sensible to leave it as it is for rest of the life"* usually more than 50 years. People also feel unsecured and uneasiness in mind that this may cause cancer, corrosion or may affect during lightening so they want to remove the implants in Nepal. Sometimes implants in body may trouble to patients while traveling abroad. With all these reasons, patients usually want removal of implants. *"If yes"* then what is the optimal time for removal? There is no exact time frame and it may vary with the type of bone fractured and the site involved. Generally saying implants are removed after 18 months to 2 years after insertion. The appropriate time is after

the proper consolidation or remodeling of fracture. Some times early removal is done when there is non healing infection, Are all implants MRI compatible and what we should say to the patients? Nowadays MRIs are done with implants in situ in most of the institutions. One school of thought say that do not removal the implants kept by others. Is it really applicable in Nepal? Lots of Nepalese people get injured abroad and get treatment there. They come back to Nepal and have no access to return to the same country or hospital where it was inserted and has to remove the implant due to some reason like infection, failure, reinjury, prominence in subcutaneous areas etc. Then this issue has to be addressed in Nepal. Sometimes patients wants the further treatment with different surgeons after the primary surgery at other centre. At that time also we have to remove the implant kept at other centres. So it is not fesiable to avoid patients in special situations which is totally unlikely in other developed countries where patients follow the same treating surgeons and hospitals unless and



until the surgeon refers to others.

Refracture during and after implant removal

This is not uncommon and patients usually present with trivial trauma. Sometimes there is re-fracture during the surgery itself. Thorough counseling to the patient is important before the treatment or removal. There are various options of fixation in case of re-fractures. If it is re-fractured during removal, we can re-fix with the same implant or sometimes similar implant when it is not possible with the same implant. Sometimes we may have to change the modality of fixation depending on the fracture personality. Here again we should be prepared with all the implants ready. In most of the hospitals, we don't have stock implants or implants ready in the operation theater and just room around for implants once disaster occurs. In some hospitals in Nepal and in developed



Fig. 10.1 - Broken IM nail are removal with difficulty.



Fig. 10.2 - Proximal femoral nail removal with difficulty which was kept abroad. There was a mismatch of the set with the head of the screw. It was removed with the help of Intramedullary interlocking nail extractor set.

countries this is not an issue.

Tips and Tricks

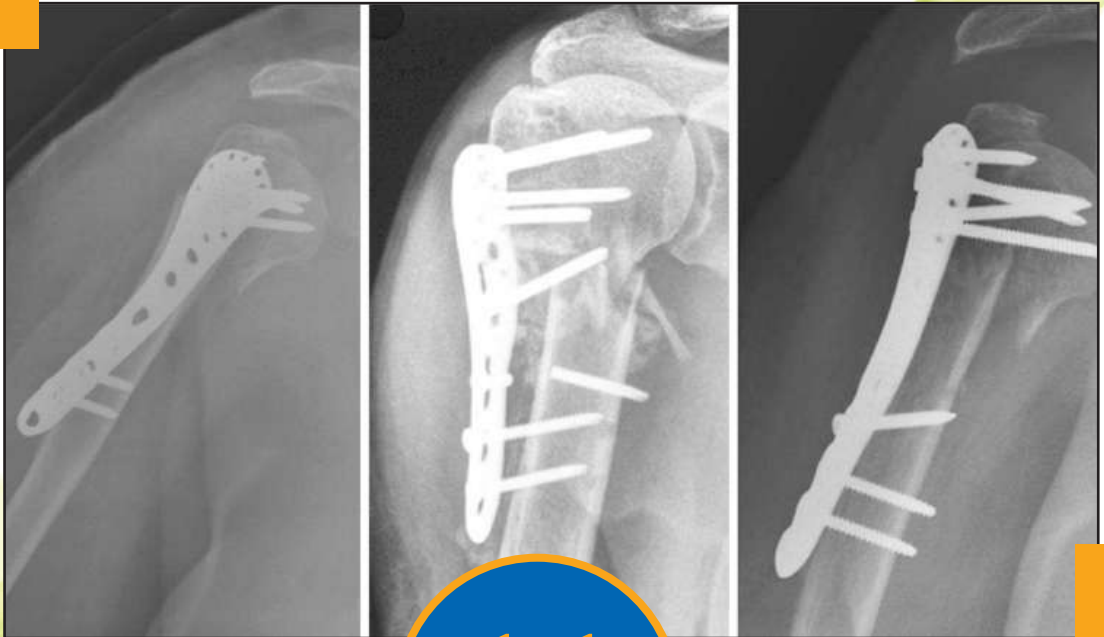
- 1) Just try to stick to single company or system of implants so that it is easy to remove and to avoid system mismatch during implant removal. E.g. Nailing system of different companies may differ and if it is not mentioned in the patients documents, it may fail during removal. It usually occurs in implants kept in other centres or another hospitals.
- 2) Screw drivers should be proper and of different designs.
- 3) Universal Extractors for nail
- 4) Difficult implant removal set for plates
- 5) Different devices like vice-clamps, multiple function clamps with hexagonal sets, bone saw, hexa blades with handles etc. should be available in the operation



Fig. 10.3 - Removal of plate from lateral malleolus kept abroad. There was mismatch between the head of the screw and the screw driver system available. We have to use unusual set for removal.

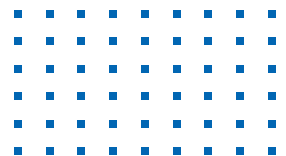


Fig. 10.4 - Intramedullary nail of humerus removal with difficulty. Due to mismatch between the system and the nail which was kept abroad. It was removed with insertion of the locking bolt into the nail head as shown in the picture.



11

IMPLANT FAILURE



This is emerging as a burning problem with the increasing number of surgeries all over the world. Why do implants fail? This is a serious question. Implant fail due to several reasons- The main three reason are as follows:

1) Patient Factor-

The hygienic status of the patient plays an important role. If the patient is weak, malnourished, or if the patient skin condition is unhealthy, there is a chance of infection and implant failure. Sometimes patient may have allergy to the implant used and discharge may persist and get infected and implant failure on long run. The other factor is the cooperation, intelligence and conscious level of the patient. If the patient is uncooperative, they do not understand the seriousness of the injury and surgery or if the patient is very old or mentally not sound then they may not know the importance or sensitiveness of the surgery and do not follow the advice given. They also have high chance of implant breakage, screws cutout or even loosening of the implant.



Fig. 11.1 - Picture A shows failure of distal femoral locking plate due to unstable medial column. Picture B shows failure of DHS due to osteoporotic bone.

2) Implant factor-

Sometimes the implant itself may be of

default . We have no mechanism to check the quality of the implants we use. We should use the time tested company implants and should not frequently change it. We have seen implant failure with corrosion. The ultimate blame is to the treating surgeons.



Fig. 11.2 - Corrosion of the stainless steel screws. There was infection and cause was unknown. After removal of the implant the cause of infection was known.

3) Surgeon Factor-

This is the most important factor for implant failure. The environment of the hospital as well as the operation theater should be hygienic. Sterility techniques and autoclaving should be proper and should not hurry on it. Sometimes the staffs in hurry may bypass the sterility system and later on we land up with the infection and implant failure. The important factor is the surgical technique, and the skills of the surgeon and team and the rehabilitation protocol. Sometimes it is also called as “surgeon failure’ instead of the implant failure. Whatever the cause, the ultimate blame is on the treating team, so we should be prepared for it.



Fig. 11.3 - Picture A shows improperly fixed femur fracture plate over the nail. Picture B shows Intramedullary interlocking nail of tibia fracture with encircilage. Picture C shows inadequate fixation of distal humerus.

4) Others

Sometimes multiple factors may cause implant failure in the same patient.

Our statistics :

In 10 years period out of 11,482 operations done at our hospital there were 16 cases of implant failure. There were 13 male and 3 female patients. They were between 21-84 years old. The main reason was infection, followed by nonunion and re-trauma.

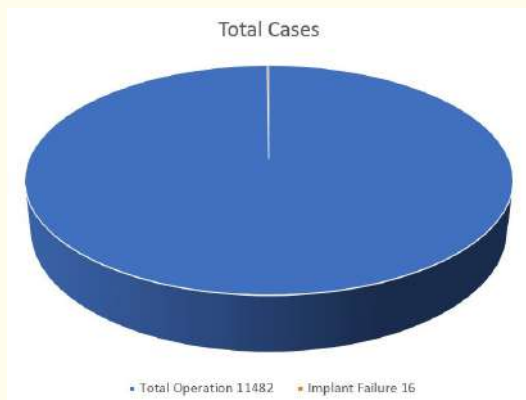
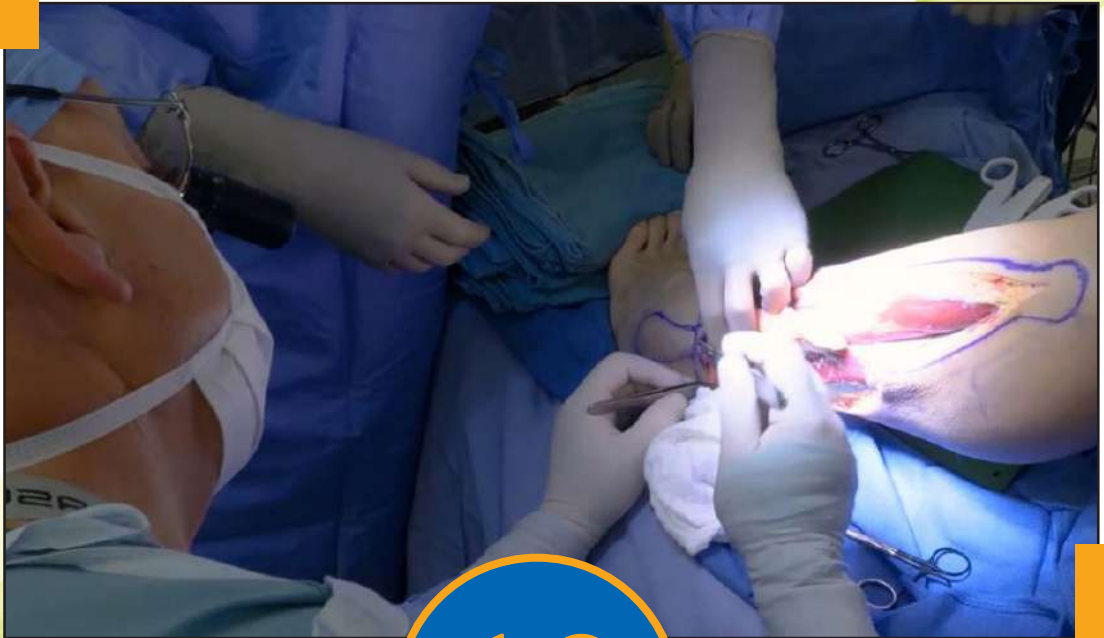


Fig. 11.4 - Pie chart showing total operations performed and total number of implant failure.



Fig. 11.5 - Picture shows failure of distal humerus fracture due to infection. Infection may be the cause of different factors.



12

MALUNION AND COMPLICATIONS

This occurs in spite of the best treatment done initially. We should be ready to face the individual case separately. Usually they present differently as mentioned in the book and as seen in the developed countries. They present late and there are no proper treatment guidelines in the book. For these

sort of problems we have to formulate our own treatment protocol by ourselves.

We will present some of the case examples which we have managed at our centre. Most of the time intervention is required and sometimes no intervention is done, but patients are kept in intensive physiotherapy.



Fig. 12.1 - Picture shows malunion of proximal femur fracture with bent kuncher nail insitu. It is very difficult to remove the nail and it is difficult for osteotomy.



Fig. 12.2 - Picture shows malunion of displaced distal humerus fracture after operation. Re-operation is required.



Fig. 12.3 - Picture shows malunion of intertrochanteric fracture. osteotomy and fixation or osteotomy is required.

Fig. 12.4 - Picture shows malunion of displaced distal radius fracture. Osteotomy and fixation with distal radius plate done.





Fig. 12.5 - This was a case of multiple trauma, proximal tibia fracture fixed with Intramedullary interlocking nail. There was unacceptable valgus malunion. Redo surgery was done with locking plate.

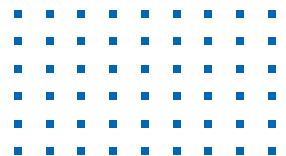


Fig. 12.6 - Picture shows maluniting both bones forearm fracture in a child. Osteoclasis and long arm cast was applied.



13

NONUNION AND DELAYED UNION



The arbitrary terms given to nonunion and delayed union sometimes may mislead our treatment plan. In case of long bones fracture the date line of six months for delayed union and date line of nine month for nonunion may vary according to the patient and severity of injury which we will discuss in successive topics. Here we will just discuss about the established nonunion. We see a lot of nonunion cases of our own hospital or referred from other centres and even patients from abroad that come to our hospital for further treatment. The most important point is that stable fixation in anatomical position with maximum bony contact is required for bony union. Bone graft is a secondary thing that may not be required in all the cases of nonunion. If it is a case of infected nonunion, then infection should be eradicated before going for surgery for nonunion. Atrophic nonunion requires bone graft.

Our statistics of nonunion operation from 2011-2021

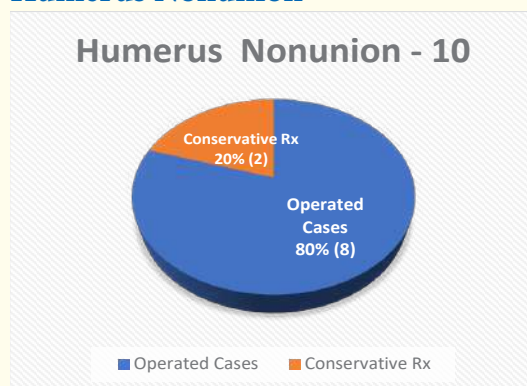


Most of the cases were referred from other hospital. Some cases were treated abroad

primarily.

Open reduction and internal fixation with plating was done in 87 cases, followed by debridement, dressing, implant removal and cast or slab application till the infection was eradicated and union was achieved.

Humerus Nonunion



- Open reduction and internal fixation with Plating was done in 7 cases and OR + Rush Nail was done in 1 case.
- Nonunion rates between 0-13% are reported for nonoperative management.
- When treated operatively for appropriate indications (e.g., multiple trauma) there is a significantly higher rate of nonunion (15% to 30%).

We have also presented a paper in CME about the "Nonunion of Humerus fracture and it's Management"

- The question arises is it necessary to operate all fractures of shaft of humerus?
- Is our technical fault responsible for nonunion?
- Is our existing methods ideal methods of operation?

The answer is individualized. Operative management is increasing since it is easy

to perform, is with less morbidity, early rehabilitation and reduction is proper.

