

**FUNCTIONAL OUTCOME OF INTERLOCKING NAILING OF TYPE I AND II COMPOUND FRACTURE TIBIA**Subash Baby<sup>1</sup>, Manoj Murungodiyil Kunjappan<sup>2</sup><sup>1</sup>Junior Resident, Department of Orthopaedics, Government Medical College, Thrissur, Kerala.<sup>2</sup>Associate Professor, Department of Orthopaedics, Government Medical College, Thrissur, Kerala.**ABSTRACT****BACKGROUND**

Introduction of closed locked intramedullary nailing has revolutionised the management of fractures of femur and tibia. The study is to prove type-I and type-II open fractures with comparatively less soft tissue damage and contamination, can be safely managed by debridement, early wound care and an unreamed/reamed interlocking nailing without any deep infection hence allowing early mobilisation, reducing morbidity, reducing reoperation/secondary procedures and malunion/non-union.

**MATERIALS AND METHODS**

A prospective observational study was approved by the Hospital Ethical Committee and an informed consent was taken from all patients. 30 patients who underwent IL nailing from March 2011 to 2012 were enrolled in this study. Of the 30 patients, 17(56.7%) patients had fracture in right tibia and 13(43.3%) had fracture in left tibia. Age of the patients ranged from 18 to 65 years with mean age being 35.5. Males dominated (73.3%) in this study population and the sex ratio was found to be 2.75. Females were represented by only 26.7%.

**RESULTS**

In this study all the cases united irrespective of the Gustilo and Anderson (G and A), OTA classification, Level of fracture and Mode of injury. Time of union ranges between 15 to 24 weeks with mean time of union is 20.1. Shortest time for a union was within 15 weeks (1 case) which was grade I Gustilo and Anderson, middle 3<sup>rd</sup>, transverse, OTA-A fracture and maximum time taken was a period of 24 weeks (2 cases) which were type II, lower 3<sup>rd</sup> fractures. From this, it is observed that there is a difference in union rate between Level, Gustilo and Anderson, and OTA classifications. In this study, it is observed that there were no cases of deep infection.

**CONCLUSION**

Closed interlocking intramedullary nailing is an effective method of treatment for Gustilo and Anderson type I and II compound tibial diaphyseal fractures. It is based on the principle of promoting biological healing and allows gradual weight bearing. Closed nailing and static locking is a technically demanding procedure. Risk of exposure to radiation is there. This method offers the possibility of maintenance of length, alignment and rotational stability in fractures of the tibial shaft, while preserving the biological environment of fracture healing. The fixation is rigid, hence there is no need for external immobilisation prior to callus formation and weight bearing.

**KEYWORDS**

Compound Fracture Tibia, Gustilo and Anderson (G and A) Classification, Interlocking Intramedullary Nailing.

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**BACKGROUND**

Aim of the study is to prove type-I and type-II open fractures with comparatively less soft tissue damage and contamination can be safely managed by debridement, early wound care and an unreamed/reamed interlocking nailing without any deep infection, hence allowing early mobilisation, reducing morbidity, reducing reoperation/secondary procedures and malunion/non-union.

Introduction of closed locked intramedullary nailing has revolutionised the management of fractures of femur and tibia. The treatment of diaphyseal fracture of the tibia by intramedullary nailing has gained popularity, mainly because of introduction of locking nail.<sup>1</sup> After intramedullary reaming,

a large sized nail can be used without jamming and small type nail used in non-reamed type nailing.<sup>2</sup> The interlocking intramedullary nailing with direct bone graft<sup>3</sup> to treat tibial bone defect takes short time to unite and it can manage all tibial fractures from proximal to distal metaphysis.<sup>4</sup> Interlocking intramedullary nailing of tibia greatly improve rotational stability.<sup>5,6</sup> The fracture below the level of the tibial tubercle and above the plafond can be treated with unreamed intramedullary stabilisation regardless of the severity of soft tissues. The small size of unreamed tibial nail is associated with increased rate of nail or screws breakage.<sup>7,8</sup> Reaming of the medullary canal may lead to vascular damage and thermal necrosis of the tibia.<sup>9</sup> The recent use of locked intramedullary nail has shown promising results.<sup>10</sup> It has also given satisfactory result in proximal third tibial shaft fracture and segmental tibial shaft fracture.<sup>11</sup> Reamed interlocking nails also have comparable results to those of unreamed nailing in open fractures.<sup>12</sup> This procedure reduces hospital stay, early mobilisation and better outcome anatomically as well as functionally as claimed by the advocates of this management. This study was conducted to find out the effectiveness of locked reamed intramedullary interlocking

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nailing in Type I and II open fractures of tibia.

