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A PROSPECTIVE ANALYSIS OF GUSTILLO-ANDERSON OPEN TYPE II AND TYPE III TIBIAL DIAPHYSEAL FRACTURES OF AO TYPE 42C1 AND 42C2; THAT WERE SURGICALLY INTERVENED UPON.

Orthopaedics

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ABSTRACT

Introduction: Segmental tibial fracture is characterized, as a distinguished kind of fracture type. They are portrayed by at least, two distinctive fracture lines, with a totally separate, inter-calary osseous section, either with intact cortical tubular or as a comminuted segment. AO type 42 C1 and C2 fractures of the tibia are generally, brought about by a high-
velocity RTA. They have a high "taux de" of complications. AO type 42 C1 and C2 tibial fractures are considered, as a discrete clinico-surgical bone trauma and are in deep contrast, with the other variants of tibial fractures.

Aim: To analyze the functional outcome of Gustillo- Anderson open type II and type III Tibial Diaphyseal fractures of AO Type 42C1 and 42C2; that were surgically intervened upon.

Materials and Methods: 62 adult patients in the age bracket of 26-55 years having Gustillo-Anderson open type II and type III Tibial Diaphyseal fractures of AO Type 42C1 and 42C2, were surgically intervened in the form of reamed IMIL nailing.**Results:** We achieved 62.36% Excellent, 13.98% Good, 15.05% Fair and 4.84% Poor outcomes calculated by the mean of mean scores of Johner AND Wruhs Criteria, Modified Knee Society Score, Yokoyama Criteria scores.

Conclusion: This study concludes that Gustillo- Anderson open type II and type III Tibial Diaphyseal fractures of AO Type 42C1 and 42C2 can be managed satisfactorily with IMIL nailing without the need of external fixator application, provided appropriate soft tissue coverage is given at the appropriate time.

KEYWORDS

Open Diaphyseal Fracture Of Tibia, Johner And Wruhs Criteria, Knee Society Score, Yokoyama Criteria, AO 42 C1, AO 42 C2.

1. INTRODUCTION:

1.1 Segmental tibial fracture is characterized, as a distinguished kind of fracture type. They are portrayed by at least, two distinctive fracture lines, with a totally separate, inter-calary osseous section, either with intact cortical tubular or as a comminuted segment. AO type 42 C1 and C2 fractures of the tibia are generally, brought about by a high-velocity RTA. They have a high "taux de" of complications. The incidence of AO 42 C2 is about 12.8 %, of all tibial bony traumatization [1]. Other modes of injury include fall from a significant height, natural calamity like earthquake and train accidents. Practically 37.5 % to 83.8 % of AO 42 fractures are open [2,3] and they inevitably are associated with injuries, to the others parts of body, either bony, ligamentous or with soft tissue disruptions. Periosteal stripping and contamination makes the fragment avascular, and having a propensity to harbor and nurture infection. To compound the problems, these cases do make a delayed presentation in India. AO type 42 C1 and C2tibial fractures are considered, as a discrete clinico- surgical bone trauma and are in deep contrast, with the other variants of tibial fractures. They are also infrequently, a part of a multi-organ trauma. They usually present with a higher complication rate.

Furthermore, their prognosis is more often than not, often guarded. Treatment objectives for these kinds of fractures, are rational clinico-radiological assessment, an attempt towards maintaining, near normal anatomical length and osteological alignment, and accepting practically and preferably, nil rotational deformity. Current treatment choices, include intra- medullary inter-locking nailing (IMILN), Locking compression plating and a wide variety and combinations of simple and hybrid external fixators.

Delayed-union and Non-union, are but expected with these patterns of tibial fractures, when contrasted with other variants of the tibial diaphyseal fractures, necessitating usually, a secondary surgical intervention.

2. MATERIALS AND METHODS:

2.1 Our study was a prospective study, conducted in the Department of Orthopaedics, Chettinad Hospital and Research Institute, Kelambakkam, Chennai from May 2015 to April 2020 (60 months of study, in which the recruitment of patients was from May 2015 to April 2019 (48 months), so that the minimum follow-up period, was at-least for 12 months. Written consent was obtained from all the patients in this series, with regard to their, clinico-radiological data being published, for educational and research purposes.

