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MANAGEMENT OF COMPOUND, EXTRA- ARTICULAR FRACTURES OF UPPER THIRD TIBIA BY EXTERNAL FIXATOR AS FINAL TREATMENT MODALITY

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Abstract:

Background : Tibia is subcutaneous on antero-medial surface and because of high velocity, road traffic accidents, compound tibial fractures are commonly seen in clinical practice. Generally they have significant soft tissue injury and comminution of fracture. Fracture upper third tibial fixation is an extended indication for nailing. When the fracture is compound and there is comminution in upper third Tibia, nailing or plating both are not ideal implant of choice. Plating is contraindicated in compound fractures and Expert Tibia nail has two problems in compound fractures, in U/3 tibia - a) High risk of infection b) Technically demanding nailing as there are high chances of Varus and recurvatum deformity. With above mentioned scenario we had conducted a study with fixation of these fractures with Biplanar external fixator as final modality treatment at our institute.

Materials and Methods: Prospective study conducted between June 2008 to June 2015 at Govt Medical College, Latur, Maharashtra. with Average follow up time period 12 -14 months. 35 patients, analysed after classified according to GUSTILO AND ANDERSONS for open fractures. There were type I - 10 cases, type II-11 cases, type IIIA--08 cases, type IIIB 6 cases

Discussion : External fixator gives static fixation. Generally, bone dies 1 or 2 millimeter back from fracture fragment ends, which may cause gap at fracture site. Static fixation with gap at fracture site, it is bound to land into nonunion if not intervened, so if necessary, external fixator adjustment at 6-8 weeks and dynamization is must with external fixator.

External fixator are commonly used for compound fractures where fracture

hematoma is washed away which is very essential for fracture healing, so also compound fracture has high chances of infection .Both of this contributes to higher chances of delayed union or nonunion which are inherent to compound fractures. External fixator are commonly used to treat compound fractures which has inherent problems of comp fractures, so reflects high delayed union and nonunion rates

Conclusion: Extra-articular, Compound fracture of upper third Tibia are difficult to manage with expert tibia nail due to possibility of Varus and recurvatum, so also nailing in compound fractures has high infection rate which is not good as we are opening the joint for entry point .So Expert tibia nail is not preferred. Plating is contraindicated in compound fractures with significant soft tissue injury.

We conclude that biplanar external fixator with early meticulous debridement was very effective in treatment of extra-articular, compound fractures of upper third tibia and yields good results.

Key words: External fixator Compound upper third tibia, comminuted upper third tibia, extra articular fractures of proximal tibia

Introduction

Tibia is subcutaneous on antero-medial surface and because of high velocity, road traffic accidents, compound tibial fractures are commonly seen in clinical practice. Generally they have significant soft tissue injury and comminution of fracture.

Fracture upper third tibial fixation is an extended indication for nailing. When the fracture is compound and there is comminution in upper third Tibia, nailing or plating both are not ideal implant of choice. Plating is contraindicated in compound fractures and Expert Tibia nail has two problems in compound fractures, in U/3 tibia - a) High risk of infection b) Technically demanding nailing as there are high chances of Varus and recurvatum deformity.

In our study, we had done early meticulous debridement within 6hours (as early as possible) by using hydrogen peroxide and povidone iodine. Use of ample of normal saline was found to be very useful for removing contamination and very effective in preventing infection.

Basic principles of debridement, such as excision of all dead and necrotic tissue and removal of all micro and macro contaminations are found to be very useful and effective in healing of wounds.

Up to Compound I III IIIA fractures, after meticulous debridement, we had primarily closed the wound with stay suture without any tensions on soft tissues and re-inspected after 24-48hours.

Care for dressing- When dressing was soaked, it was changed immediately even twice daily, because soaked dressing with blood, is good culture medium for growth of organism. **So, all soaked dressing**

changed without any hesitancy or delay.

Local antibiotic application of povidone iodine with metrogyl was found to be more scientific and effective as damaged soft tissues has precarious blood supply, where systemic antibiotic doesn't reach with desired Minimal Inhibitory Concentration (MIC).

Construct Of Fixator -

Conventional external fixator is Uni-Planar so, also only has two Shanz pins in proximal tibia, in single direction. Our Biplanar construct has 3 Shanz pin fixation in proximal tibia. 2 Shanz pin are passed obliquely, one each in medial and lateral tibial condyle through special T clamp which has facility to accommodate connecting rod in center, third Shanz pin passed right angle to above 2 pins lateral to medial direction in tibial plateau and connected to distal 3 Shanz pin through connecting rods.