### MATERIALS AND METHODS

A prospective observational study was approved by the Hospital Ethical Committee and an informed consent was taken from all patients. 30 patients who underwent IL nailing from March 2011 to 2012 were enrolled in this study. Of the 30 patients, 17 (56.7%) patients had fracture in right tibia and 13 (43.3%) had fracture in left tibia. Age of the patients ranged from 18 to 65 years with mean age being 35.5. Males dominated (73.3%) in this study population and the sex ratio was found to be 2.75. Females were represented by only 26.7%.

Compound fracture was classified using Gustilo and Anderson's Classification. Patients with Gustilo Anderson Type I/II compound fracture tibia, meeting the inclusion criteria will be included in the study. Fracture was classified using OTA-AO classification using antero-posterior and lateral view x-ray of tibia including knee/Ankle joints.

#### Inclusion Criteria

- Skeletally mature patients of both sexes.
- Gustilo Anderson Type I/II compound fracture tibia, fresh cases.
- Fractures below and above 5 cm from articular surface of knee and ankle joints.
- No known hypersensitivity to any medications.

#### Exclusion Criteria

- Polytrauma patients.
- Fat embolism syndrome.
- Any disease that may increase the chance of infection.
- Patients with compartment syndrome.
- Cases lost for follow-up.

Type of wound closure: a) Primary closure, b) Delayed primary closure, c) Split skin grafting, d) Healing by secondary intention.

After thorough debridement under anaesthesia, an Unreamed/ reamed interlocking nail was inserted with assistance by an image intensifier. All nails will be statically locked, proximally and distally. All patients were clinically evaluated on 1<sup>st</sup> and 3<sup>rd</sup> day post-operatively. The incidence of early perioperative complications was recorded on a database at the time of discharge. All patients were clinically and radiologically evaluated on 3<sup>rd</sup> day, 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 6<sup>th</sup> and 12<sup>th</sup> months post-operatively.

#### Functional Outcomes Evaluated

- Fracture Union: Meantime of Callus formation (6 - 12 weeks) and bony healing (28 - 34 weeks). Fracture union was assessed on the basis of clinical and radiographic criteria. A fracture was deemed to be united when the patient could fully bear weight with no pain at the fracture site and there was radiographic evidence of bridging of 3 of 4 cortices on standard antero-posterior and lateral views.
- Functional outcome assessed by Johner and Wruh's criteria (knee, ankle and subtalar joints, deformities, pain etc.).
- Infection (defined as continuing wound drainage of pus or positive bacteriological culture).

- Malunion (defined as a rotational deformity of more than 15°, an angulation deformity of more than 5° or shortening by more than 10 mm in comparison with normal side).
- Non-Union: Established when a minimum of 9 months has elapsed since injury and the fracture shows no visible progressive signs of healing for the last 3 months.
- Gait of the patient.
- Statistical analysis was done using Pearson's Chi-square test.

### RESULTS

Age of the patients ranged from 18 to 65 years with mean age of 35.5. Males dominated (73.3%) in this study population and the sex ratio was found to be 2.75. Females were represented by only 26.7%. Out of 30 patients, 17 (56.7%) patients had fracture in right tibia and 13 (43.3%) had fracture in left tibia. Road traffic accident (76.7%) was found to be a single major reason for compound fracture tibia, other causes included fall which accounts to 23.3%.