2.2 INCLUSION CRITERIA:

1) All open diaphyseal tibial fractures conforming to within type II to type III B of the Gustillo and Anderson classification and also conforming to AO type 42 C1 and C2.
2) Patients of either sex, in the age bracket of, 26 to 55 years.

2.3 EXCLUSION CRITERIA:

1) Grade I and beyond Grade III B Gustillo-Anderson and other AO tibial diaphyseal fractures.
2) Closed tibial diaphyseal fractures.
3) Pathological tibial diaphyseal fractures, resulting due to defective osteoid mineralization, due to secondary metastasis or primary bone tumor.
4) Those subjects, who are on long term steroid therapy, with sickle cell anemia, with bleeding diathesis or on medication for osteoporosis.
5) Severe systemic illness like carcinoma, elsewhere in the body, on either completed or on-going chemo- radio therapy, with renal failure on renal dialysis.
6) Anaesthetic contraindications for the surgical intervention.

3. MANAGEMENT PROTOCOL:

3.1 Pre-Operative management:

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Patients were received in the Trauma centre and at first settled with adequate immobilisation, following which intra-muscular injection of 3 ml of Diclofenac potassium was administered. In patients, who were found to have a history of asthma, for the relief ofpain, injection Tramadol 50mg IM, along with injection Ondansetron 4mg was given, to prevent any nausea or vomiting. AP, Lateral and Oblique view x-rays were routinely taken of the afflicted leg side. The X-rays were taken in a 14x17 inch film, in a Diagonal fashion, in order that both the knee and ankle could be visualised, in the same film. In the event of any clinical suspicion of a concomitant knee/ankle injury, an MRI of knee/ankle were also included in the imaging investigative basket.

3.2 Pre-Op planning:

In the event that the fracture was within the proximal 1/3 of tibia, then a parallel and a high entry point was planned for. If the fracture was in the middle of the tibial diaphysis, a central entry point was decided upon. If a fibular fracture was seen within 8 cm from the ankle, ORIF of the fibula, concomitantly and independently, was decided upon.

Planning for a polar screw was done, if there the fracture line was inside the metaphyseal area, to limit the medullary canal teeter and to correct anydeformity while nailing. Upon suspicion of any intra-articular extension of fracture line, either proximally or distally, a 3D Recon CT, was also, necessarily obtained. The length of the middle fragment, was meticulously estimated.

With the radiograph of the contra-lateral uninjured tibia as a template, the rough length of the proposed nail was estimated, taking the Proximal and Distal landmarks, to be the level of the tibial tuberosity and the most prominent part of the medial malleolus respectively (Fig 1). The transverse distance across of medullary canal, at the level of the isthmus, was also estimated.

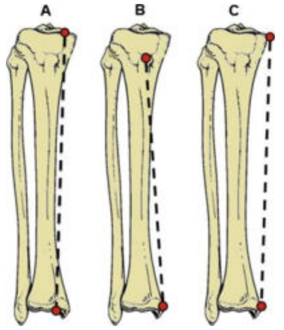

Fig 1: Various methodologies to estimate tibial nail length required for Tibial IMIL nailing [4,6].

The radiographically estimated tibial nail length, was clinically reaffirmed using the formula established by Venkateswaran et al [5]; which stipulates that the tibial nail length be calculated as a distance from the medial joint line of the knee to the medial ankle joint (JJm), minus 2 cm, alternatively the distance measured from the medial joint line of the knee to the medial malleolus (MM), minus 4 cm.

3.3 OPERATIVE MANAGEMENT:

The nails utilized, were of cannulated stainless-steel nail, with 2 proximal (medio-lateral) and 3 distal (2 medio-lateral and 1 antero-posterior) inter-locking variants (Fig 2), of appropriate measurement, so as to be flush with the outer cortical margins, of the far distal end of the tibial bone.

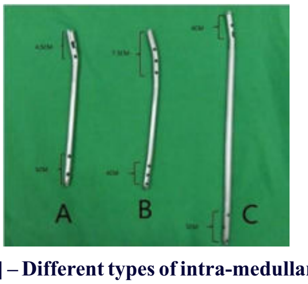

Figure 2[A, B, C] – Different types of intra-medullary interlocking nail are currently available. The (C) variant was used by us routinely, for all our cases in this particular series.