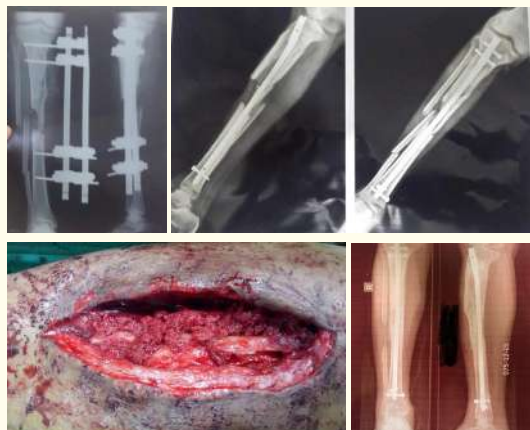


Fig. 13.1 - Picture shows bone loss nonunion managed with bone graft and intramedullary interlocking nail with good outcome.

Literature shows that :

Long-Term Follow-Up of Persistent Humeral Shaft Non-Unions Treated with Tricortical Bone Grafting and Compression Plating Annette Billings, MD and Sherman S Coleman, MD

- Although humeral shaft non-unions are not frequent, when they do occur they can be very difficult to treat.
- This paper presents a treatment option that has been very successful in achieving union even in patients who have a true pseudoarthrosis and in patients who have failed multiple prior procedures (six in one patient).
- This technique offers an alternative to the use of the much more extensive and complicated vascularized bone grafting, and may be applied to other sites of non-union.
- We have employed this technique in treating

clavicular nonunions, also with a 100% success rate.

Procedure we follow:

- We explored these nonunions,
- removed the fixation devices and excised fibrous tissue and dead bone
- stabilised with the Ilizarov fixator.
- In five patients union was achieved. Bone grafting was not required.
- In the single patient in whom treatment failed, there had been a severely comminuted open fracture



Fig. 13.2 - Picture shows nonunion of distal femur fracture fixed with retrograde Intramedullary interlocking nail. It was managed with open reduction and internal fixation with locking plate with bone graft with good outcome.

We will present here our presentation and a paper that we have prepared on distal femoral fractures nonunion and their management in Orthocon-2016.

Femoral Fractures nonunion, Our experience at Alive Hospital & Trauma Centre

Abstract

Background

There are various ways of femoral fracture fixation. Out of them gold standard of fixation is intramedullary interlocking nails. Nonunion is common in subtrochanteric and distal third femoral fractures. We have

experienced nonunion of distal third femoral fractures more commonly than other femoral fractures.

Methods

From 2011 July to June 2016 we prospectively studied sixty nine cases of femoral fractures. Out of them there were eighteen supracondylar, seventeen distal third and thirty four shaft and subtrochanteric fractures. They were between sixteen to ninety two years old. There were 44 male and 25 female. Supracondylar fractures were fixed with closed reduction and locking plates, shaft and distal third fractures were fixed with intramedullary interlocking nails and proximal third with locked or unlocked intramedullary nails. All the nonunion of distal third femoral fractures were fixed with open reduction and internal fixation with locking plates with or without bone grafts.

Results

All supracondylar, middle and proximal third femoral fractures united without complications. Out of seventeen distal third femoral fractures, there were nine nonunion. There were no infection and other complications. All the nonunion united without complications with open reduction and internal fixation with locking plates with or without bone graft.

Conclusion

In our experience, distal third femur fracture

nonunion is common. The exact cause is not known. Open reduction and internal fixation with locking plates with or without bone graft is a good method of fixation with excellent outcome.



Fig. 13.3 - Picture shows 25 years old nonunion of distal tibia which was managed conservatively in childhood. There was deformity and nonunion. It was managed with open reduction and internal fixation with locking plate. There was union with good outcome.

Our paper on distal third femur nonunion.

Results of Aseptic Distal Third Femur Fractures Nonunion Treated with Locking Plates

Lamichhane P*, Bhattarai A**

*Consultant orthopaedic surgeon, Alive hospital & Trauma Centre, **Consultant Orthopaedic surgeon, Department of Orthopaedics

Abstract

Nonunion of femoral fracture is common and it is more common in subtrochanteric and shaft region. There are various causes

of nonunion and the most common causes of nonunion are open fractures, infection, instability, malalignment, precious blood supply. The commonest methods of treatment of nonunion are exchange nailing, dynamization, bone grafting, dual plating, locking plating, compression plating and external fixators. Non of these methods are conclusive and may lead again to nonunion. The author reports a series of nine aseptic nonunion of distal third femur fractures previously treated by various modalities and later on nonunion managed by open reduction and internal fixation with stainless steel locking plate with or without bone graft. All of them united without any complications. The exact cause being not known but instability with tugging effect along with other contributing factors may contribute to nonunion.

Key words- Distal third femur fracture, nonunion, locking plate

Introduction

Nonunion is defined as non progressive clinical and radiological signs of union until nine months of fixation of fractures. Nonunion of femoral fractures commonly occurs in subtrochanteric and shaft region.¹ There are various causes of nonunion like open fractures, infection, altered biomechanics, instability, malalignment, precious blood supply.² The other contributing fractures are obesity and tobacco use.³ There are various ways of management of nonunion of femur like exchange nailing, dynamization,

bone grafting, dual plating, locking plating, compression plating, external fixators.⁴ Non of them is conclusive and may lead to nonunion again.⁵ In our experience we have seen nonunion more common in distal third femoral fractures. We perform open reduction and internal fixation with locking plate with or without bone graft and have a good union rate. Union is defined as bony continuity in at least three cortices and the patient is able to weight bear without pain.⁶ We use local bone graft when there is excessive callus around the fracture ends.

Methods

From 2011 July to June 2016 we prospectively studied sixty nine cases of femoral fractures. Out of them there were eighteen supracondylar, seventeen distal third and thirty four shaft and subtrochanteric fractures. They were between sixteen to ninety two years old. There were 44 male and 25 female. Supracondylar fractures were fixed with closed reduction and locking plates, shaft and distal third fractures were fixed with intramedullary interlocking nails and proximal third with locked or unlocked intramedullary nails. All the nonunion of distal third femoral fractures were fixed with open reduction and internal fixation with locking plates with or without bone grafts. First of all we removed the hardware, open the nonunion site, freshened the bone ends, remove all the fibrous tissues, drill the ends for fresh bleeding, prepare the both ends to get maximum contact, harvest the local bone

graft (hypertrophic callus), fix with locking plate and place the callus in , close the wound in layers. Usually no drain, suture removal at two weeks. Non weight bearing for six weeks, then partial weight bearing to full weight bearing allowed at three months time.

Inclusion criteria were all the fractures which were not united in 9 months time irrespective of the methods of fixation. This study analyzed the management of aseptic nonunion of nine cases in adults managed with open reduction and internal fixation with locking plate.

Results

All supracondylar, middle and proximal third femoral fractures united without complications. Out of seventeen distal third femoral fractures, there were nine nonunion. There were no infection and other complications. Wound healed in two weeks time, There was discharge from the wound in one of the case which ultimately healed with dressing and antibiotics. All the nonunion united without complications with open reduction and internal fixation with locking plates with or without bone graft in six to nine months time.

Discussion

Nonunion is more difficult to deal with than fresh fractures since there is already a complication. In literature a lot of things are written regarding causes and management of nonunion. The common sites of nonunion of femoral fractures are subtrochanteric and middle third fractures. We have

experienced distal third femoral fractures more commonly than middle third and subtrochanteric fractures. There are various causes of nonunion of femur fractures. Common causes are open fractures, infection, altered bio-mechanics, instability, malalignment, precious blood supply. The other contributing fractures are obesity and tobacco use. Open fractures also heal without infection if done early with thorough debridement. If that was the cause a lot of closed fractures lead to nonunion. Infection not always lead to nonunion, low grade asymptomatic infection may lead sometimes to excess callus formation and union. In our experience altered bio-mechanics is the main cause of nonunion in distal third. Altered canal diameter, angulation, precarious blood supply, instability, tugging effect in nailing system, technical default lead to nonunion. So this issue should be properly addressed.

There are various methods of treatment of nonunion. Exchange nailing with one to three millimeters larger size nail is inserted after reaming which should snugly fit the canal. Failure of exchange nailing rate is as high as 53%. canal. Some supplement it with bone graft. But it may require additional processes like bone grafting, dynamization. Dynamization only or dynamization with bone grafting is another option. Some group go for open reduction and internal fixation with plating. Dual implant fixation, plating over nailing is another method for nonunion. We usually go for open reduction and internal fixation with locking plates. We Remove the

existing hardware, prepare the bone ends and rigidly fix with locking plate. The result is promising and we have no nonunion. When there is frank infective nonunion, remove the implant, immobilize the nonunion site with slab and cast for six weeks, let the wound heal infection eradicated and fix the nonunion with locking plate (literature).

We conclude that distal third femoral fracture is the commonest site of nonunion in femoral shaft fracture in our series and open reduction and internal fixation with locking plate is a very good and reliable method of fixation of nonunion of distal third femur fractures nonunion.

References

1. Taitsman LA, Lynch JR, Agel J, Barei DP, Nork SE: Risk factors for femoral nonunion after femoral shaft fracture. *J Trauma*. 2009, 67 (6): 1389-1392. 10.1097/TA.0b013e318182afd0. [View ArticlePubMedGoogle Scholar](#)
2. Canadian Orthopaedic Trauma Society: Nonunion following intramedullary nailing of the femur with and without reaming. Results of a multicenter randomized clinical trial. *J Bone Joint Surg Am* 2003, 85:2093-2096. [Google Scholar](#)
3. Wolinsky PR, McCarty E, Shyr Y, Johnson KD: Reamed intramedullary nailing of the femur: 551 cases. *J Trauma*. 1999, 46: 392-399. 10.1097/00005373-199903000-00007. [View ArticlePubMedGoogle Scholar](#)
4. Ostrum RF, DiCicco J, Lakatos R, Poka A: Retrograde intramedullary nailing of femoral diaphyseal fractures. *J Orthop Trauma*. 1998, 12: 464-468. 10.1097/00005373-199809000-00006. [View ArticlePubMedGoogle Scholar](#)
5. Giannoudis PV, MacDonald DA, Matthews SJ, Smith RM, Furlong AJ, DeBoer P: Nonunion of the femoral diaphysis. *J Bone Joint Surg (Br)*. 2000, 82: 655-658. 10.1302/0301-620X.82B5.9899. [View ArticleGoogle Scholar](#)
6. Malik MH, Harwood P, Diggle P, Khan SA: Factors affecting rates of infection and nonunion in intramedullary nailing. *J Bone Joint Surg (Br)*. 2004, 86: 556-560. [Google Scholar](#)
7. Lynch JR, Taitsman LA, Barei DP, Nork SE: Femoral nonunion: risk factors and treatment options. *J Am Acad Orthop Surg*. 2008, 16: 88-97. [PubMedGoogle Scholar](#)
8. Wu CC, Chen WJ: Treatment of femoral shaft aseptic nonunions: comparison between closed and open bone-grafting techniques. *J Trauma*. 1997, 43: 112-116. 10.1097/00005373-199707000-00026. [View ArticlePubMedGoogle Scholar](#)
9. Pihlajamaki HK, Salminen ST, Bostman OM: The treatment of nonunions following intramedullary nailing of femoral shaft fractures. *J Orthop Trauma*. 2002, 16: 394-402. 10.1097/00005373-200207000-00005. [View ArticlePubMedGoogle Scholar](#)
10. Wu CC, Chen WJ: Exchange nailing for aseptic nonunion of the femoral shaft.

- Int Orthop. 2002, 26: 80-84. [10.1007/s00264-001-0313-5.PubMed](#) [CentralView ArticlePubMedGoogle Scholar](#)
11. Brinker MR, O'Connor DP: Exchange nailing of ununited fractures. *J Bone Joint Surg Am.* 2007, 89: 177-188. [10.2106/JBJS.F.00742.View ArticlePubMedGoogle Scholar](#)
 12. Wu CC: Exchange nailing for aseptic nonunion of femoral shaft: a retrospective cohort study for effect of reaming size. *J Trauma.* 2007, 63: 859-865. [10.1097/01.ta.0000233663.24838.76.View ArticlePubMedGoogle Scholar](#)
 13. Shroeder JE, Mosheiff R, Khoury A, Liebergall M, Weil Y: The outcome of closed intramedullary exchange nailing with reamed insertion in the treatment of femoral shaft nonunions. *J Orthop Trauma.* 2009, 23: 653-657. [10.1097/BOT.0b013e3181a2a337.View ArticlePubMedGoogle Scholar](#)
 14. Hak DJ, Lee SS, Goulet JA: Success of exchange reamed intramedullary nailing for femoral shaft nonunion or delayed union. *J Orthop Trauma.* 2000, 14: 178-182. [10.1097/00005131-200003000-00005.View ArticlePubMedGoogle Scholar](#)
 15. Weresh MJ, Hakanson R, Stover MD, Sims SH, Kellam JF, Bosse MJ: Failure of exchange unreamed intramedullary nails for ununited femoral shaft fractures. *J Orthop Trauma.* 2000, 14: 335-338. [10.1097/00005131-200006000-00005.View ArticlePubMedGoogle Scholar](#)
 16. Banaszkiewicz PA, Sabboubeh A, McLeod I, Maffuli N: Femoral exchange nailing for aseptic non-union: not the end to all problems. *Injury.* 2003, 34: 349-356. [10.1016/S0020-1383\(02\)00191-2.View ArticlePubMedGoogle Scholar](#)
 17. Cleveland KB: Delayed union and non-union of fractures. *Canale & Beaty: Campbell's Operative Orthopaedics.* Edited by: Canale ST, Beaty JH. 2013, Mosby, Philadelphia, Ch.59-12[Google Scholar](#)
 18. Tay WH, de Steiger R, Richardson M, Gruen R, Balogh ZJ: Health outcomes of delayed union and nonunion of femoral and tibial shaft fractures. *Injury* 2014. in press.[Google Scholar](#)
 19. Somford MP, van den Bekerom MPJ, Kloen P: Operative treatment for femoral shaft nonunions, a systematic review of the literature. *Strat Traum Limb Recon.* 2013, 8: 77-88. [10.1007/s11751-013-0168-5.View ArticleGoogle Scholar](#)
 20. Park J, Kim SG, Yoon HK, Yang KH: The treatment of nonisthmal femoral shaft nonunions with IM nail exchange versus augmentation plating. *J Orthop Trauma.* 2010, 24: 89-94. [10.1097/BOT.0b013e3181b8dafd.View ArticlePubMedGoogle Scholar](#)
 21. Choi YS, Kim KS: Plate augmentation leaving the nail in situ and bone grafting for nonunion of femoral shaft fractures. *Int Orthop.* 2005, 29: 287-290. [10.1007/s00264-005-0668-0.PubMed](#) [CentralView ArticlePubMedGoogle Scholar](#)

[tralView ArticlePubMedGoogle Scholar](#)

22. Penzkofer R, Maier M, Nolte A, von Oldenburg G, Püschel K, Bühren V, Augat P: Influence of intramedullary nail diameter and locking mode on the stability of tibial shaft fracture fixation. *Arch Orthop Trauma Surg.* 2009, 129: 525-531. 10.1007/s00402-008-0700-0.