Most common site was middle third followed by lower third and upper third. Lower 3<sup>rd</sup> fracture comprises 8 (26.7%), middle third 17 (56.7%) and upper third 5 (16.7%). All cases were open fractures and Gustilo and Anderson type II compound fracture predominates with 19 cases (63.3%) and type I with 11 cases (36.7%). Distribution of the 30 tibial diaphyseal fractures by OTA-A 17 (56.7%) B 2 (6.7%) and C 2 (36.7%). In this study group of 30 patients, pattern wise distribution of Transverse fracture- 2 (6.7%), Oblique- 15 (50%), Spiral- 7 (23.3%), Wedge- 2 (6.7%) and Comminuted- 4 (13.3%). Of the 30 tibial fractures in the majority of cases, fibula is also fractured (80%). Time delay for surgery was between 6 hours and 8 hours.

Majority of cases were hospitalised for 10 days (60%), more prolonged hospital stay was due to suspected wound infection. All the patients were discharged after suture removal and no sign of infection.

In this study, all the cases united irrespective of the Gustilo and Anderson, OTA classification, Level of fracture and Mode of injury. Time of union ranges between 15 to 24 weeks with mean time of union of 20.1. Shortest time for a union was within 15 weeks (1 case), which was grade I Gustilo and Anderson, middle 3<sup>rd</sup>, transverse, OTA-A fracture and maximum time taken was a period of 24 weeks (2 cases) which were type II lower 3<sup>rd</sup> fractures. From this, it is observed that there is a difference in union rate between Level, Gustilo and Anderson, and OTA classifications.

In this study, it is observed that there were no cases of deep infection. Only 4 out of 30 cases were infected and they were all superficial infections. Those cases which were infected belonged to Gustilo and Anderson Type II, middle 3<sup>rd</sup> fractures. Superficial infections were treated with supportive measures, antibiotics and debridement when needed. In all the cases tibial fractures were united and infection was controlled. Deformities are very less with IL nail tibia in the frontal plane. Mobility was assessed as a part of functional outcome evaluation serially at regular intervals after the surgery by using Johner and Wruh's criteria. It is observed that ROM following ILN tibia is associated with excellent result regarding post-op mobility and rapid return to work.

Mild limping persisted in many of the patients due to lack of confidence, because all other parameters were within normal limits which will improve with time.

Deformity	Frequency	Percent
<b>Varus/Valgus</b>		
None	18	60.0
2-50	12	40.0
<b>Procurvatum</b>		
None	28	93.3
2-50	2	6.7
<b>Recurvatum</b>		
None	30	30
<b>Rotation</b>		
None	20	66.7
10	10	33.3
<b>Shortening</b>		
None	14	46.7
0-5 mm	13	43.3
6-10 mm	3	10.0
<b>Deformity</b>		

Fracture Site Pain	Frequency	Percent
None	12	40.0
Occasional	17	16.7
Moderate	1	3.3
<b>Total</b>	<b>30</b>	<b>100.0</b>
<b>Fracture Site Pain</b>		

Strenuous Activities	Frequency	Percent
Possible	27	90.0
Limited	3	10.0
<b>Total</b>	<b>30</b>	<b>100.0</b>
<b>Strenuous Activities</b>		

Mobility	Frequency	Percent
<b>Knee</b>		
Full	16	53.3
>80%	10	33.3
>75%	4	13.3
<b>Ankle</b>		
Full	12	40.0
>80%	13	43.3
>75%	5	16.7
<b>Subtalar</b>		
Full	12	40.0
>80%	16	53.3
>75%	2	6.7
<b>Joint Mobility</b>		

Gait	Frequency	Percent
Mild Limping	18	60.0
Moderate Limping	12	40.0
<b>Total</b>	<b>30</b>	<b>100.0</b>
<b>Gait</b>		

Walking Distance	Frequency	Percent
> 3000 metres	1	3.3
> 2000 metres	17	56.7
> 1000 metres	12	40.0
<b>Total</b>	<b>30</b>	<b>100.0</b>
<b>Walking Distance</b>		

Anterior Knee Pain			Screw Discomfort		
Anterior Knee Pain	Frequency	%	Screw Discomfort	Frequency	%
No	19	63.3	No	26	86.7
Yes	11	36.7	Yes	4	13.3
<b>Total</b>	<b>30</b>	<b>100.0</b>	<b>Total</b>	<b>30</b>	<b>100.0</b>
<b>Complications</b>					

The main complication of tibial nailing is knee pain. There is as yet no satisfactory explanation as to why patients get knee pain following tibial nailing.