The patient was placed supine, on a radio-luscent table, with the knee flexed, from at-least 90 degrees and up-to 110 degrees (Fig 3). The C-arm was positioned, so that visualization of the tibia and the articular surface proximally and distally were possible, in both the AP and the Lateral views.

Figure 3: Patient leg positioning for Tibial nailing, in order to visualize the entire length of the bone by C- arm Imaging.

At the proximal entry point (Fig4), through a patellar ligament splitting approach (Fig 5), an entry point was made. Progressive reaming was done in the proximal fragment (Fig 6) using a flexible reamer and then the guide wire was then subsequently passed, under a C- arm guidance (Fig 7), and the reduction of the fracture, confirmed. In the event that it was found not to be satisfactory, at that point, the fracture site, was opened up surgically and tibial fracture was manually reduced under Direct Vision. Valuable intra-operative time was not lost trying to re-attempt at closed reduction and then for C-arm confirmation. Serial reaming was done in the distal fragment, while themiddle fragment was controlled with a reduction clamp or an uni-cortical Schanz pin or a stout drill bit, depending on the availability in our operation theatre at that instance. The Intra-medullary nail was then inserted (Fig 8) and then locked (Fig 9) with two proximal screws and another 2 or 3 distal screws, as the situation warranted.

Fig 4: Patellar tendon splitting approach.

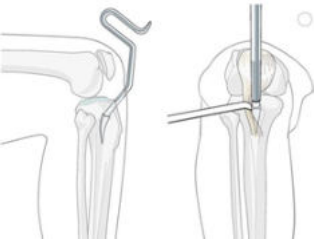

Fig 5: Proximal entry point made with a pointed bone awl.

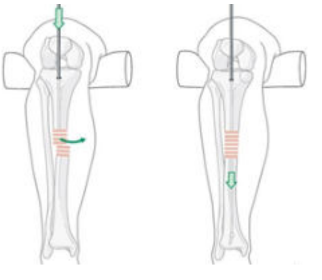

Fig 6: Passing of the guide wire.

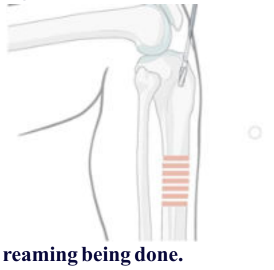

Fig 7: Progressive reaming being done.

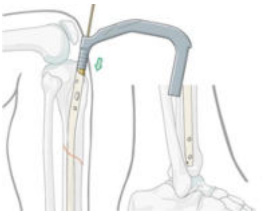

Fig 8: Insertion of intra-medullary nail, with the help of a Jig.

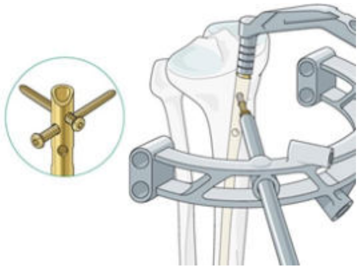

Fig 9: Locking of intra-medullary nail, was carried out after using Jig and C-arm guided drilling, tapping followed by the screw placement. The 90-90 orientation of the screws gives additional rotational stability [7].

The adequacy of fracture reduction and the appropriateness of the alignment, was then confirmed, in both the coronal and the sagittal planes with the C- arm imaging.Supplementary fibular plating, if deemed necessary, was done through a separate postero-lateral approach. For the fibular fixation, the skin, the subcutaneous tissue and the fascia were incised. The peroneal muscles were retracted anteriorly. The inter-osseous membrane was stripped from the anterior border of the fibula, in a proximal to distal direction. The fibular fracture site was then exposed, freshened and reduced. After achieving the proper alignment and reduction, the fibular plating was done, with an appropriately sized, one-third tubular or Locking compression plate. Proximally cortical and Distally cancellous screws of appropriate sizes, were used, to secure the fixation. Tourniquet was not used in any of our cases. Wound was closed in layers and a suture secured DT was put in place. After painting the sutured wound with Betadine solution, sterile dressing was applied, and a crape compression 6" bandage was snugly applied.