[View ArticlePubMedGoogle Scholar](#)

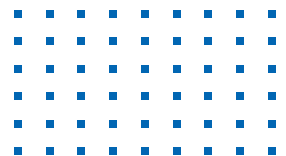
23. Bakker AD, Kroeze RJ, Korstjens C, de Kleine RH, Frölke JP, Klein-Nulend J: Reaming debris as a novel source of autologous bone to enhance healing of bone defects. *J Biomed Mater Res A.* 2011, 97: 457-465. 10.1002/jbm.a.33080.

[View ArticlePubMedGoogle Scholar](#)



14

OSTEOMYELITIS



Osteomyelitis is a vague term that indicate bone infection. It may be acute, subacute or chronic infection. In children it is more disaster and it is more difficult to diagnose than in adult. The mechanism of infection may be different in different age group and in different situations.

The most common organism is staphylococcus aureus occurring in more than 90 % of cases followed by staphylococcus and gram negative organisms.



Fig. 14.1 - Case of open tibia fracture managed primarily with external fixator. There was fulminant infection and osteomyelitis implant was removed and managed conservatively in cast. Infection was eradicated and it was fixed with locking plate with bone graft. Union was achieved with good outcome. Diphyseal sequestrum was not removed.

In children it is mainly from hematogenous route and presentation may be different as compared to adults. Sometimes the history is misleading with the history of trauma or occult injury. So high index of suspicion

should be there if child presents with features of inflammation regardless the history of trauma. Thorough investigation should be done under supervision.

Most of the time, it is a surgical emergency rather than medical and initial treatment determines the long term outcome of the patient.



Fig. 14.2 - Picture shows acute osteomyelitis of distal femur which went undiagnosed initially. There are series of complication afterwards.

Septic arthritis should also be treated in the same manner with high index of suspicion and it is more serious than just osteomyelitis. Occult trauma sometimes confuse with the osteomyelitis. Over suspicion and treatment of osteomyelitis is better than to face the disaster. Pain, redness rise of temperature of the joint with irritable child, should be decompressed. Osteomyelitis should also be decompressed irrespective of the severity. Donot rely on external features and soft tissue involvement, rely on extent of bone

involvement.

Treatment

1) Clinically and through investigations

– if there is no collection and if there is no signs of bony involvement, then just IV antibiotics under supervision is done. Constant monitoring is done by admitting the patient. If the symptoms subside in subsequent days, then the patient can be discharged on oral antibiotics with or without the support to the involved limb depending on the clinician's judgment with regular follow up. Usually antibiotics are continued till six weeks. If patient deteriorates or if the conservative treatment fails, or if collection develops and features of bony involvement develop, we have to move for the next step.

2) Surgical emergency - If the conservative treatment fails, if the patient presents with features of collection and /or features of bony involvement in both cases of septic arthritis or osteomyelitis then we have to go for surgical decompression.

A) If only soft tissue is involved like collection or joint effusion just drain the pus, excise the unhealthy tissues and debris in cartilage. Put the drain and IV antibiotics and observation with supportive care.

B) If features of bony involvement is present then we have to curette the bone, sequesterize it or make a cortical window or make multiple holes in the bone to decompress the bone, Gram stain, culture sensitivity

and biopsy should be done and treat further according to the report.

3) Treatment of chronic osteomyelitis – This

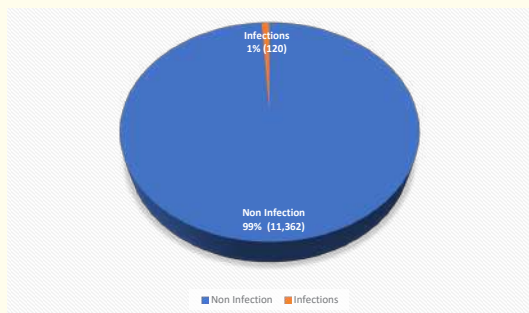
is one of the challenging topic to deal with. There are lots of dreaded complications following osteomyelitis if it does not subside with the primary treatment or if the patient presents in the late stages.



Fig. 14.3 - Picture shows acute osteomyelitis of radius missed at the initial stage. Chronic osteomyelitis is disabling the child life long.

In children growth arrest, limb length discrepancy and deformity are the late complication and they are difficult and time consuming to deal with. In general repeated infection, fractures of the involved bones, stiffness of the joints, bone gap, nonunion and malunion are the difficult complications. All these complications should be dealt individually.

Our Statistics



Out of 11,482 operations, we came across 120 cases of infections in 10 years period. Out of them, seven cases were of osteomyelitis. Four male and three females were involved. All of them got cured after the treatment.

Controversies

In case of osteomyelitis, there are two school of thoughts.

1) **Some surgeons are very aggressive** - In case of osteomyelitis, they excise the whole involved part and do a bone transport or bone grafting in the remaining area. They even excise the whole diaphysis and transport the bone from either end or metaphysis.

2) **The second group of surgeons donot excise the bridging diphsial sequestrum.** They let the bridging callus to form and remove the dead bone once the new bone bridge is strong enough . The second procedure is easy, reliable, less expensive and surgeon as well as patient friendly and we follow it. If this process fails there is always the first option of radical surgery and bone transport.

Tips & Tricks



Message

- Most of the times osteomyelitis is misleading with history of trauma
- Simple I&D with appropriate antibiotics coverage gives good result with no residual morbidities.

Post surgical infection

- 1) With implant in situ. Healed fracture, remove the implant, infection will be cured



Fig. 14.4 - Picture shows case of shaft of humerus fracture with infection with implant insitu. There is healing of the fracture.

- 2) Healing fracture- Early removal and some types of protection of the weak bone is done till full union of the bone.
- 3) Non healing fracture with infection- two options- a) wait and watch- dressing, let the fracture heal. Early removal is done then after.



Fig. 14.5 - Picture shows infective nonunion of distal femur fracture with nail insitu. Infection was eradicated and open reduction and internal fixation with locking plate was done with good union.

- b) Removal-again two options are available

- i) Immediately fix with bigger nail or titanium implant,
- ii) wait and watch for 6 weeks till the wound heals and again fix the fracture.
- 4) In case of low grade infection- wait and watch, some callus is benefit for union.

Tips & Tricks



Message

- Exchange nailing, Exchange the fixation modalities after thorough debridement
- Window period –Remove the hardware, debride, splint the part till the wound is completely healed and perform next definitive surgery (usually it is 6 weeks to 2 months)



Message

- When the window period method fails, or still there is infection, we continue the treatment protocol with dressing and antibiotics until and unless the implant is doing its job. Most of the time fracture unites and we do early removal of implants and subsequently the infection subsides.

Message

- Most of the time implants are the nidus for infection and it is exaggerated by our surgical procedures. So removal of all hardwares and protection just in splints cures all the problems.

Amputations and stump osteomyelitis

- It is very difficult in case of AK amputation for shortening of bone.
- Just have to fight and fight with the infection

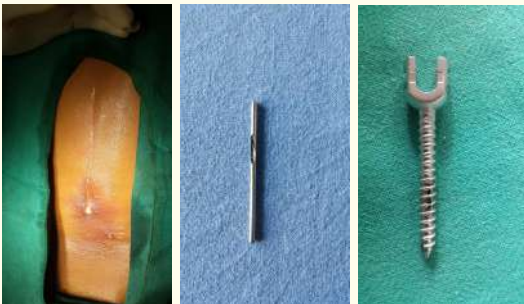


Fig. 14.5- Picture shows corrosion of the implant with infection.

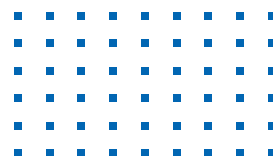
Conclusion

- There are various ways of management of chronic osteomyelitis
- Antibiotics, debridement and stabilization are the mainstay of treatment
- In case of bone gap -bone grafting, tissue flaps and bone transport is required, which is very specialized
- We should practice with minimal morbidity to the patients.



15

SPINE



Spine

Controversies

- There are various classification and non is conclusive for guidance for Rx
- Treatment-Conservative Vs Surgery
- Timing of Surgery- in neurological involvement
- Surgery-Anterior , Posterior or Both
- Choice of implants
- Level of Fixation and Fusion

Classification

- Holdsworth
- Mace
- Dennis Brawn
- Comprehensive
- AO
- Load sharing Classification

Load sharing classification

- <7 Points-Posterior Fixation only
- >7 Points-Anterior Fixation only
- #Dislocation <7 points-
Posterior Fixation
- # Dislocation >7 points-
Ant graft+Post Fixation

Methods of Pedicle Screw Fixation

- Intersection technique
- Mamillary Process Technique
- Pedicular Technique

Conclusion-

- Spine is full of controversies
- Short segment fixation has high failure rate
- Prefer Long Segment Stabilization

- Pedicle Screws Fixation is demanding and challenging
- Restoration of normal anatomy is important
- Indirect Decompression is sufficient in most cases
- Early mobilization is important

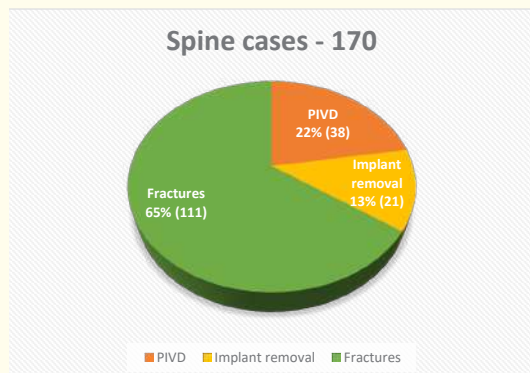
Statistics

	North America	Nepal
RTA	50%	28%
Fall	20%	69%
Sports	10%	-
Assault	20%	-
Accident	-	3%

The data shows different demographics of spine injury as compared to the developed western world. So it would be easier for management and treatment if we have our own data and management protocols in spine injuries. The most common mode of injury in Nepal is fall as compared to RTA in America. Most common age is 32- 40 years of age. Male are affected in more than 60% of cases. Thoracic spine fracture is the commonest followed by lumbar spine fractures. Source of data. – This is not the exact national census or national representative data, but collected from the presentations from 2009 to 2023 AD in Orthocon . (Alive Hospital & Trauma Centre, TUTH, B&B Hospital, National Trauma Center, BPKIHS Dharan, and few other colleges and hospitals.

Our Statistics

In ten years periods (2011-2021) we operated 170 case of spine, 21 cases were of PIVD, 38 cases were of implant removal for spine fractures. Out of 111 spine fractures there were 62 male and 49 females, Thoracolumbar fracture was followed by lumbar fracture in number.



Five indications for surgery

- Instability
- Infection
- Deformity
- Paralysis
- Tumors

Description

- In elderly patients non surgical treatment, - in osteoporotic fractures, mostly fall, treat with medical replacement therapy.
- Kyphoplasty is not started in several hospitals in Nepal.
- Due to low socioeconomic status, ignorance, low demand go for conservative in some cases of borderline fractures.



Fig. 15.1 - Picture shows case of thoracolumbar fracture managed conservatively with early mobilization.

Conclusion

- Spine is full of controversies
- Short segment fixation has high failure rate
- Prefer Long Segment Stabilization
- Pedicle Screws Fixation is demanding and challenging
- Restoration of normal anatomy is important
- Indirect Decompression is sufficient in most cases
- Early return to preinjury status with less morbidity should be the goal



Fig. 15.2 - Picture shows thoracolumbar fracture fixed posteriorly with rod and pedicle screw with early mobilization.

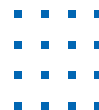
Tips and Tricks

Earlier rehabilitation in cases of conservative treatment is advise as stated in earlier chapters gives more patient satisfaction and less complications.

In cases requiring surgery, we can go for individualized decisions. In cases of elderly patients with osteoporosis or patients with comorbidities, leaning towards conservative treatment gives more or less the same results as compared to surgical treatment. Not for the medical purpose but the patient with less demand and very low socioeconomic conditions also benefit with this modality of treatment with good outcome.

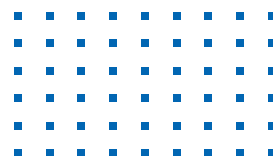


Fig. 15.3- Picture shows thoracolumbar fracture dislocation with complete paraplegia manage with surgery. Patient recoverd and could walk independently.



16

UPPER LIMB



Clavicle Fracture



Fig. 16.1 - Picture shows extreme conservative treatment of clavicle fracture with brace for years and with primitive method.

Clavicle fractures are the commonest fracture, in which middle third clavicle fracture is the most common fracture followed by later third of clavicle fracture. The least common is the medial third of the clavicle fracture. There are two school of thoughts regarding the management of clavicle fractures. Conservative treatment versus operation. Text books and literatures say that both the modalities have no so much differences in the treatment outcome. But the trend of surgical intervention is increasing. There are both pros and cons of surgical interventions. We believe that the complications after surgical treatment are more dreaded and disabling than that of conservative treatment. We still prefer conservative treatment over surgical treatment and recommend surgical treatment in nonunion cases of clavicle fractures.

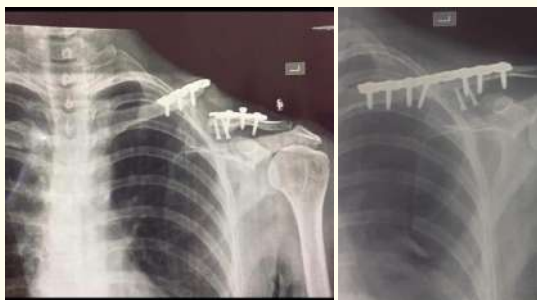


Fig. 16.2 - Picture shows clavicle fracture with implant failure treated with re-reconstruction plating with good result.

We have presented a scientific paper in ORTHOCON 2023 at Butwal. The abstract is as follows.

Management of Clavicle fractures 2023

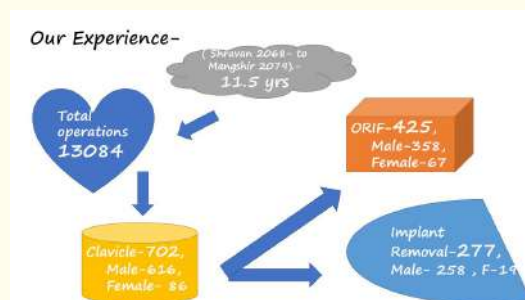
Dr. Pramod Lamichhane

Dr Anil Bhattarai

Dr Santosh Kamar

Abstract

Management of clavicle fracture is simple either we treat it conservatively or operatively. The principle is straight forward for different portions of clavicle fractures like medial, middle and distal third of clavicle. With the increasing trend of operative method, complications are also increasing in terms of infection, nonunion, implant failure and paresthesia. Still the conservative method is safe and more promising with excellent results.