The antero-posterior proximal cross screws and any distal screw inserted on the medial border of the tibia are subcutaneous and patient may complain of significant discomfort within a few weeks of nailing. This occurred in 4 (13.3%) patients of our study and it was not significant also. All patients tolerated the screws till union/ dynamisation.

Functional Outcome	Frequency	Percent
Excellent	18	60.0
Good	11	36.7
Fair	1	3.3
<b>Total</b>	<b>30</b>	<b>100.0</b>
<b>Functional Outcome</b>		

Functional outcome was assessed by Johner and Wruh's criteria into Excellent, Good, Fair and Poor. Of the 30 patients 18 (60%) were excellent, 11 (36.7%) were good and 1 (3.3%) fair outcome. These results are comparable to International similar study groups. As there is only one case which has fair functional outcome, that case is not considered while relating the functional outcome with other variables. This is because in the two-way table, if we include the fair case some of the cells may have zero frequencies which are theoretically not allowable for finding out the Chi-square.

	Functional Outcome				Total
	Excellent		Good		
	Frequency	%	Frequency	%	
18-30	11	84.6	2	15.4	13
31-40	4	50.0	4	50.0	8
Above 40	3	37.5	5	62.5	8
<b>Total</b>	<b>18</b>	<b>62.1</b>	<b>11</b>	<b>37.9</b>	<b>29</b>
<b>Association of Functional Outcome on Age Group</b>					

$\chi^2 = 5.353$ , Degrees of freedom = 2, P value = 0.069.

The patients responded well, which was evident by the outcome rating both from functional as well as radiological scoring. Most of the patients were rated excellent after treatment. Irrespective of their age, they responded to the treatment well. Even though Chi-square analysis showed no significant (P value = 0.069) influence of age in the final rating of outcome, young age was found to be more responsive to the treatment as less than 40 years' age group comprised maximum of excellent rating category.

Level of Fracture	Functional Outcome				Total
	Excellent		Good		
	Frequency	%	Frequency	%	
Lower Third	4	57.1	3	42.9	7
Middle Third	10	58.8	7	41.2	17
Upper Third	4	80.0	1	20.0	5
<b>Total</b>	<b>18</b>	<b>62.1</b>	<b>11</b>	<b>37.9</b>	<b>29</b>

**Association of Functional Outcome on Level of Fracture**

$\chi^2 = 0.831$ , Degrees of freedom= 2, P value= 0.660.

Every patient responded well, which was evident by the outcome rating both from functional as well as radiological scoring. Most of the patients were rated excellent after treatment. Irrespective of their level of fracture, they responded to the treatment well. Even though Chi-square analysis showed no significant (P value= 0.660) influence of level of fracture in the final rating of outcome, middle 3<sup>rd</sup> and upper 3<sup>rd</sup> fractures were found to be more responsive to the treatment, as both these groups formed maximum of excellent rating category.

G and A Classification	Functional Outcome				Total
	Excellent		Good		
	Frequency	%	Frequency	%	
Type I	8	80.0	2	20.0	10
Type II	10	52.6	9	47.4	19
<b>Total</b>	<b>18</b>	<b>62.1</b>	<b>11</b>	<b>37.9</b>	<b>29</b>

**Association of Functional Outcome on G and A Classification**

$\chi^2 = .084$ , Degrees of freedom= 1, P value= 0.149

Every patient responded well, which was evident by the outcome rating both from functional as well as radiological scoring. Most of the patients were rated excellent after treatment. Irrespective of G and A classification, they responded to the treatment. Even though Chi-square analysis showed no significant (P value= 0.149) influence of G and A classification in the final rating of outcome, grade I compound fractures were found to be more responsive to the treatment as grade I fractures formed maximum of excellent rating category. From the above table, it is evident that 8 out of 10 patients (80%) in grade I compound fracture responded with excellent outcome.