3.4 Post-Operative Management:

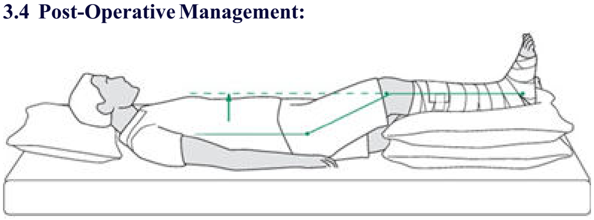

Fig 10: Limb elevation (level above heart level), done post operatively, to effectively reduced post-surgical edema.

The operated limb was kept elevated in the succeeding post-operative period and kept up for at-least 48 hours (Fig 10). DT was removed on POD2. Straight leg raising, isometric quadriceps exercise and toes mobilization was initiated from POD 2. Active range of movement (ROM) for knee and ankle were also usually initiated, from POD 3. Parentral antibiotics (Cefoperazone+Sulbactam 1gm) were stopped on POD 3, unless warranted by special situations like poor diabetic control, significant soakage with edema, feveretc. In the absence of other organ system injuries or with absence of other appendicular fractures, non- weight bearing walker ambulation was initiated from POD 4. Suture removal was usually done on POD 12.

3.5 Follow up:

All the fractures in our series were followed up through, by a clinical and a radiological examination at intervals of 4 weeks. The maximum follow-up was of 59 months (range: 12 to 59 months). On each follow-up axial alignment was assessed and the functional analysis was quantified using Modified Knee Society Scoring (Fig 11), Johner and Wruhs criteria (Fig 12) and Yokoyama Criteria (Fig 13), at the end of at-least 12 months post-op. This data was quantified, tabulated and critically analyzed. Radiographs were analyzed for the correction achieved and the maintenance of position or otherwise loss of reduction. Fracture union, was said to have been achieved, when the patient was able to bear full weight on the injured limb, without pain and ambulate without any walking-aid support and when radiographs showed a healthy bridging of callus, in at least 3 sides of the cortices. For assessingthis, 4 views of the X-rays were taken including the standard AP and Lateral views and the 2 oblique views.

3.6 Evaluation of the results:

The results were quantified, tabulated and then assessed as per the criteria laid down by the Modified Knee Society score (MKSS) [8]

MODIFIED KNEE SOCIETY SCORE

Objective Scoring

1) Pain	Points
None	50
Mild or occasional	45
Stairs only	40
Walking and stairs	30
Moderate occasional	20
Moderate continual	10
Severe	0

2) Range of motion	Points
5 degree = 1 point	Total 25

Stability (maximum movement in any position)

3a) Anteroposterior	Points
<5 mm	10
5-10 mm	5
10 mm	0

3b) Mediolateral	Points
<5 degree	15
6-9 degree	10
10-14 degree	5
15 degree	0

4) Flexion contracture	Points
5-10 degree	-2
10-15 degree	-5
16-20 degree	-10
>20 degree	-15

5) Extension lag	Points
<10 degree	-5
10-20 degree	-10
>20 degree	-15

6) Alignment	Points
5-10 degree	0
0-4 degree	3 points for each degree
11-15 degree	3 points for each degree

Functional scoring

7) Walking	50 points
Unlimited	40
>10 blocks	30

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5-10 blocks	20
<5 blocks	10
Housebound	0

8) Stairs climbing	Points
Normal up & down	50
Normal up, down with rail	40
Up & down with rail	30
Up with rail; unable down	15
Unable	0

9) Functional Deductions	Points
Cane	-5
Two cane	-10
Crutches and walker	-20
Others	20

Points	Grading
80-100	Excellent
70-79	Good
60-69	Fair
<60	Poor

Fig 11: Modified Knee Society Score [8]

Criteria	Excellent	Good	Fair	Poor
Nonunion/infection	None	None	None	Yes
Neurovascular injury	None	Minimum	Moderate	Severe
Deformity				
Varus/valgus	None	2-5^0	6-10^0	>10^0
Ante/Posterior	0-5^0	6-10^0	11-20^0	>20^0
Shortening	0-5 mm	6-10 mm	11-20 mm	>20 mm
Mobility				
Knee	Full	>90 %	90 - 75 %	<75 %
Ankle	Full	>75 %	75-50 %	<50 %
Pain	None	Occasional	Moderate	Severe
Gait	Normal	Normal	Mild limp	Significant limp

Fig 12: Johner and Wruhs Criteria [9]

Results
Excellent • No notable abnormality
Good • Occasional pain with prolonged use • Joint motion 75% of normal • Trivial swelling • Normal gait
Fair • Pain with ordinary activity • Joint motion 50% of normal • Small amount of swelling • Slight limp
Poor • Constant pain • Joint motion <50% of normal • Any visible deformity • Limp, gait on cane or crutches

Fig 13: Ketenjian and Shelton Criteria, modified by Yokoyama [10].