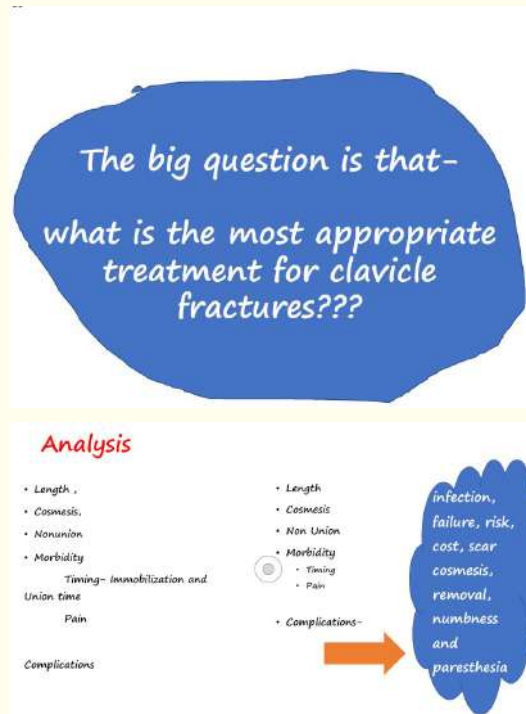


Discussion

Both the conservative and operative modalities have the pros and cons the methods. We have to analysis either the complications over ride if we do not go for that modality of treatment.

Conclusion

- Review is necessary for the trend of increasing surgical intervention
- We should be vigilant about commercialized management
- Analysing and reviewing all complications, conservative management is still better than surgical interventions



First figure shows patient with the clavicle brace for 12 years, the second figure with treatment of clavicle fractures in a primitive way. Both the methods are extreme due to ignorance, false beliefs, and social rituals.

AC joint separation

This is also a common injury and sometimes it is missed at the primary onset especially in multiple or polytrauma. There are various methods of management of AC joint

separation according to the grade or severity of injury. In cases of type I and type II injury, conservative methods with short term immobilization, analgesics and sometimes strapping of the AC joint will suffice.



Fig. 16.3 - Picture shows nonunion of clavicle fracture again treated with bone graft and replating.



Fig. 16.4 - Picture shows cases of clavicle fracture with implant failure.

In our practice, in conservative management we do not immobilize and strap the injured site. We advise the patient to mobilize the upper limb as tolerated with analgesics as needed. There is no proper immobilization even with the strapping technique. The shoulder girdle moves as well as the injured AC joint also moves during our different activities.

It is impossible to relocate the joint to its

anatomical position with whatever the conservative measures we do. The long term results are the same. So we just manage the pain and early mobilize of the limb and shoulder.

Surgery

There are different modalities of surgery in cases of grade III and above injuries. Nowadays arthroscopic surgery is also done and long term results are yet to be awaited. We believe that non of the management protocol is ideal for management of AC joint separation till date. open reduction and internal fixation with K wires, TBW, Screw fixation, ligament reconstruction or hook plate are the common modalities of treatment. Sometimes there are complications in all the modalities and there is some residual subluxation after the rehabilitation and implant removal. To analyse the benefits of surgery over conservative , we believe that there is hardly any benefit of surgery over conservative except for cosmetic reason. Visible scar is another drawback of surgery.

Shouder Girdle Injury

Displaced fracture of the glenoid with displacement requires surgery since it is an articular area. Otherwise we can get the same results with conservative as well as surgery in scapular fractures. The trend of operating the scapula fracture is increasing. We treat all other injuries of the shoulder conservatively regardless of the displacement. Scapular is covered with thick muscles and hardly any deformity or disability persist after the rehabilitation.

Proximal Humerus Fractures.

Proximal humerus comprises the head and neck of humerus. It is a common injury and it is more challenging in elderly patients with 3 or 4 parts fracture of proximal humerus and also fracture dislocation of the shoulder.

There are two school of thoughts.

In developed countries and in most of the countries globally people go for replacement surgery with shoulder arthroplasty in comminuted and displaced fractures of the proximal humerus. In Nepal we still practice fixation of the proximal humerus fracture with good results with pain free motion of the shoulder joint with union of the fracture. In very high risk cases, which cannot undergo surgery, conservative treatment has still a good outcome.



Fig. 16.5 - X-Ray shows proximal humerus fracture treated conservatively. Conservative treatment also has with good outcome.

Open reduction and internal fixation with special type of locking plates are practiced nowadays in cases which are posted for surgery.

To make surgery less expensive with equally good outcomes, low profile plates like stainless steel L or T plates can be used.



Fig. 16.6 - Proximal humerus fracture treated by open reduction and internal fixation with plating.

If everything fails, and if we have no facility of shoulder arthroplasty and if there is infection and necrosis and nonunion of humeral head fracture, just excision of the humeral head will also give a fairly good result. Patient can perform activities of daily living with no pain. Its like girdle stone arthroplasty in the hip. We have practiced this surgery in one case and is doing fairly good.

Our Statistics



From 2068-2078, in 10 years time, out of 11,484 surgeries we operated 54 cases were of proximal humerus fracture. There were 26 male & 28 female. Overall result was good with union. There was one fracture dislocation which ultimately failed and we have to excise the head.

Greater Tuberosity Fractures

Dislocation of the shoulder with greater tuberosity fracture or just displaced greater fracture is a common pattern of GT fracture. Most of the time after relocation of the shoulder dislocation, displaced greater tuberosity aligns with the humerus and further intervention is not required. If the GT is incarcerated in the shoulder joint, then open reduction and internal fixation or Closed relocation and screws or plate fixation is recommended. Despite the displacement, GT fracture recover fully with conservative treatment.

Shoulder dislocation

Relocation with local injection or under sedation and mobilization of the the shoulder early to prevent stiffness is practised. Just avoid extension and external rotation. Immobilization in arm sling is sufficient. Some people immobilize the joint for 3-4 weeks which may complicate with pericapsulitis and pain.

Frozen shoulder

There are various causes for pain and stiffness, with inability to move the shoulder even for months. Trivial trauma mostly in elderly is the most common cause. There are various modality of treatment of frozen shoulder. NSAIDS, physiotherapy, oral or injectable steroids are the common modalities of treatment.

Non of these modalities are conclusive for the treatment. Arthroscopic release is an advanced modality practiced nowadays.

We perform manipulation under anaesthesia (MUA) in most of the cases with excellent results. This is a very rewarding technique and, relatively not an expensive procedure. This is a blind procedure and it may be criticized by some practisenors. It has an excellent result. Patients get pain free mobile shoulder joint with in a week or two.

Technique- Since it is a common problem and non of the modalities of treatment are satisfying and the patient is having severe pain with sleepless nights, we want to elaborate the procedure. Patient is kept nill per oral for 4 hours, basic preoperative investigations are done as required by the anaesthetics. The joint is mobilized gently in the operation theater under intravenous anaesthesia, keeping in mind the fragile joint with high chances of fracture during the procedure. Methyl prednisolone is injected into the joint with lignocaine for pain relief. This is done on a day care basis.



Fig. 16.7 - Picture shows good range of motion of shoulder after MUA of shoulder joint.

The shoulder is mobilized under supervision from the very next day with NSAIDs for 5-7 days. Usually patients get pain less mobile joint with in 5-7 days and become very happy and we regard this procedure as a rewarding procedure.

Our Statistics-

We do not have the exact data from the OPD.

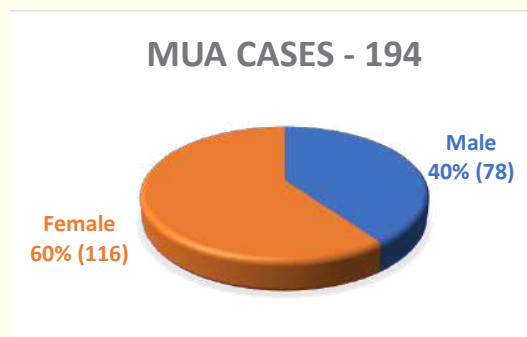


Fig. 16.8 - Picture shows good range of motion of shoulder after MUA of shoulder joint.

There were more female than the male and all of them did well after MUA.

Brachial Plexus Injury

There are recent advances in the management of brachila plexus. We have to analysis that what is the benefit of surgery over just conservative treatment. We have to think that *"can the benefit claimed with surgery, could had happen naturally with time in conservative methods?"*

There is certainly a role of muscles transfer and tendon transfer. We have no much experience on it.

Shaft of humerus fracture

Previously most of the shaft of humerus fractures were treated conservatively. Nonunion and malunion were managed surgically.

The trend of surgery is increasing nowadays. We presume open reduction and internal fixation with plating are better than intramedullary nailing in case of shaft of humerus fractures. We can explore or see the radial nerve in case of radial nerve palsy pre-operatively, we do not violate the shoulder mechanism in plating unlike in intramedullary nailing. Different types of plates like DCPs or locking plates are used. We can mobilize the limb early, it is more promising, and it is more satisfying to the patient than with conservative treatment or IM nailing of the humerus.

Distal Humerus Fracture

This is the most difficult fracture to deal with in the upper limb. It is difficult to expose the fracture. It is also intraarticular in most cases, and this fracture is notorious for stiffness after best of the best fixation..

We perform from the posterior approach, mostly by olecranon osteotomy, we do bicolumnar fixation and early mobilization of the elbow as usual.



Fig. 16.9 - Picture shows good outcome after distal humerus fracture fixation.

Radial Nerve Palsy -tips and tricks

- 1) If the radial nerve is injured preoperatively, we just explore during plating of the fracture shaft of humerus, or distal humerus. We repair the nerve, if it is transected.
- 2) If it is iatrogenic palsy, just be sure there is no transection or entrapment of the radial nerve, then we wait and watch, with medications. Most of the time they recover fully at 3-6 months time. Just we have to thoroughly counsel the patient.

Tips & tricks

Radial nerve injury occurs more commonly during implant removal, than during primary surgery. We should be careful and should counsel the patient thoroughly beforehand.

If there is no recovery of the radial nerve after 6 months too. Tendon transfer or other surgeries are performed to improve the hand function. We have no experience with it and refer to the hand surgeons.

Elbow dislocation

Relocation in emergency room under local xylocaine injection or under sedation in operation theater is done. The main principle is not to immobilize the elbow joint in slab for more than 4-7 days if the reduction is stable. If it is unstable, then immobilize the joint for 3-4 weeks. We should do serial xrays in between to see for any dislocation during follow up since re dislocation occurs in the slab or cast. If the dislocation is very unstable

and it is difficult to maintain in a slab, then we insert the temporary radiocapitellar pin for 3 weeks.

If elbow dislocation is complex with tetrable triad or radial head # dislocation, we perform the CT scan, and fix the fractures accordingly. The results are fairly poor which should be clearly explained to the patient and patient party. It is very difficult to gain full extension rather than full flexion of the elbow joint.

In case of isolated chip of capitulum #, we should fix the fracture with screws. If it is comminuted and if we cannot fix it, and if it is hampering the elbow ROM, we should remove the fractured piece which ultimately gives a good result.

Radial head and Neck fracture Dislocation

Radial head dislocation is rare and more commonly we see fracture of the radial head. There are different methods of treatment of the radial head fracture. If it is a simple displaced fracture, fixation with screws, or retrograde nails or k wires or even plating is done.

Radial head replacement is common nowadays and there are different types of prosthesis. Long term results are to be awaited and in few cases we have seen loosening and wear off of the radius head and hampering the elbow motion.

When it is not possible to fix the radial head,

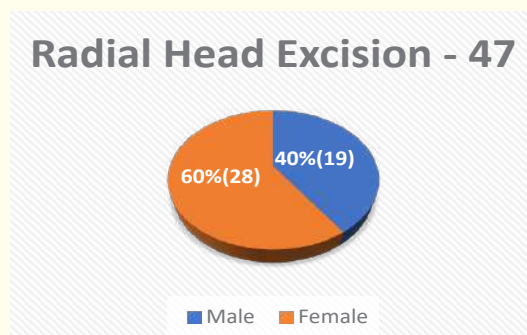
or salvage the joint, and if we think that the salvage procedures may hamper the elbow as well as the radial head rotational motion later on, we go for excision of the radial head.

Excision of the radial head

Tips & tricks

- 1) If it is an isolated radial head fracture with intact radioulnar interosseous ligament, we go for primary excision of the radial head.
- 2) If it is an Essex-Lopresti lesion, we immobilize the upper limb for 4 weeks and go for excision of the radial head once the interosseous membrane heals. The risk of migration of the radius proximally is less.

Our Statistics



We had 47 cases of radial head excision, 19 male and 28 female with full range of motion, no pain and deformity with good patient satisfaction.

Controversy

It is said that after excision of the radial head, the radial side pillar is weak and there is tendency of valgus instability which ultimately leads to deformity and pain in the elbow.

We have seen good result with radial head excision. With full range of motion and no instability with no pain.



Fig. 16.10 - Picture shows ten years long term outcome of radial head excision after trauma.

This procedure is easy to perform and we can give early mobilization of the elbow with less morbidity and good patient satisfaction.

Olecranon Fractures

Open reduction and internal fixation with TBW or open reduction and internal fixation with olecranon hook plate gives a good result. Whenever possible we go for plating rather than TBW with more stable construct. When the proximal fragment is small or comminuted then we go for TBW fixation.

Both bones forearm fractures

In case of forearm both bones fracture, Monteggia fracture and Galeazzi fracture, open reduction and internal fixation with Small DCP is still a gold standard treatment. This procedure can be done even up to GIII A injury. We have no experience with intramedullary nails or pin fixation in adults.

Distal Radius Fractures

Distal radius fracture is a common fracture in adults. There are various modalities of treatment of distal radius fractures. Closed reduction and crossed K wires fixation is performed in extraarticular or even in comminuted intraarticular fractures. It is a simple procedure, easy to perform and it is with less morbidity to the patients. Immobilize the limb in short arm volar slab for 4 weeks, remove the pins which are outside the skin and start mobilization of the wrist and hand. There is less stiffness and the patient returns to preinjury status early with great satisfaction.

Ligamentotaxis and external fixator application

Indirect ligamentotaxis is practiced by some surgeons. We have no experience on it. This procedure is more demanding than percutaneous K wires fixation. Cost of the external fixator is also more than the K wires and it is associated with more morbidity since we have to involve the metacarpal bone as well as shaft of the radius.

Plating

It is widely practiced nowadays. Either volar, dorsal or dual plating is done. They are very suitable for volar or dorsal Barton fractures or carpal subluxation. They also leave a big scar, stiffness may occur, and implant cost is higher as compared to closed reduction and K wire fixation.

In very old and very high risk cases and with

severe osteopenia, closed reduction and cast treatment for 4-6 weeks is done. Start mobilization early to prevent stiffness and sudek osteodystrophy or shoulder hand syndrome. In Nepal, we see a lot of such cases ever for months and even years just wondering hospitals to hospital. Thus, we should counsel the patient thoroughly, mobilize the limb and wrist early with analgesics in the cost of pain and swelling. The more we immobilize, the more the trouble we create. We should ask even to mobilize the elbow and shoulder from the first day of surgery to prevent stiffness. Stiffness is commonly seen in Nepalese patients and this is one of the main reason of patient dissatisfaction. Early mobilization and prevention of stiffness is rewarding for the treating surgeon rather than just treatment of distal radius fracture.