This construct with Shanz pins 90 degree to each other with 3 Shanz in distal fragment is mechanical superior strength, rigid and sturdy which gives desired stability.

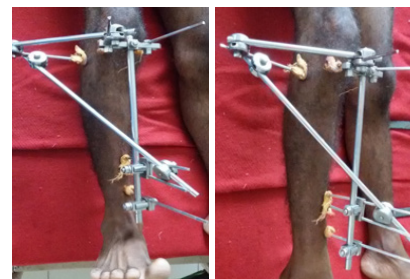
Photographs of Instruments used



T CLAMP



T CLAMP WITH CONNECTING ROD



External Fixator With Frame In SITU

Materials And Methods

Prospective study conducted between June 2008 to June 2015, with Average follow up time period 12 -14 months.

35 patients, analysed after classified according to GUSTILO AND ANDERSONS for open fractures.

There were type I - 10 cases, type II-11 cases, type IIIA--08 cases, type IIIB 6 cases.

Inclusion Criteria:

1. Age above 18 yrs.
2. Compound fractures of upper third tibia.

Exclusion criteria

1. Intra-articular fracture extension of upper third tibia
2. Compound grade IIIC fractures
3. Age below 18 years
4. Pathological fractures
5. Medically unfit patients

Technique Of Ex Fix Application

- 1) Patient to be taken on fracture table, for fixator application. It has two advantage:- a) Traction aids and maintains the alignment b) Varus/valgus angulation, rotation ,compression/ distraction can be easily managed on fracture table for good reduction c) Prolonged traction by assistant during fixator application not required.
- 2) 1st apply proximal 3 pins in tibial plateau. Pin placement in the proximal fragment was done as mentioned above in introduction. Then do reduction, connect connecting rods and clamps for distal fragment and mark the position of distal Shanz pins through clamp. Then insert distal pins through the marks made through clamp
 Advantage of following this sequence, is after fixation of Shanz pins to connecting rod, REDUCTION IS NOT LOST.
 If we apply proximal and distal pins separately independent of each other and then connect with connecting rod, reduction is generally lost as Shanz pin may not be necessarily in the same line and connecting rod is straight.
- 3) Bony contact : Achieve reduction in such a way that bony contact of fracture fragment should be more than 80-90% even in comminuted fractures.
- 4) If feasible, pass lag screw, in close manner to give inter fragment compression to improve mechanical stability.
- 5) Early dynamization by loosening the clamp bolts is advisable and done by 8-10 weeks when fracture shows early features of union
- 6) Bone dies 1 or 2 millimeter back from fracture fragment ends.

- Which may cause gap at fracture site, fixator adjustment done to achieve compression during follow up periods
- 7) If fracture doesn't show any signs of union by 8-10 weeks in comminuted fractures early autogenous cancellous bone grafting or bone marrow injection is recommended and done
 - 8) In uniting fractures after dynamization, patient is allowed to do partial to full weight bearing with walking aid. Patient encouraged to do weight bearing which was good impetus for fracture union and consolidation.
 - 9) Pin track care: pin track infection is major problem. Ask the patient to clean Shanz pin entry site with Dettol regularly.

Pin track infection was effectively treated with oral antibiotics, local dressing. Local injection of Gentamycin at pin site is very effective and safe

We stick to above mention way of management and yielded good clinical and radiological results.

Observations And Results:

GUSTILO AND ANDERSONS classification—35 open fractures, fracture

Type I - 10 (28.57%)cases, Type II-11 (31.42 %) cases, Type IIIA—08(22.85 %) cases, Type IIIB 6 (17.14 %) cases.

Mean age of patient was 36 years with youngest of age 19 years and 72 years being the oldest

Out of 35 patients 7 were females [20%].

90% injuries were because of road traffic accidents, 10% because of fall from height.

Complications : Table No. 01

S.N.	Complications	No. Of Pts.	Perct.
1.	Wound infections		
	Superficial	05	14.28 %
	Deep	02	05.71 %
2.	Pin tract Infection	10	28.57 %
3.	Delayed Union	01	02.85 %
4.	Non-Union	01	02.85 %

05 patients developed superficial infection which improved after debridement and IV antibiotics.

02 patients developed deep infection and needed repeated debridement.

Pin tract infection developed in 10 cases .On reviewing, it was found that pts., after discharge, from hospital, do not clean their pin tract sites with Dettol regularly and also are living in rural areas and living in unhygienic rural setups.These cases were treated with local dressings and broad spectrum oral antibiotics. Gentamycin injection at pin tract site was given in few cases. All cases recovered with no complications.