4. RESULTS:

Table 1: Age And Sex Distribution.

Age (in Years)	No. of Patients		Total patients $N = n_1 + n_2$	Sample % age
	Male 'n_1'	Female 'n_2'		
26-30	9	2	11	17.74
31-35	12	1	13	20.97
36-40	7	1	8	12.90
41-45	5	7	12	19.35
46-50	5	6	11	17.74
51-55	3	4	7	11.30
Total n_1, n_2	41	21	62	100
and N				
Total	66.13%	33.87%	100%	
% age				

Table 2: Mode Of Injury.

Mode of injury	No: of patients 'n'	% age
RTA	46	74.19
Fall from height	11	17.74
Jallikattu injury	3	4.84
Collapse of a wall	2	3.23
Total	62	100

Table 3: Accompanying Frature Of The Fibula

No: of Fracture line	No of Patients 'n'	% age
Single Fracture	11	17.74
Segmental Fracture	07	11.29
Double Segmental fracture	14	22.58
No fracture	30	48.58
Total	62	100

Table 4: Associated Skeletal Injury

ASSOCIATED INJURY	No of PATIENTS 'n'	% age
Acetabulum injury on right side.	2	3.22
Closed both bone fracture contralateral leg.	4	6.45
Closed segmental shaft of femur fracture, ipsilateral.	4	6.45
Grade II compound fracture both bone leg with closed clavicle fracture ipsilateral.	2	3.22
Superior pubic ramus fracture ipsilateral side	5	8.07
Ipsilateral concomitant fibular fractures	32	51.61

Table 5: Complications

Complications	No: of Patients 'n'	% age
Shortening of less than 1.5cms	12	19.35
Shortening of more than 1.5cms	5	08.06
Anterior knee pain	17	27.42
Dropped Hallux syndrome	9	14.52
Evidence of peroneal nerve dysfunction (numbness of first web space)	4	6.45
Infection	8	12.90
Total	62	100

Table 6: Modified Knee Society Score [8]

Modified Knee Society score	No: of patients 'n'	% age
Excellent	43	69.35
Good	6	09.68
Fair	10	16.13
Poor	3	04.84
Total	62	100

Table 7: Johner And Wruhs Criteria [9]

Johner and Wruhs criteria	No: of Patients	% age
Excellent	35	56.45
Good	10	16.13
Fair	13	20.97
Poor	04	06.45
Total	62	100

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Table 8: Functional Results As Per Ketenjian And Shelton Criteria Modified By Yokoyama [10]

Criteria	No: of patients 'n'	% age
Excellent	38	61.29
Good	10	16.13
Fair	12	19.35
Poor	2	03.23
Total	62	100

Table 9: Master Chart comparison of 3 Criteria/Scores (as percentages of patients) and Calculation of the Mean of Mean Scores.

Criteria/score	MKSS	JWC	YC	Mean
Excellent	69.35	56.45	61.29	62.36
Good	9.68	16.13	16.13	13.98
Fair	16.13	20.97	19.35	18.82
Poor	04.84	06.45	03.23	4.84

MKSS – Modified Knee Society Score
JWC – Johner and Wruhs Criteria
YC – Yokoyama Criteria

4.1 In our case series of 62 patients, with regard to their age and sex distribution, 20.97% (n=13) patients, were maximally there, in the age group of, 31 to 35 years. The least were, in the age group of, 51 to 55 years. With regard to the Mode of Injury, RTA, constituted 74.19% (n=46) patients, by far the maximum. The 79.03% of the cases (n=49) constituted, those with other associated skeletal injuries. Associated fibular fractures, of the ipsilateral side, constituted 51.61% (n=32)patients. Of these, only 22.58% (n=14), required to be surgically plated, at the same operative setting, as when the IMIL was being done. Dynamization was considered, when there was no significant radiological evidence of union, by the end of 8 weeks POD. In 12.90% (n=8) cases, we had to resort to ipsilateral autologous iliac crest bone grafting, which we preferred to do, at the same time frame, as was chosen for Dynamization.