Scaphoid Fracture

The principle of treatment of displaced scaphoid fractures is fixation with herbert screw with or without BG . In case of undisplaced fractures, just go for conservative treatment. If there is no signs of union and pain persists after 3 months too, then repeat the x ray and do the CT scan if needed. If there is frank nonunion, then again go for open reduction and internal fixation with k-wires or screws fixation. We have seen no complications after the surgery. There is union and there is no residual necrosis or pain afterwards.

In case of metacarpal fractures we have

choices, if the patient is demanding we can go for closed reduction or open reduction and pinning, otherwise conservative treatment is sufficient if there is no visible clinical deformity irrespective of the displacement and comminution.

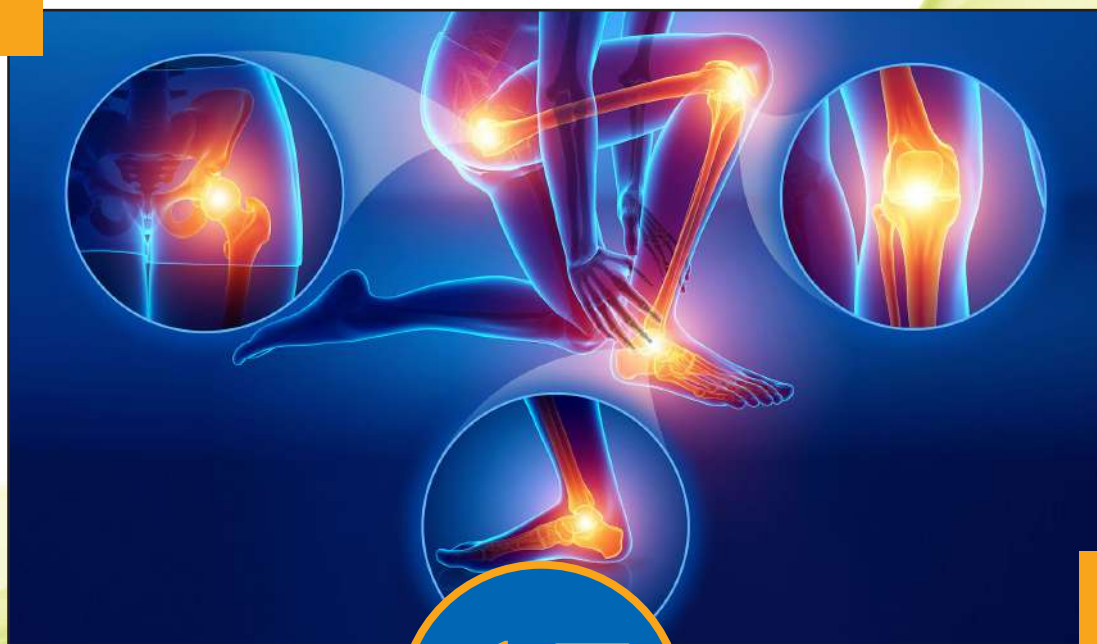
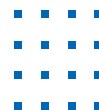
Neck of metacarpals should be reduced and fixed if they are displaced and angulated and full function of the hand is altered.

Phalynx fractures is notorious and result in alteration of hand function in most of the times, especially in intraarticular phalynx fractures. This should be addressed anatomically and start the range of motion early irrespective of union with in 2-3 weeks time after surgery. Regain of hand function should be the priority rather than achieving union.

Tip of distal phalynsx fractures with no deformity can be ignored with early mobilization. Stiffness of the IP and MCP joints is really notorious after injury in cases of intra articular fractures and results are suboptimal. We should counsel the patient thoroughly.

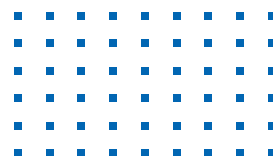
Carpel tunnel syndrome-

Treatment of refractory carpel tunnel syndrome are rewarding with percutaneous release of the carpel tunnel under local anaesthesia. This is better than injection of steroid at the affected site.



17

LOWER LIMB



Pelvic Ring Fracture -

In case of stable patients, we continue the conservative treatment despite the displacement since the bones are covered by thick muscular structures no residual disability or deformity persist after the recovery similar to the scapular girdle injury and treatment. In case of pubic symphysis diasthesis with significant displacement we reduce and fix with reconstruction plates. If cases present late and it is painful we fix the pubic diasthesis and if it is not painful, we can continue the conservative treatment irrespective of displacement.

SI Joint-

Usually it should be anatomically reduced and fixed. Long term disability may persist, so fusion is better in case of SI joint dislocation and injury.

Acetabular Fractures

All displaced fractures of the acetabulum should be fixed either it is anterior column, posterior column or both. Central fracture dislocation are difficult and they should also be addressed surgically.

Tips

We should counsel the patient for possible total hip replacement later on since the hip may go into arthrosis even with the best treatment.

Femoral Head fractures

It should be fixed with screw and we have to

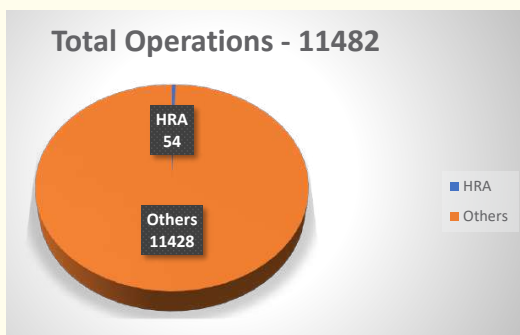
counsel for possible AVN later on. We have no such experience on it.

Neck of femur

In young patients we should attempt for fixation irrespective of time of injury. We should always take a chance to provide the natural joint to the patient. Patient's own bone and joint is better than the prosthesis. If it fails then we should go for total hip replacement later on.

In case of elderly patients with features of hip arthritis, we go for hip replacement surgery. In case of nepalese patients we prefer hemi hip replacement over total hip replacement if acetabulum is ok. It is less expensive, more affordable to all the patients and it is easy for the operating surgeons even in the periphery. In hemi hip replacement we prefer thompson hip arthroplasty over Austin moore or bipolar hip arthroplasty since we can allow immediate weight bearing on that leg on the next post operative day and the patient satisfaction and recovery are also earlier and better.

Our Statistics



All the cases were done with cemented thompson. Two cases had chronic pain and we have to remove the prosthesis and revise the hip.



Fig. 17.1 - Picture shows two cases of neck of femur fracture treated with cemented thompson.

Intertrochanteric fracture, besicervical neck of femur fractures

Now days there are various implants available for intertrochanteric fracture fixation like proximal femoral nail (PFN), different types of plates like trochanteric plates and DCS, but we believe DHS as the gold standard implant for intertrochanteric fracture fixation.

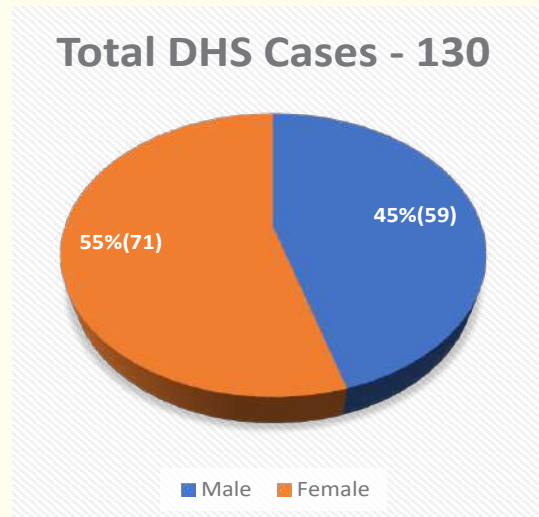
We would like to describe the procedure of DHS fixation. DHS fixation in intertrochanteric fracture was introduced in 1970s and it is still a method of choice for most of the surgeons. Though there are number of ways and implants for intertrochanteric fracture fixation, we still belive in this time tested implant for various reasons.

- 1) It is time tested and easy to use
- 2) It can be done in normal operation table

and doesnot require fracture table. Can be done in periphery.

- 3) Less time consuming and cheaper as compared to other implants.

Our Statistics



We operated 130 cases of intertrochanteric fracture. There were 59 male and 71 female. There was implant cutout. We have to revise the 1 case five times and implant removal was done in other 4 cases.



Fig. 17.2 - Outcome of intertrochanteric fracture fixed with DHS.

External Fixator application

In case of patients who cannot go for general anaesthesia or spinal anaesthesia. We can apply AO tubular external fixator under local anaesthesia. This is better than traction in long run since it is easier for mobilization, the risk of prolonged bed rest or recumbency is less and easy for daily care of the patient. We can extend the life expectancy of the patients who cannot undergo internal fixation.

Subtrochanteric fractures-

intramedullary interlocking is the best option for subtrochanteric fractures. If it is difficult or if intramedullary interlocking fails, locking plate fixation is an equally good method of fixation of subtrochanteric fractures.



Fig. 17.3 - Proximal femoral fracture revised with locking plate.

Tips and tricks in Hip Fracture

It is very important to make the patient up and above early, to get a good result in case of hip fractures especially in elderly patients.

Prolong the patient in bed, means more worst is the result. Patient physiology and comorbidities alters in long run and it is difficult to deal both comorbidities and the injury and the fracture.

Our experience

Shaft of Femur fracture

intramedullary interlocking is the gold standard of treatment in shaft of femur fracture. The best alternative is locking plates fixation. If we are working in a constraint setup and if we do not have radio intensifier, the second option of locking plate fixation of the shaft of femur fracture is a good option with excellent result.



Fig. 17.4 - Picture shows shaft of femur fracture, implant failure, infection and finally union with locking plate.

Distal third femur Fracture,

Locking plates have good results.

intramedullary interlocking is another option. But due to wide canal of the femur, nails do not snugly fit the medullary canal of femur. It is difficult to maintain alignment and chances of nonunion is more common with intramedullary interlocking in distal third femur fracture as compared to fixation with the locking plates.

Retrograde Intramedullary interlocking nail is another option. Due to wide canal at the distal area of the femur it is difficult to maintain the alignment of the fracture with the intramedullary nails. The other drawback of this procedure is that we may damage the intraarticular structures of the knee joint and there is always disadvantage of opening a knee joint.

Distal femur IA Fractures-

These are the most difficult fracture around the knee. They are usually associated with vascular injury. These fracture should be evaluated thoroughly. open reduction and internal fixation with locking plates is the treatment of choice. Single or double column fixation is done according to the fracture personality. Post operatively, vascular status of the limb and development of Deep vein thrombosis is important and should be evaluated thoroughly.



Fig. 17.5 - GIIIB distal femur fracture fixed with locking plate with good outcome at 2 years.

Stiffness and range of motion may be the problem. Early ROM and rehabilitation is important.

Patella fractures-

TBW is the gold standard

Tibial plateau fractures

Evaluate and treat this tibial plateau fractures like the distal femur fracture. We should protect peroneal nerves. Articular surface alignment is most important.



Fig. 17.6 - Tibial plateau fracture fixed with locking plate with good outcome at 18 months.

Tibial spines-

Treatment is controversial- Either to continue conservative treatment or go for surgery. In case of surgical group it is again a controversy in either to go for open or arthroscopic fixation of the tibial spine.

Discussion on Knee injury

There are two school of thoughts in case of knee injury. Trauma surgeon focus on bony structures and their injury pattern and fix the bony structures anatomically, where as arthroscopic surgeons focus on soft tissue disbalance.

Investigation in knee injury

It is still controversy in investigating a knee injury. We all agree in doing a series of xrays of the knee. Then for further investigation, either CT or MRI is a big question. Trauma surgeons go for CT evaluation and plan the treatment accordingly. Then what about the role of MRI knee in case of knee injury? There are school of thought that MRI should be done in selected cases of knee injury and ligament injury should be addressed simultaneously along with the bony injury.

These methods of 'bone only' or 'bone and ligaments together' modality of treatment are still in a discussion phase and there are no long term established results of 'bone and ligament together'.

To simplify, both the structures are equally important. Basic rule is just to align the bony injury first, then address the soft tissue then after. This may be done in the same setting or next setting or addressed late after the bony union. The recent trend of arthroscopic surgeon is to address the both problems simultaneously. The feasibility of this technique depends on the experience and personality of the fractures.



Fig. 17.7 - Minimal invasive plate Osteosynthesis (MIPO) is a good modality of long bone fracture fixation.

Proximal third Tibia fractures-

There are two pattern of fractures in proximal tibia which are surgically important. In the notorious type, there is anterior angulation of the proximal fragment after intramedullary interlocking nail. This fractures usually heals but radiograph seems unacceptable, The better option is miniplating of the fracture and the nail insertion which is easy and gives an excellent result.

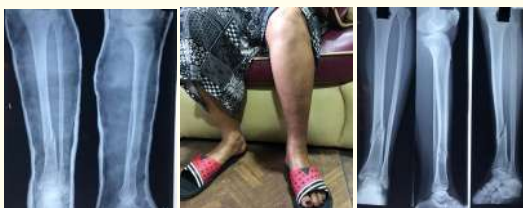


Fig. 17.8 - Shaft of tibia fracture can still be treated conservatively with good outcome.

Shaft of tibia fractures-

Intramedullary interlocking nail

Distal third tibia fractures

Intramedullary interlocking nail or locking plates are the best treatment. Locking plates are the better option for the intraarticular fractures involving medial malleolus or posterior malleolus fracture.

Malleous Fracture

TBW, Screws, or recon or semitubular plates., syndesmotic screws

Talus fracture

It is the fracture of necessity, Closed reduction and screws fixation is done early to minimize the risk of AVN of talus.

Calcaneal fractures-

Closed reduction, screws fixation

Open reduction and internal fixation with calcaneal plates is another option in case of calcaneal fractures. This procedure is demanding and this is a more invasive surgery with more chances of wound infection and wound gap which is another challenging complication.

Complication of calcaneal fractures are the long term swelling of the foot, inability to fit the same size shoes in both the feet and residual pain may persist for a long time.

We should counsel about arthrodesis and residual disability.

Lisfranc injury- Anatomical reduction and fixation with screws, or k-wires should be done.

Base of 5th Metatarsals fracture-

In undisplaced and minimally displaced fractures short term immobilization and weight bearing as tolerated with analgesics is advice.

Metatarsals and phalanges fracture

Unlike hand they have less importance and most of the time can be treated conservatively. Short term immobilization around 2-3 weeks and then weight bearing as tolerated . We should not bother about the swelling and residual pain. As in hand injuries, long term immobilization and non weight bearing leads to osteopenia, sudek osteodystrophy and reflexly more disability. Up and above early in the cost of tolerated pain with early return to the preinjury status should be the aim of treatment.