Table No. 02 Radiological Union (Weeks)

S.N.	No. Of Weeks	No. Of Pts.	Percentages
1.	8-12	05	14.28 %
2.	12-16	12	34.28 %
3.	16-24	13	37.14 %
4.	24 wks & Above	05	14.28 %
Total		35	100.00 %

Out of 35 patients 1 patient had delayed union and 1 patient went into nonunion. Delayed union patient was having primary bone loss which was treated with secondary bone grafting.

So overall union rate was 97 %

Discussion:

Extra-articular, Compound fracture

of upper third Tibia are difficult to manage with expert tibia nail due to possibility of Varus and recurvatum, so also nailing in compound fractures has high infection rate which is not good as we are opening the joint for entry point .So Expert tibia nail is not preferred. Plating is contraindicated in compound fractures with significant soft tissue injury.

External fixators are blamed as non-union machines.

Reasons :

1] External fixator gives static fixation. Generally, bone dies 1 or 2 millimeter back from fracture fragment ends, which may cause gap at fracture site. Static fixation with gap at fracture site, it is bound to land into nonunion if not intervened, so external fixator adjustment at 6-8 weeks and dynamization is must with external fixator.

2] External fixator are commonly used for compound fractures where fracture hematoma is washed away which is very essential for fracture healing, so also compound fracture has high chances of infection .Both of this contributes to higher chances of delayed union or nonunion which are inherent to compound fractures. External fixator are commonly used to treat compound fractures which has inherent problems of comp fractures, so reflects high delayed union and nonunion rates.

Advantages of Bone grafting or bone marrow injections :

If comminution at fracture site is more than 2/3rd of bone diameter, as rule of thumb primary bone grafting at 6-8 weeks is mandatory which is very useful in fracture healing and yields high union rate In delayed union , Bone marrow injection at small fracture

gaps under image intensifier control are useful and helps in fracture healing

With meticulous debridement we used Biplanar external fixator with special T clamp which had given good mechanical stability.

Conclusion:

Extra-articular, Compound fracture of upper third Tibia are difficult to manage with expert tibia nail due to possibility of Varus and recurvatum, so also nailing in compound fractures has high infection rate which is not good as we are opening the joint for entry point. So Expert tibia nail is not preferred. Plating is contraindicated in compound fractures with significant soft tissue injury.

We conclude that biplanar external fixator with early meticulous debridement was very effective in treatment of extra-articular, compound fractures of upper third tibia and yields good results.

Rate of infection was very less as mechanical stability was given by good external fixator construct and repeated debridement was done without hesitation /delay.

We recommend Biplanar external fixator for compound extra-articular upper third tibia fractures as an effective and definitive treatment modality alternative to expert tibia nail or plating.