Amongst our case series, 9.67% (n=6), required skin grafting and another 6.45% (n=4), required musculo-cutaneous flap coverage. The average time of bone union in our series was at 32 weeks (7.36 months approximately).

4.2 Among the other complications encountered, in our series, we had 19.35% (n=12) of shortening of less than 1.5cms, 8.06% (n=5) had resultant shortening of above 1.5cms, but less than 2.5cms. 27.42% (n=17) of our cases had complaints of Anterior knee pain, which resolved in 70.58% (n=12), in about 18 months of time.

4.3 Dropped Hallux Syndrome constituted 14.52% (n=4) of our cases. There was evidence of peroneal nerve dysfunction in 6.45% (n=4) of our cases,which presented as numbness of the, 1st web space. All these cases, resolved in 9 months of post-op time. In 12.90% (n=8) cases, we had Infection complicating the surgical wound. 6.45% (n=4) cases needed, nail exchange with re- reaming, upon failure, to arrest infection by 8 weeks post-op.

5. Case Illustrations

5.1 Case Illustration 1

Fig 14: (a) **Fig 14: (b)**
Pre-Op X-rays

Fig 15: (a) **Fig 15: (b)**
Immediate Post-Op X-rays

Fig 16(a): ROM Knee at 12 months PO review

Fig 16(b): Rom Ankle at 12 months PO review

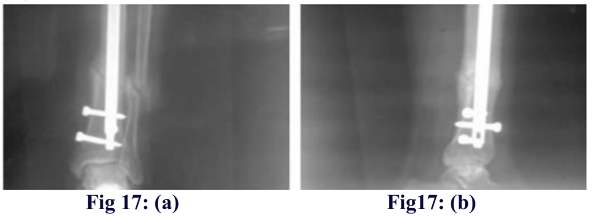

Fig 17: (a) **Fig17: (b)**

X-ray 3 months Post-Op review, showing advancing union.

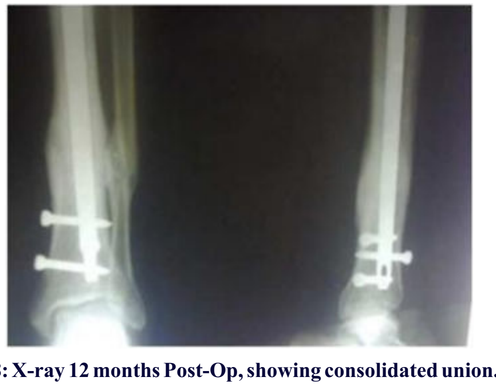

Fig 18: X-ray 12 months Post-Op, showing consolidated union.

5.2 Case Illustration 2

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5.2 Case Illustration 2

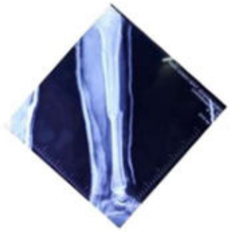
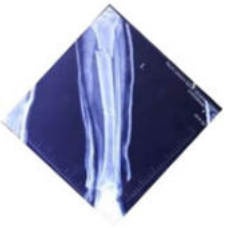

Fig 18(a) **Fig 18(b)**

Pre-Op Xrays

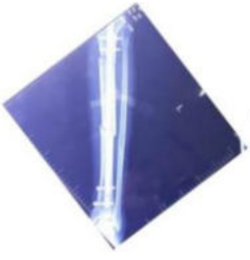
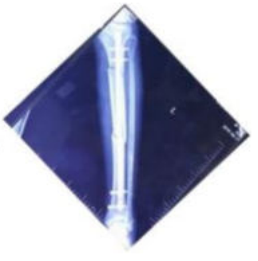

Fig 19(a) **Fig 19(b)**

Immediate Post-Op X-rays


Fig 20(a) **Fig 20(b)**

X-ray 8 months Post-Op review, showing consolidated union.

Fig 21: 8 months Post-Op functional outcome showing patient able to squat and sit cross-legged.