18

PAEDIATRIC TRAUMA

Paediatric Orthopaedics

A child is not just a small human. Their anatomy, physiology and pathology differs from an adult body. So there are certain differences from the adults.

- 1) Anatomy and physiology of bone is different since there are growth plates and physical injury is different
- 2) Potentiality to remodel is more in children
- 3) Minimal or no intervention is sometimes sufficient in children as compared to adults fracture
- 4) Pattern of injury and fracture is different in children and mode of treatment is also different in children.
- 5) There is wide acceptance range in treatment of fracture in children.
- 6) The surgery is less invasive as compared to adults.
- 7) Pinning over plating or nailing & k-wire, rush pin or TENS nail are commonly used in paediatric fracture.

Our Statistics (2011-2021)

Total OPD Cases	67588
Total Emergency Cases	7799
Total operations	11,484
Total Paediatric Operations	2486 (21.64%)
Male Paediatric Operations	1959 (78.8%)
Female Paediatric Operations	527
Total Operation for Fractures in Children	1621 (65.20%)



Fig. 18.1 - X-Rays show there is high remodeling capacity in children.

There is changing pattern of paediatric fractures management. Previously external fixators for open fractures and plaster cast for closed fractures were the mainstay of paediatric fracture treatment. We use rush nails/pins instead of TENS which are cheaper, easy to insert, which has less entry point irritation and easy to remove. These procedure overcome the difficulties of frequent hospital visits, reduces the chances of re-manipulations and increases parents satisfaction.

Plaster casts are applied in cases of plastic deformation, torus fractures, undisplaced and anatomically aligned fractures.

Paediatric orthopaedics is another crucial and challenging field of Orthopaedics. Most of the complications and morbidities that persist during adulthood is the sequelae of treatment done during childhood. Our major part of treatment also comprises of treatment of paediatric injury. Most of the children are brought to the hospital late and some of

them are illmanaged at the periphery due to which many preventable complications occur. We are preventing such complications by providing prompt treatment.

Use smooth pins since it is a growing bone and threaded pins may obstruct the growth and shortening or deformity.



Fig. 18.2 - X-Rays show multiple fracture and both bone forearm fracture treated with intramedullary rush pin.



Fig. 18.3 - Picture shows open forearm fracture treated with rush pin.

Difference in treatment (Salient Features) as compare to other factors.

- 1) All clavicles are treated conservatively, no support at all unless pain. Counselling is very important. Clavicular braces and other support are more unfriendly to the children.
- 2) AC joint and Scapular fractures are treated conservatively.
- 3) Proximal humerus fractures, - Undisplaced and minimally displaced – conservatively just immobilization in a sling, displaced CR or OR and k wires fixation
- 4) Shaft of humerus and D3 shaft of humerus fracture – Conservative. In demanding patients Retrograde rush nails or TENS.
- 5) SC fractures- closed reduction and pinning.
- 6) Lateral condyle fractures- diagnosis is important in elbow. It confuse with supracondylar, lateral condyle or physical separation, and elbow dislocation. Whenever there is dielema go for thorough clinical and radiological evaluation, if facilities available USG, Xray, CT or even MRI to diagnose the fracture . This make a huge difference in management and outcome of the elbow injury. Mal union , nonunion and delayed deformity are serious complications which may persist throughout the life. We still see a lot of late presentations , with complications and with gunstock deformity and cubitus valgus in lateral

condyle nonunion in cases usually the patients from rural areas. And with incomplete or non or traditional treatment at the outset primarily.

- 7) Monteggia fractures with late complications of missed or neglected radial head dislocation is another challenging complication. There are various treatment modalities with massive invasive surgery, but still may be with residual disability.
- 8) Both bone fractures most of the time are treated with CR + LAC. In elder children and with demanding parents nowadays, CR or OR and rush pinning or TENS are done. We still prefer rush nails, since they are cheap, with beveled ends and less skin irritation.
- 9) Distal radius fractures- CR plus cast sometimes, CR and k wires fixation. Maximum remodeling potentiality.
- 10) Hand injuries, -- less aggressive than in adults.
- 11) Pelvis – Conservative in Stable patients.
- 12) In unstable patients, and unstable pelvis, External fixator
- 13) Acetabulum fractures, displaced fractures requires open reduction and internal fixation and conservative in undisplaced fractures. We have no experience with this fractures.
- 14) Humeral head and Neck Fracture- OR or CR and Fixation. Through counselling about nonunion, AVN and other procedures later on should be done
- 15) IT – DHS, DCS, Screws

- 16) ST #s- Plates or Antigrade nails from the greater trochanter.
- 17) SOF fractures,- Retrograde Rush nails or TENS or Plating, EF in GIIIB and above open injuries.
- 18) Distal femur #, Screws or plates or k-wires
- 19) Proximal tibia- same as distal femur
- 20) Shaft of tibia fractures- closed reduction casts, or Antigrade Rush nails or tens, sometimes plating and ex fix in severe open injury.
- 21) Ankle injury- Screws and smooth k wires.
- 22) Talus and Calcaneal fractures- Screws or k wires
- 23) Foot Injury- Conservative
- 24) Spine fractures- lean towards more conservative treatment



Fig. 18.4 - Picture shows management of shaft of femur fracture in children with rush pin.

We have presented a paper in Global Ortho Congress 2017 and our abstract has been published online. The abstract is as follows.

Management of unstable pediatric long bones fracture with intramedullary rush pins

Authors:

Pramod Lamichhane

Anil Bhattarai

Abstract

There are different ways of management of long bones fractures and the most common is conservative with closed reduction and plaster. With the advancing technology, operative management is increasing in certain cases. The common methods of operative management are fixation with pin and plaster, k-wires, rush pins, kuntscher nails and plating. We treated 131 long bones fractures with intramedullary rush pins within 12 hours of injury and immobilized in slab for 1 month from August 2011 to July 2016. There were 62 both bone forearm fractures, 43 shaft of femur fractures and 26 shaft of tibia fractures. There were 25 open fractures and 4 multiple fractures. They were between 3 to 16 years of age. There were 75 males and 52 females. All the fractures united in 6 weeks to 3 months time. There were no infections, no refracture, no deformity and no any other complications with relatively less morbidity. Operative treatment with intramedullary rush pins in pediatric long bones fractures especially in multiple and

open fractures is effective ,safe and with good outcome and less morbidity.

Changing trend of management

- Treat the parents
- Post reduction x rays should be excellent
- Increasing the surgical indications
- Indications for operative Treatment
- Open Fractures
- Multiple injury/Polytrauma
- Unstable fractures

Methods

- | | |
|--|----------------|
| • Total Cases-131 | • SOF # -43 |
| • Time- August 2011-July 2016 (5 years) | • SOT #- 26 |
| • Age- 3 years -16 years | • Open #-25 |
| • Male-75, Female-52 | • Multiple #-4 |
| • BB forearm fractures-62 | |

- Surgery was performed within 12 hours of injury
- Immobilized in slab for 4 weeks to 6 weeks
- Weight bearing and ROM started at 4 weeks to 6 weeks time

Rush pins

- Flexible
- Stainless steel
- Bent on one side and bevelled on other side
- Cheap
- Easy to insert
- Easy removal



Results

- Union -6 weeks- 12 weeks
- No infection,
- No refracture,
- No deformity,
- Less morbidity,
- Less cost
- Cosmetically less scar

We have presented a paper on management of shaft of tibia fractures in children with antigrade flexible rush nails – Our experience at Alive hospital and Trauma Centre in Orthocon, the abstract is as follows:

Abstract

Introduction- Shaft of tibia fractures in children is common and is usually managed conservatively with plaster casts and slabs. Surgery is performed in some cases especially in open fractures and multiple trauma patients. Different modalities of surgery are pin and plaster, external fixators, pinning and plating.

Methods

We treated 21 cases of shaft of tibia fractures in children from August 2011AD to July 2015 AD. There were 13 males and 8 females. They were from 3 years to 14 years of age. 9 cases were open fractures (GII-GIIB), Out of them 2 were multiple trauma with both open shaft of tibia and femur fractures. Immediate definitive surgery was performed between 6

to 12 hours. Weight bearing was allowed at 6 weeks. Implant removal was done after 6 months.

Results

All fractures united in 6 weeks to 3 months time. There was no infection, no revision surgery. All the patients were satisfied. It was relatively cheap with less morbidity.

Conclusion

Management of shaft of tibia fractures in children especially multiple trauma and open fractures by antigrade intramedullary rush nails is a safe and effective method of treatment with good outcome with less morbidity and low cost.

Literature Review

- [J Pediatr Orthop](#). 2012 Dec;32(8):770-6. doi: 10.1097/BPO.0b013e318270468b.
- Immediate intramedullary flexible nailing of open pediatric tibial shaft fractures.
- Pandya NK¹, Edmonds EW.
- Method-
 - 26 tibia fractures, Open # 14, Closed # 12
- Conclusion-
 - Immediate flexible nailing of open pediatric tibial shaft fractures is safe with minimal risk of wound infection.
 - Risk of compartment syndrome in high velocity injury and
 - Risk of systemic complications in head injury patients should be evaluated

Literature Review

- [J Bone Joint Surg Am](#). 2005 Aug;87(8):1761-8.
- Operative treatment of tibial fractures in children: are elastic stable intramedullary nails an improvement over external fixation?
- Kubiak EN¹, Egol KA, Scher D, Wasserman B, Feldman D, Koval KJ.
- Method-3 institutions, 31 patients, 16 IM flexible nails, 15 ex fix
- Result- Union time shorter than ex fix group
- Functional outcome better in IM group than ex fix in terms of pain, happiness, spot and global function
- Conclusion-
 - When surgical stabilization of tibial fractures in children is indicated, we believe that the preferred method of fixation is with elastic stable intramedullary nailing.

Tibia

- Shaft of Tibia fractures in children is

commonly treated conservatively with good outcome.

- Closed , stable , undisplaced, minimally displaced and G1-G11 fractures are treated conservatively

Surgery

- Open Fractures
- Multiple trauma
- Unstable fractures
- Failed closed reduction and casts
- Nonunions

Treatment Options

- Casts with or without window
- Pin and Plasters
- External Fixators
- Traction
- Flexible/IM nails
- Open reduction and internal fixation with plates and screws


Our experience

- Safe and effective method of treatment with
- Less morbidity
- Early range of motion
- More satisfaction
- Relatively cheaper than other modalities of surgery
- Early return to preinjury status

Protocol

- Immediate definitive surgery -6-12 hours
- Weight bearing at 6 week

- Implant removal at 6 months
- Union 6 weeks 3 months
- NO infection
- NO revision surgery
- No nonunion, and malunion
- All patients and parents were satisfied
- Relatively cheap
- Less morbidity



Literature Review

- [Chir. Narządów Ruchu Ortop. Pol.](#) 2009 May-Jun;74(3):139-44.
- [Treatment of the femoral, tibia and humeral shaft fractures in children with the use of intramedullary nailing or external fixation, a long term study]
- [Article in Polish]
- [Kolecki E, Niedzielski KB, Lipczyk Z, Flent P](#)
- Method-
 - 127 patients, 4-18 years old, Ex fix- 81, Enders nail-46
- Conclusion-
 - Surgical treatment is better
 - Results comparable in both the surgical groups
 - Flexible IM nails- minimal invasive, short hospital stay, early rehabilitation

Literature Review

- [J. Trauma](#), 2008 Jul;65(1):109-15. doi: 10.1097/TA.0b013e3181623309.
- Use of elastic stable intramedullary nailing for treating unstable forearm fractures in children.
- [Garg NK, Ballal MS, Malek IA, Webster RA, Bruce CE](#)
- Background-
 - Fractures requiring surgery are-Presence of unacceptable angulation, fracture instability, open injury, failure of conservative management
- Method - 21 patients, mean age 11.8
- Result- union in 13 weeks, no infection, no non union
- Conclusion-Better than plates and ex fix- minimal invasive technique, less time consuming, easier removal, better cosmesis

Conclusion

- Shaft of tibia fracture is common in children
- Open fractures, multiple trauma, unstable fractures require surgery
- Flexible intramedullary antigrade rush nails is safe and effective treatment

We have presented a free paper on "Results of Annular Ligament Reconstruction in Neglected Radial Head Dislocation in Children" in Orthocon-2022, the abstract is as follows.

*Dr Santosh Kamar, Dr Anil Bhattarai, Dr Pramod Lamichhane
Alive Hospital and Trauma Centre, Bharatpur, Chitwan*

Abstract

Neglected radial head dislocation in children is a challenging problem to treat. There are several procedures for relocation, like closed reduction and long arm casts, annular ligament reconstruction, relocation of radial head and fixation with k wires, radial head replacement and sometimes excision of radial head. None of them are definitive procedures and have varying outcome. We treated six cases of neglected radial head dislocation by annular ligament reconstruction using either triceps fascia or extensor carpi longus fascia and temporary fixation of humerus to radius was done by k wires in relocated position of the radial head and applied long arm slab for four weeks which were missed at the time of injury. There were three boys and three girls, they were five to twelve years old, one right and five left elbows involvement. In long term follow up results are good in terms of range of motion, pain and deformity. Annular ligament reconstruction using triceps fascia/ extensor carpi radialis fascia is a good option with excellent results in case of neglected

radial head dislocation in children.

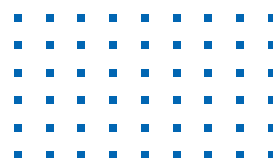


Fig. 18.5 - Picture shows longterm result of child with annular legament reconstruction in neglected radial head dislocation.



19

PHYSICAL DISABILITIES



Physical disability is a neglected part of orthopaedics and only few centres are doing surgeries for physically disabled people. There is a great burden by physical disability in Nepal, due to late treatment and complication of trauma.



Fig. 19.1 - Picture shows different types of physical disabilities in Nepal.

Hospital and rehabilitation centre for disabled children (HRDC), Banepa is constantly rehabilitating children 16 years and under for the last 35 years. Most of us surgeons are less exposed to such diseases and have less experience. We frequently do club foot treatment like ponseti treatment and surgery for cubitus varus deformity.

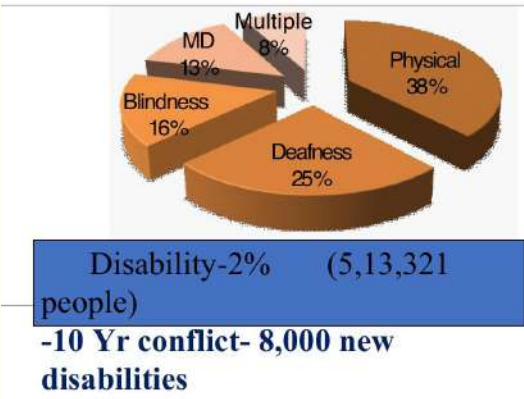


Fig. 19.2 - Chart shows burden of disabilities in Nepal.