Clinical Photographs



Before Debridement



After Debridement



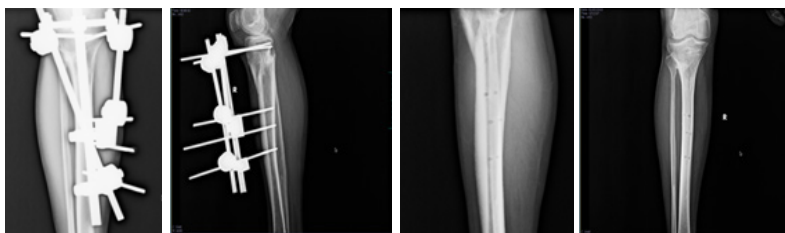
Healing Wound With Fixator In SITU

CASE NO. 01



Pre Operative

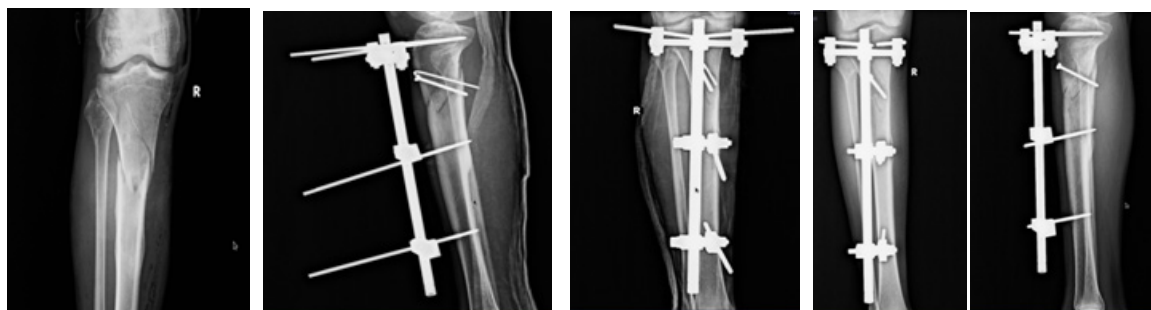
Immediate Post Operative



Fracture Union

After Fixator Removal

CASE NO. 02

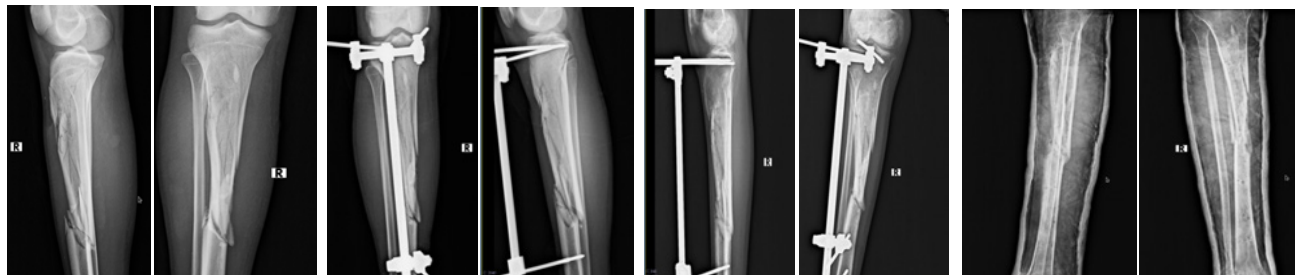


Pre Operative

Immediate Post Operative

Fracture Union

CASE NO. 03



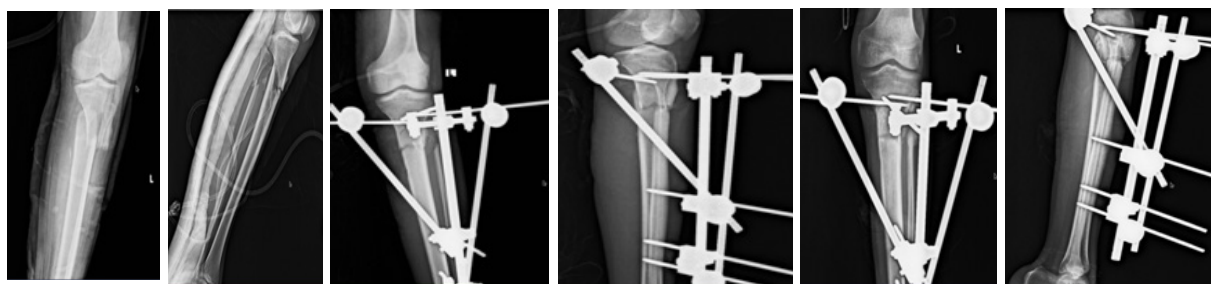
Pre Operative

Immediate Operative

Fracture Uniting

After Fixator Removal

CASE NO.04

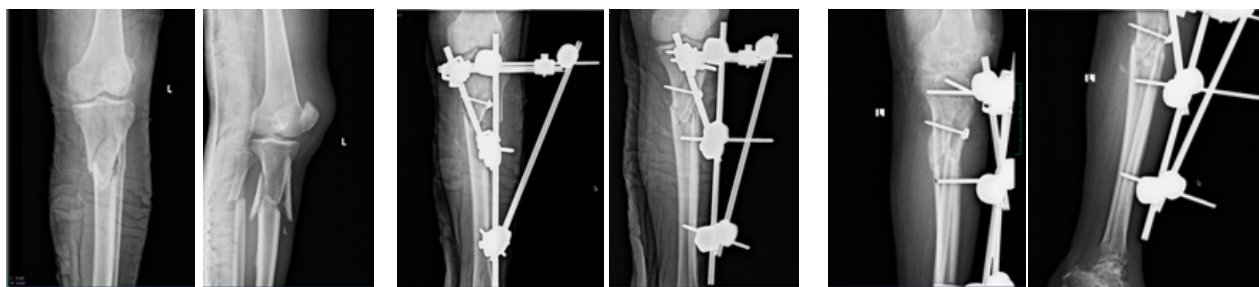


Pre Operative

Immediate Post Operative

Fracture Union

CASE NO.05



Pre Operative

Immediate Post Operative

Fracture Union

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