Fig 22: 8 months Post-Op functional outcome showing no fixed deformity at knee joint.

Fig 23: 8 months Post-op functional outcome showing ROM Hip and ROM Knee.

5.3 Case Illustration 3


Fig 22: (a) **Fig 22: (b)**

Pre-Op X-rays showing intact tubular component.


Fig 23: (a) **Fig 23: (b)**

Immediate Post-Op X-rays

Fig 24(a): X-ray 3 months Post-Op review, showing advancing union.

Fig 24(b): X-ray 12 months Post-Op review showing consolidated union.

Fig 25(a): Functional outcome at 12 months review showing patient able to sit cross-legged.

Fig 25(b): Functional outcome at 12 months review showing no fixed deformity at knee joint.

Fig 25(c): Functional outcome at 12 months review showing ROM Hip and ROM Knee.

6. DISCUSSION

In Orthopaedic Trauma, it is often a debatable subject as to whether one has to nail or one has to plate when encountered with an open fracture of the tibia, wherein we do not contest the role of a LRS or an Ilizarov in the management of tibial fractures. We still continue to have a lot of faith in Intra medullary nailing. This particular study has been evolved with the same faith.

The special methods of bony stabilization and the plastic surgeon's role in soft tissue reconstruction are also discussed followingly. It is not at all debatable that tibia is a place of common open fractures occurrences that is close to susceptible to be open. As a matter of fact, as much as 63% of the fractures that appear to be open arise only in the tibial bone.

We all orthopaedic surgeons are aware of the precarious blood supply and the dismal soft tissue cover of the shaft of tibia which makes it more vulnerable to fracture, infections and its inability to unite in a doctored time frame.

While the external fixators have been extremely popular for their versatility and ease of fixation and management of infection, they have their own constraints. The patient comfort becomes paramount in treatment of any surgical fixation of open fracture of tibia as it is related to his locomotive ability. Hence in a guarded way, we began this journey.Not to reflect on the fact that apart from patient inconvenience, there are many problems with external fixations. We do, however concede to the fact that our applications may not be totally right whenever there is a large bone loss or there is an accompanying neuro-vascular injury that is why we have constraint ourselves to AO types 42C1and AO type 42C2. But when bone length compromise is not a primary concern, we deliberate on the utility of tibial nailing. Because concerns of bone length are not the primary issues with the advent of excellent plastic surgery supportive measures that are currently available. Hence it becomes the primary and the paramount aim to achieve union and union alone with regard to tibia considering its rather perilous supply of blood.

Now come the question as to whether if at all we decide on nailing, has it to be reamed or un-reamed. Reaming has distinct advantages over the un-reamed counterpart by the virtue of the fact that reaming provides space for accommodating a wider diameter nail which in turn provides for stability of fracture fixation and it also stimulates endosteum for new callus formation. Study done by Yu Guangshu et al [11] states that there are more chances of non- union in un-reamed Tibial nailing. Hence, in our study, we fixed all the fractures with reamed IMIL nailing, as it serves the benefits of both the worlds in the form of better initial stability and subsequent time-lagged Dynamization providing for micromotion at the fracture site and thereby ensuringtimely union, which can be achieved despite the precarious blood supply of the tibia. While there are certain concerns about transmitting the infection during the process of reaming and compromising its endosteal blood supply and also the concerns of disseminating the infection all along the diaphyseal length of the bone as the reamer goes from top to bottom of the long tibial bone. But let the debate remain there and the concerns looks scientifically justifiable! However we beg to differ from these preconceived ideas.

While all scientifically oriented orthopaedic surgeons are not agreeable to a reamed intra medullary nail, we all stand to believe that by disturbing the endosteal supply of blood and the chance of spreading the infection we can increase the chance of non-union also thereby increase the chance of an ischemic environment for the bacterial infection to flourish. Therein lies the fear! Let the fear be overcome. However we beg to differ from these preconceived ideas.

Are we going to compromise on stability, of-course not. Therein lies the logic of reaming because all of us orthopaedic surgeons concur that a reamed and larger diameter nail gives better stability. Instability shall provide for non-union and the infections can play their celebration. We therefore conclude that we shall not make any compromise with regard to the stability of the fracture site. We also do not disrespect other methods of fixations for the open fractures [6]. We however are strong proponents of intra medullary reamed nailing of fractures of tibia as it is becoming popularly acceptable in the western globe. Un-fortunately in the Indian sub-continent this continues to remain an insolvable debate.