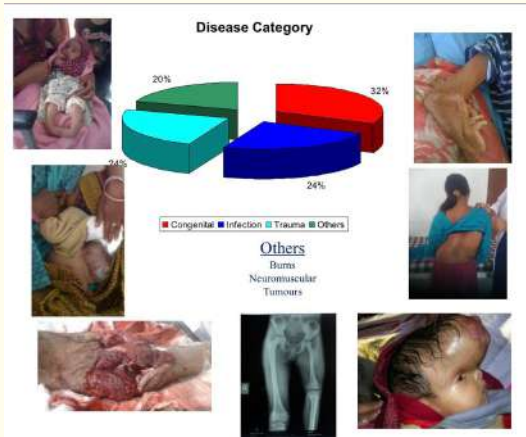


Fig. 19.3 - Picture shows different types of disease category of physical disability.

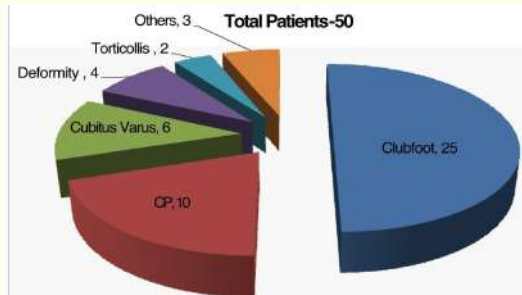


Fig. 19.4- Picture shows causes of burden of disabilities in Nepal.

We have also presented two papers in ORTHOCON regarding physical disabilities.

Physical Disabilities Rehabilitation & Challenges, orthocon-2013

Dr. Pramod Lamichhane



Abstract

Introduction

Physical disabilities is a neglected part of cold orthopaedics which accounts for around 38 % of total disability (2 % of total population of Nepal). Rehabilitation of such people is very difficult due to lack of expertise and geographical condition of the country, lack of awareness, motivation and low socioeconomic status of the patient.

Materials and Methods

From July 2011 to December 2012, we performed 50 surgeries for physically disabled people of age 2 months to 61 years at Alive Hospital and Trauma Centre . Among these there were 6 cubitus varus, 25 club feet, 10 cerebral palsy, 2 torticollis, 4 deformity correction and 3 others.

Results

Overall results were good in terms of patient satisfaction, correction of deformity and recurrence of deformity. There was one low grade infection, no recurrence of deformity and the patients were satisfied.

Conclusion

Rehabilitation of physically disabled people is a challenging job since it requires a lot of experience, good team, good set up, motivation of the patient and the patient party, proper rehabilitation and follow up protocol including the treatment process which is very expensive and lengthy.

Key Words- Physical Disabilities, Rehabilitation, Challenges

Level of evidence-Level III (Prospective Study)



Fig. 19.5 - Picture shows case of recurrent patellar dislocation with patellar realignment surgery.

Abstract

Dome Osteotomy for correction of Cubitus Varus Deformity orthocon 2014

Introduction-

Cubitus varus deformity occurs secondary to supracondylar humerus fracture malunion. The main indication for surgery is for cosmetic purpose. Out of various methods of correction of cubitus varus deformity, dome osteotomy has a good outcome in terms of correction of deformity, cosmesis and stability.

Methods-

From June 2012 AD to September 2013 AD, we treated 13 cases of cubitus varus in children between 8 to 16 years of age. There were 8 female and 5 male children with 8 left and 5 right elbow involvement. They were immobilized in long arm posterior slab for six weeks. Follow up period was between 6 months to 15 months.

Results-

Out of 13 cases, 12 cases had good outcome in terms of correction of deformity and cosmesis. Range of motion of the elbow was full and there was no infection and no pain. There was one recurrence due to unstable fixation.

Conclusion-

Dome osteotomy for correction of cubitus varus deformity is a safe and effective procedure with good outcome.



Fig. 19.6 - Picture shows cubitus varus deformity treated with dome osteotomy.

Our Statistics

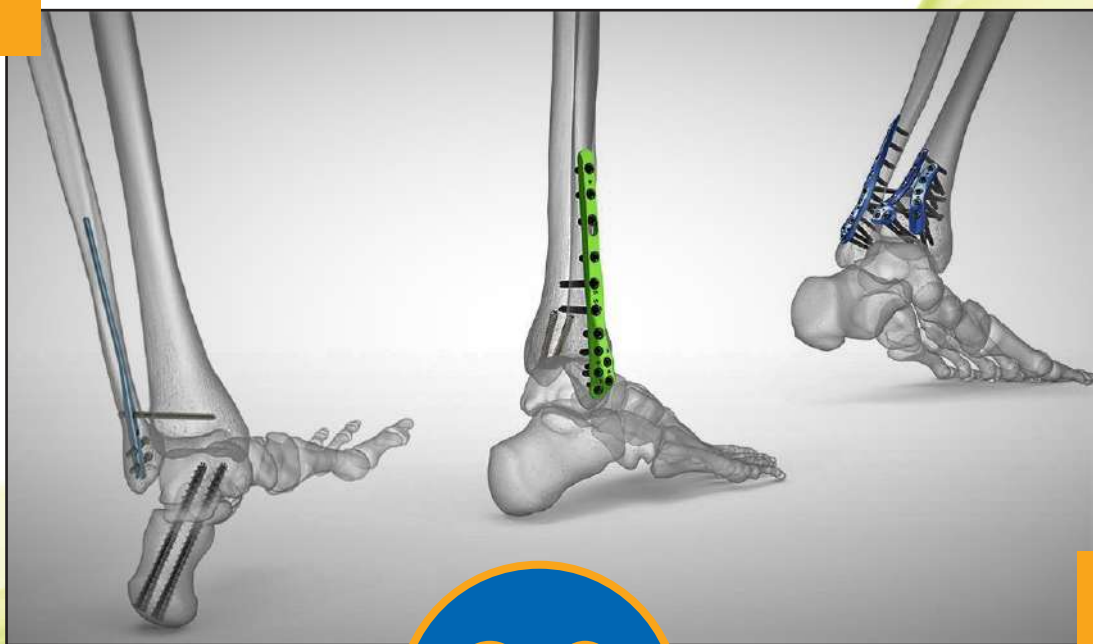
From 2011 to 2016 we screened 1200 disabled patient in the mobile camp. We rehabilitated 220 patients out of them we performed surgery for 179 cases. There were 105 children with 109 clubfeet.



Fig. 19.7 - Picture shows child with club foot treated with serial ponseti cast.

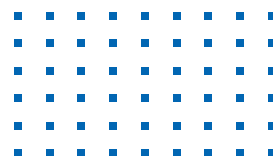


Fig. 19.8 - Picture shows post traumatic physical disability managed with reosteoclasis and fixation with DCP.



20

IMPLANTS



Implants

There are two types of implants commonly in use. Stainless steel and titanium alloys. Stainless steel implants are 316L steel and are cheaper than titanium implants. Stainless steel was widely used all over the world previously but now titanium implants have become popular. We still prefer stainless steel, except in certain conditions like allergy to steel, or severe infection where stainless steel cannot be inserted, since they are cheaper and stronger than the titanium implants. The difference between these implants are shown in the table below.

Properties	Stainless Steel	Titanium
Weight	Heavy	Light
Strength	Strong	Weaker
Ductility	Less ductile	Ductile
Corrosion	More corrosive	Corrosion resistant
MRI	Not compatible	Compatible
Allergic reaction	More	Less
Removal of Implant	Usually required	Usually not required
Cost	Cheaper	Costlier

In Nepal two types of implants are in use namely titanium and stainless steel. The pros and cons of the implants are already discussed in the earlier chapter. Most of the centres and hospital use stainless steel implants of different Indian companies. Only few centres use titanium implants. In spine most of the centres use titanium implants. Titanium implants are far more costlier than the stainless steel implants. We will highlight some of the commonly used implants in Nepal.

External Fixators

1) Ilizarov Ring fixation

This is a demanding implant, ie difficult to use but can be used in most of the cases in which we cannot go for internal fixation. It requires expertise and surgery time increases and also it is heavier to carry on by the patients. Some surgeons even apply ilizarov in cases of closed

fractures too. We usually just reserve the ilizarov ring fixation option for cases like limb length lengthening, deformity correction, open fractures and the joint sparing when AO fixator is not feasible. It is not that patient friendly and repeated pin tract infection is another disadvantage of this method which requires regular dressing and even removal of the ring if the infection is fulminant.



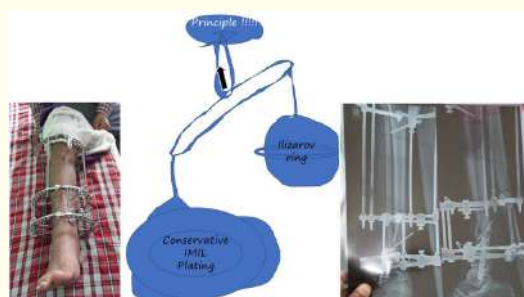
Fig. 20.1 - Picture shows limb length lengthening and deformity correction with the use of ilizarov ring.



Fig. 20.2 - Picture shows open tibia fracture with segmental bone loss managed with ilizarov ring and bone transport.

2) AO external Fixator

AO tubular external fixators are surgeon friendly and they are easy to use. They are also called the rescue implants since they are used in multiple purposes and are the implant of choice when other modalities of fixation fails. They can be used for temporary stabilization or can be continued as definitive method of treatment. They are not so stable as the ilizarov ring fixation but are easy to use, takes relatively less time to apply and they are more patient friendly as compared to ilizarov ring. They are even cheaper than the ilizarov external fixator. They are of great help in case of polytrauma , multiple trauma and unstable patients which require quick surgery with less interventions.



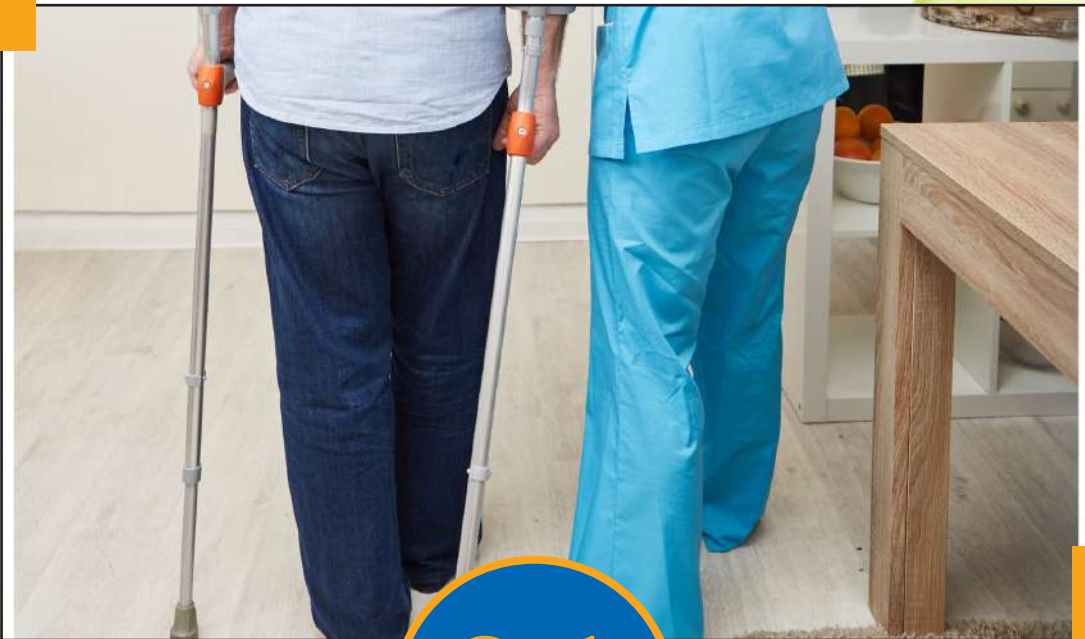
Internal fixation

There are various implants that are used for internal fixation. K wires, rush nails, TENS, Kuntscher nail are more common and easy to apply implants. When everything fails, we can come out with the help of these implants. So we should keep in mind that these basic implants are readily available in the operation theater all the times. For example if we fail with intramedullary interlocking nail in case of shaft of femur fracture, either kuncher nail or plating are the better options.

Intramedullary interlocking nail of different varieties are available both of titanium and stainless steel. They are of different sizes in length and diameter.

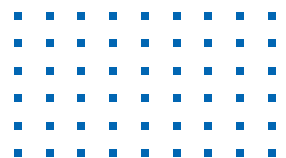
There are many types of plating system commonly in use. Reconstruction plates, dynamic compression plates and locking plates are common plating systems. They may have different names and shapes according to their different use in different places like olecranon plate, proximal humerus plate etc.





21

**ARBITRARY TERM & TIME
FOR FRACTURE UNION**



Every individual has a different physiology and healing potentiality. It depends on different factors. Normally, in case of long bone fractures, if there is no progressive signs of union till six months, then it is called delayed union and if there is no union till nine months, then it is called nonunion. This is not applicable in children who have high healing potentiality. It may take longer time in open fractures and elderly patients. So we should not be rigid in these deadlines and use our experience and own judgment in deciding the nonunion or delayed union. This is very hard to decide and debate may arise and sometimes patients create disputes due to varying opinions. We should be able to show examples and evidences that the process of the treatment is correct. But sometimes there are dreaded complications and clear signs of nonunion, like fulminant infection, gap nonunion or atrophic bone ends then we have to go for another modality of treatment. Like change of implant or bone grafting.



Fig. 21.1 - Picture shows proximal third femur fracture with radiological features of delayed union. Union occurred without intervention in three years time.

Callus formation and x ray are not only the tools of diagnosis, clinical improvement of the patient and the limb are also important parameters in the diagnosis of fracture healing. If there is no pain and limb function is improving then delayed union can be observed which most of the times unite on long duration. The only thing is we should counsel the patient thoroughly.

Early mobilization of the limb and protected weight bearing is very crucial with vigilance. This helps in early recovery of the patient, increases satisfaction and overall healing of the fracture. Again it is better to do nothing than to do more harm.



Fig. 21.2 - Case of tibia fracture managed with intramedullary interlocking nail. Delayed union at four years without intervention.

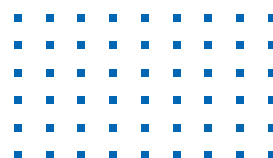
Conclusion

In our case series, we have seen that the arbitrary term of six months for delayed union & nine months for nonunion for long bones fractures from the time of fracture treatment requires more justification. The time for fracture healing is different in different patients and it should be individualized to the patients.



AO TRAUMA FELLOWSHIP

Similarities and differences in treatment of trauma patients between western world and our setup



AO Trauma Fellowship
Erasmus Medical Center, Erasmus University
Rotterdam, the Netherlands
16th May - 24th June 2022
Dr. Pramod Lamichhane
Orthopaedic Surgeon, AO trauma Fellow
Nepal
Email- drpramod131@gmail.com

Disclaimer

All available content on this report is only for information purposes. I am not biased and have no other interest to any parties or organizations. This report is just to share the experiences and not for any business purpose. Photographs are taken with the permission of the Trauma Surgery Department without revealing the patients' identity.