The timing of surgery is paramount. Delayed undertaking of the surgery beyond 72 hours have their own adverse repercussions. Adequate antibiotic cover like Cefoperazone+ Sulbactum 1gm was our protective umbrella. In the 70 cases that we operated with in the golden time interval (within 8 hours) per about 55% of our cases, we wanted to itemize the complications that we encountered. Our institute being a tertiary referral centre, often has cases referred after preliminary treatment elsewhere and hence this delay to not address the problem within the golden hour. And all scientific orthopaedic surgeons would concur that compromised delayed intervention in open tibial fractures has a relatively higher risk of infection which in itself can indirectly contribute towards mal-union and subsequent flourishing of infection causing infective non-union.

We like to disagree with who are the strong proponents of Sargiant et al [12]; who had suggested that there may be ischaemic necrosis of the cortical bone upon reaming and had proposed a less tighter nail. In the South Indian scenario of Chengalpattu district, we had the opportunity of reaming and assessing the complication. But we took care to screw all the holes in order to ensure that the fixation was secured and rigid as envisaged by the AO principle of fixation and dynamization if at all considered was not before 8 weeks of operative intervention. The plastic surgeon help was required in about 6.45 % of cases in the form of musculo-cutaneousgrafts which compares more favourably than that of the study of YOKOYAMA et al [10].

Split skin grafts were required in about 9.67% of our cases. Doing all these procedures became relatively easy as there were no intrusions with respect to an external fixation.

Hence the soft tissue musculo-cutaneous procedures which were able to be carried out more conveniently. Dynamization was only considered in the event of there being no signs of union radiologically within 8 weeks of surgical intervention.

We however, differ from the conception pf the Wittle el al[13]; wherein he suggested dynamization at the end of 3 months and above if there were no signs of bony union. We preferred to intervene earlier in the broad interest of the patient. Our mean union period was around 28 weeks which closely collaborates with the study of Court Brown et al [14].

We had a 12.90 % of bony infections which could be well controlled with IV antibiotics for a period of 3 weeks followed by oral antibiotics for an additional 3 weeks. These figures are in close collaboration with the study of Atul Agarwal el al [16]; We had to resort to dynamization in about 12.90%. In 77.41% of our cases, we got radiological evidence of union at the end of 8 weeks. In 12.90% of our cases we required to have a postero- lateral autologous bone graft from the iliac crest in the same sitting as we did the dynamization. We resorted to bone grafting as we do not have a great experience with respect to the benefits of PRP or mesenchymal bone cells in-corporation. The earliest solid union radiological evident was achieved at 9 months and the most delayed ones at 11 months. Thus, the average time forunion was around 32 weeks which is comparable to the study of Atul Agarwal et al [15];

With respect to the functional grading that was suggested by

KETENJIAN and SHELTON [14] and further modified later by YOKOYAMA et al [11]; we could in our series achieve as per these criteria 61.29% of Excellent, 16.13% of Good, 19.35% of Fair and 8.23% of Poor outcomes. However, we have plotted the outcomes also on 2 other criteria/scores viz; MKSS and JW criteria. Our "Mean of Mean" scores were as being 62.36% Excellent, 13.98% Good, 15.05% Fair and 4.84% Poor outcomes. This result matches that, with the outcomes of Atul Agrawal et al [15].

7. CONCLUSION

We conclude, as to reaming, as a preferably better choice, than leaving the tibial 42C1 and 42C2 fractures un-reamed. Early soft tissue coverage in the form of SSG or musculo- cutaneous flaps, restore vital perfusion of the tibial bone, which has a precarious blood supply, especially in its lower third. The trauma, in itself cause severe compromise of vascularity by virtue of soft tissue and periosteal stripping. The learning skills for the consultant, are also not so difficult to master. The goal of the treatment, is to provide immobilization initially, followed by micro movement after an appropriate time lag, restoration of vascularity by ensuring early soft tissue cover.All these "garnish" makes for a good "dish" and enables sound healing of the "not so surgeon friendly" tibial bone to behave "not with such hostility".

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