Acknowledgement

I would like to express my special thanks of gratitude to the AO foundation, AO Trauma Surgery and AO Alliance for providing me this prestigious short-term AO Trauma Fellowship in Erasmus Medical Center under Erasmus University, in Rotterdam. I am also very thankful to Erasmus Medical Center, Trauma Surgery Department, Emergency Department and Operation Theater Department and Sophia Childrens Hospital for giving me the opportunity to go through my fellowship and guiding me and giving opportunity to learn the art of trauma surgery. I thank Prof Dr. M.H.Verhofstad, chief of trauma surgery, Dr Mathew Wijffels, academic coordinator, who invited and

guided me to get through to the Erasmus Medical Center for the fellowship. Special thanks goes to Dr D. Den Hartog, Dr T. Hagenaars, Dr. P.P. De. Rooij, Dr. O.J.E. Van Waes, Dr. M.G. Van Vledder, Dr. Timo Haak and Dr. Lucas Timmermans for their hands-on teaching, and training to deliver the art of trauma surgery. I also thank the residents and medical students of the hospital for constantly helping with the languages, logistics and guidance during my stay at Rotterdam.

Introduction

AO Trauma

AO Trauma is the largest global group of orthopaedic and trauma surgeons, researchers and ORP striving for excellence and voluntary for a common goal. AO trauma provides several fellowships to the surgeons and orthopaedic surgeons all around the world every year. To receive this short term AO Trauma Fellowship in Erasmus Medical Center, Level I trauma center is an honor and means a lot to me and the Nepalese patients.

Erasmus Medical Center

Erasmus Medical center is one of the largest and best Trauma Center in Europe and ranks 23rd in the world as a best hospital (source – Google). It's a tertiary level I trauma center located at Rotterdam, Netherlands under Erasmus University. It has 1233 inpatient beds, 121 ICU beds, 14.000 employees and generates a revenue of about 2.1 Billions. This hospital under



Fig. AO_1 - A1 History -Place where previously hospital was located, memorable gate in Lijnbaan, City center; A2 Current location and Hospital Complex

Erasmus Medical University is providing different levels of medical education including AO trauma fellowship for the orthopaedic surgeons and trauma surgeons from around the world every year. This hospital was established in 1840 and previously it was located in Coolsingelziekenhuis. Currently it is located in Dijkzigtziekenhuis, Rotterdam. It is the university hospital of Erasmus Medical Center and there are several medical academic activities are going on in EMC every year.

Discussion

During this six weeks period of AO trauma fellowship in EMC, I spent around 260 hours in the hospital, busy in seeing and assisting the surgeries in operation theater, observing the traumatic patients' managing traumatic patients in emergency department, participating in clinical meetings, grand rounds and ward rounds. I had an opportunity to assist in lots of surgeries and observe lots of trauma surgeries in the operation theater. Although the pattern of fracture and AO principles of management of fractures are the same all over the world, the way of holistic approach and management of trauma patients, the volume and the strategy of management of complicated cases, nonunion, infection and multiple trauma patients was highly qualified here in Erasmus Medical Center. Most of the common trauma cases were the same but there were certain cases which were managed differently. I could master my hands and mind in management

of trauma patients during my fellowship in all kinds and varieties of trauma cases. The knowledge that I have gained within these six weeks will be very beneficial to our patients in Nepal after I return back to Nepal. I can implement the new techniques and methods of fracture management. I am benefited a lot from the AO trauma fellowship and hope this will continue to our young surgeons from Nepal for the sake of Nepalese people. Now I would like to explain the things that I have learnt and could share my experience during my AO trauma fellowship.

1) Insurance of the Patients

All most all the patients and citizens have health insurance in Netherlands and they have no issue of cost of treatment and every patient can go for the best treatment available which helps patients to return to their preinjury status as early as possible with less morbidity and mortality. In Nepal very few people have health insurance and others have to pay by themselves for the treatment and sometimes have to modify the mode of treatment because of economy of the patients.

2) Patient Registry

Erasmus Medical Center has a very secure and precise paperless patient registry. The IT department is so advanced that the entry system is very extensive and simple. Even the clinical meetings and discussions can be done from any corners of the hospital online which is very easy for all to attend without any trouble and loss of time. In Nepal we have

very poor patient registry system in papers and patients have to carry their records with them and sometimes the records are misplaced.

3) Research and publications

Every work is recorded, evaluated and researched. Hospital has a big team for the research purpose and which is very essential for the betterment of the hospital and the patients. This part is highly lacking in Nepal.

4) Prehospital Care

Prehospital care and management of patients is so organized that the medical and transport team reach at the accident site immediately, do the needful to save the patient and bring the patient to the hospital in a secured mode. They inform the emergency department about the type of injury and the emergency team prepare accordingly.

5) Emergency Department

The infrastructure of EMC is one of the best for the emergency trauma management. The management team is dedicated, with a team leader with members involvement from all the departments. Quick laboratory tests, x-ray and CT scan is available in the emergency room itself. Everything is done in a quick succession and they make the management plan in a group and implement it immediately. I think this is very important since we can save more lives and prevent a lot of morbidities like amputations.



Fig. AO_2 - B, Emergency Room and Management of Trauma Patient

6) The Trauma Team

I found the Trauma team is different in the Netherlands than that in Nepal. In Nepal we have orthopaedics and general surgeons who usually take care of trauma patients. In the Netherlands there are separate trauma surgeons rather than orthopaedic surgeons who take care of trauma patients. The hospital has a big dedicated trauma team. Every surgeon is specialized in different field like pelvis and acetabulum, knee, upper limb, lower limb, reconstruction, rehabilitation and so on, so that not a single case is left unturned. Every case is discussed in the clinical meeting about what was done today and what is planned or booked for tomorrow and for the whole week. There is a group decision which ultimately leads to less chance of loopholes in the management of trauma cases.



Fig. AO_3 - C1,C2- Clinical Meetings/ Discussion/ Grand Rounds

7) The Operation Theater

The operation theater has 26 operating rooms and the Sophia Childrens Hospital has 10 operating rooms. All the operation rooms are modular and very advanced. A lot of surgeries including cardiac surgery, liver and kidney transplantation go on simultaneously along with trauma surgery. The techniques and surgeries that I learnt new during my AO trauma fellowship here in the Netherlands certainly would make a huge difference to our patients care in Nepal.



Fig. AO_4 - D1,D2- Modern Operation Room

8) Osteointegration

Rehabilitation of the lower limb amputee with osteointegration and prosthesis was highly demanding and totally new for us. We used to provide custom made prosthesis to our patients which is troublesome and unfriendly to the patients and they seldom use these prostheses. Sometimes they have pressure sores and other infections. With this osteointegration process that I learnt here during fellowship, patients could almost return to their preinjury status with near normal activities of daily living which is very important. Overall treatment cost is expensive but we could adopt this to our patients in Nepal if we can insure all the patients and citizens.



Fig. AO_5 - E1- During operation, E2- X-ray after Implantation, E3- Clinical picture after surgery, E4- Template of Osteointegration and rehabilitation.

9) Precise Nailing

This is another new advance in the management of short and mal-aligned leg with less morbidity to the patient. The precise nail with the magnet inside could lengthen about 1 mm length per day. This is also a recent advance that I learnt to perform surgery and will be very beneficial to our patients in Nepal if we can somehow reduce the cost of the nail.

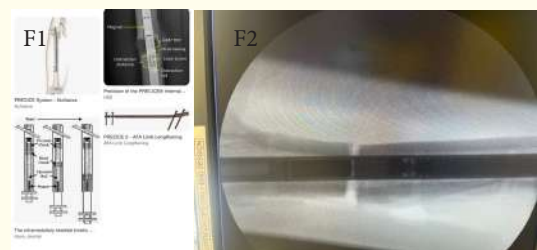


Fig. AO_6 - F1,F2- Precise nailing template and post operative X Ray

10) Pelvis and Acetabular Surgery

I could learn 'the hands on Pelvic and acetabular fixation, SI joint fixation and fusion'. Now I can deliver such services in our country which was very important for me and for my patients in Nepal.



Fig. AO_7 - G1,G2,G3- NO-Pelvis and Acetabular surgery x-rays and ,P-Post operative x-rays

11) Rib Surgery

Patients with multiple ribs fracture and flail chest benefit a lot from rib fixation which is not started yet in Nepal. Now we can perform this in Nepal for our patients and decrease the morbidity and mortality.

12) Plating

We used to treat metacarpal and metatarsal fractures with k-wires and calcaneal fractures with cannulated cancellous screws under fluoroscopic guidance. open reduction and internal fixation and plating of these fractures is also new for us and we can rehabilitate the patients early with good results.

IM reaming of the femur and harvesting a huge amount of bone graft to fill large bony defects is another technique that is very crucial and new for us. We can perform this technique in our country now onwards since more and more patients with nonunion and bone gaps are increasing.



Fig. AO_8 - H1,H2,H3,H4- X-ray during surgery of tibia plateau #, I3- Clinical picture during operation, I4- IM reaming and harvesting of Bone graft from Femur

13) Management of Infection

Soft tissue infection after surgery in fractures and osteomyelitis of bone are very notorious complications in trauma. Management was very aggressive in Erasmus Medical Center with fairly good results as compared to our part of the world. For superficial and soft tissue infection, several debridement and IV antibiotics and coverage of the wound is done later on by secondary closure, skin grafting and flap usually by the plastic surgeons. In case of osteomyelitis, excision of the entire unhealthy-looking bone and use of antibiotics impregnated bone cement as spacer is done until the infection is controlled. Definitive fixation of the fracture is done later on using bone grafting. We use very less bone cement in our part.



Fig. AO_9 - I1,I2,I3- Clinical pictures and x-ray of patient with complicated distal tibia fracture

14) Use of Antibiotics

Antibiotics are used very rarely after surgery that also after proper culture and investigations. Long term antibiotics are used for established infections. We use antibiotics quite often regularly for 2 weeks postoperatively.

15) Implants

Most of the plates, rods and screws are titanium from reputed companies. Operating instruments were so fine that surgeons could perform the surgery so comfortably with less complications. We most of the times use stainless steel implants from Indian Companies.

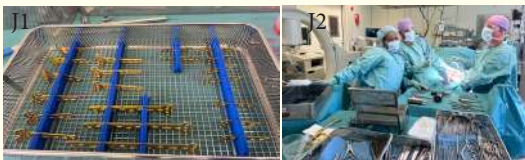


Fig. AO_10 - J1,J2- Titanium Implants and Fine Instruments

16) Paediatric Fracture Management

There is a Sophia paediatric hospital attached to the main building of EMC. I could even see and assist in paediatric fracture management in the childrens' hospital. Trauma in children are given high priority and they have made the hospital as child friendly. It was like entering into some art gallery or school and it

was so attractive to children. National players and figures usually used to visit the children hospital to motivate the admitted children with chronic diseases. Children do not feel like they are away from home and school and this is very important for the psychological treatment of the children.



Fig. AO_11 - K1- Sophia Hospital Operating Room, K2- Clinical picture of operation

17) Complications

I could see and assist in lots of nonunion including distal humerus and olecranon fractures. So we could learn the art of managing several such difficult cases. Since it is a tertiary referral center and level I trauma center, they receive a lot of complications from around the country.



Fig. AO_12 - L1,L2,L3,L4- Management of Complicated case, infections and deformities

It was strange for me that, after performing the complicated surgery, patients were referred to the previous hospital to perform the remaining minor and intermediate surgeries. In our countries we do all the surgeries required in the same hospital possibly under the same anaesthesia, which we feel is good to the patients. The concept of trauma surgery and surgeon, is different than from other countries. This was a good system of managing trauma patients in the Netherlands. In our place we used to manage open fractures within 6 hours of injury by definitive internal fixation and primary closure of the wound whenever patients were fit for surgery from the anaesthesia side. We also operate in acute fracture cases with huge swelling within 6-12 hours of injury thinking that in most of the times, the soft tissue stretching is due to increase in volume of bone and joint due to injury. Once we reposition the fracture and dislocation acutely, then these complications can be minimized. We think that early return of the patient to the pre injury status with less cost and less morbidity is very crucial for the patients.



Fig. AO_13 - AM1,M2,M3,M4,M5,M6- Department of Trauma Surgery, Different activities and Farewell Parties.

Conclusion

Erasmus Medical Center is a good academic hospital and I could learn the art of trauma surgery and lots of things regarding management of trauma patients and master my mind and hands during this 6 weeks period of AO Trauma Fellowship here in the Netherlands and hope to apply my gained experience in managing my trauma patients in Nepal.

RESEARCH AND PUBLICATIONS CONTROVERSIES AND OUR OPINION

There are always two types of opinion for and against an issue. Both types of for and against opinion should be considered positively for the betterment.

Nowdays, rules and laws are becoming more precise and strict for publications for writing a paper or for publications. In the past decade it was very easy to publish an article but there were very few articles published at that time from Nepal.

There was hardly any barriers for publications. Nowdays, We should get an ethical board IRB or ERB approval for all types of research papers and articles. Even for the new innovations and techniques that we are applying or practicing, we have to show the evidence or similar articles or we have to quote them. In one sense it is good since this system check and balance the unethical doings and practices and also discourages the things which harms the patients especially in case of interventions.

Otherwise they may be obstacle to the innovations. For example, just to publish a paper in implant removal, which ultimately has to be done mentioning we treated this number of cases, with this no of males and females with this no of complications and re-fractures and with this difficulties, I think to

take a ethical board approval, may be just an obstacle to publications. Since there is no any harm to the patient.

In my opinion, the better way should be that NHRC should go through all the research articles, and scrutinize them and if there is no issues of ethical or patient safety, they should provide the permission of publication instead of too much obstacles and lengthy administrative process before the research in cases of retrospective articles.

Most of the developed countries have their own treatment protocols. They formulate their own principles and we follow them. To formulate a new protocol or principle, there is no similar articles or publications. I will just give an example, that in case of proximal humerus fractures, K wires fixation was practiced at one time and there were papers regarding its protocol and guidelines, surgeons followed those methods but with time treatment modalities changed and nowdays open reduction and internal fixation with locking plates is more sensible treatment modalities and the papers are published in favour of it.

Now analyzing retrospectively, were we doing justice to the patients treated with K wires, and were they really ethical to publish! So the

principle of treatment is changing with time and there is no any gold standard treatment for any fractures or injury. Once thought gold standard procedure becomes absolute with time and is replaced by another procedure. Just like posteromedial release replaced by ponseti methods of treatment in case of management of clubfoot management. Once PTB graft was very popular for ACL reconstruction, nowadays hamstring graft is common and surgeons are shifting towards peroneous graft. There is also a shift in treatment of fractures from simple method of pin fixation to more invasive fixation system. There arise two issues.

First to treat a problem, we are somewhat scarifying another part. The second is we should owe the benefit and demerits of scarifying another part. So before going for any modality of treatment we should consider every aspect of the management.