OTA Classification	Functional Outcome				Total
	Excellent		Good		
	Frequency	%	Frequency	%	
A	10	62.5	6	37.5	16
B	1	50.0	1	50.0	2
C	7	63.6	4	36.4	11
<b>Total</b>	<b>18</b>	<b>62.1</b>	<b>11</b>	<b>37.9</b>	<b>29</b>

**Association of Functional Outcome on OTA Classification**

$\chi^2 = .136$ , Degrees of freedom= 1, P value= 0.934.

As per OTA classification, there is no significant association between the type of fracture and functional outcome (p value- 0.934).

Fracture Pattern	Functional Outcome				Total
	Excellent		Good		
	Frequency	%	Frequency	%	
Comminuted	2	50.0	2	50.0	4
Oblique	8	57.1	6	42.9	14
Spiral	5	71.4	2	28.6	7
Transverse	2	100	0	0	2
Wedge	1	50.0	1	50.0	2
<b>Total</b>	<b>18</b>	<b>62.1</b>	<b>11</b>	<b>37.9</b>	<b>29</b>

**Association of Functional Outcome on Fracture Pattern**

$\chi^2 = 1.998$ , Degrees of freedom= 1, P value= 0.736

As per association of fracture pattern and the outcome, although statistics showed no significant association, transverse fracture showed excellent outcome, but it was not evident in statistics because there were only 2 cases. Spiral fractures also had a better outcome.

Fracture Pattern	Functional Income			Grand Total
	E	F	G	
	Percent	Frequency	Percent	
Lower third				
Type I	3	1	2	6
Type II	1		1	2
Middle third				
Type I	4			4
Type II	6		7	13
Upper third				
Type I	1			1
Type II	3		1	4
<b>Total</b>	<b>18</b>	<b>1</b>	<b>11</b>	<b>30</b>

**Association of Functional Outcome with Level of Fracture and G and A Classification**

Middle 1/3 fractures had a better outcome with type I constituting majority, upper 1/3 ranked 2<sup>nd</sup> and followed by lower 1/3.

Union (Weeks)	G and A Classification			
	Type I		Type II	
	Frequency	Percent	Frequency	Percent
Below 18	3	27.3	0	0
	4	36.4	12	63.2
Above 20	4	36.4	7	36.8
<b>Total</b>	<b>11</b>	<b>100</b>	<b>19</b>	<b>100</b>

**Association of Union and G and A Classification**

$\chi^2 = 6.120$ , Degrees of freedom= 2, P value= 0.049.

Majority of type I fractures united after 18 weeks and type II united at 18 - 20 weeks. Hence, it can be observed that there is no definite difference in union rates.

Infection	G and A Classification			
	Type I		Type II	
	Frequency	Percent	Frequency	Percent
No infection	11	100	15	78.9
Superficial infection	0	0	4	21.1
<b>Total</b>	<b>11</b>	<b>100</b>	<b>19</b>	<b>100</b>

**Association of Infection and G and A Classification**

$\chi^2 = 2.672$ , Degrees of freedom = 2, P value = 0.102

We also studied the relationship between infection rate and G and A classification. It is observed that there was no case of infection in type I fractures and there were 4 cases of mild superficial infection in type II fractures. Hence, it can be assessed that type I had a better outcome, even though there was no statistically significant relationship (p = 0.0102).

	No.	Type	Union (wks)	Infection (%)	Non-Union (%)	Malunion (%)	Joint Stiffness (%)	Compartment Syndrome (%)
Klemm and Borner (1986)	267	Closed Open G1	?	2.2	1.1	?	?	0.4
Henley (1989)	24	Closed Open (GI, II)	24	0	0	4.2	?	0
Court-Brown et al (1990a)	125	Closed Open G1	16.7	1.6	1.6	2.4	7.2	1.6
Alho et al (1990)	93	Closed Open GI, II	15	3.2	3.2	10.7	9.7	3.2
Hopper et al (1991)	29	Closed Open G1	15.7	0	0	3.4	13.7	3.4
Habernek et al (1992)	109	Closed Open GI, II	?	1.8	6.4	12.8	?	1.8
Present Study	30	Open	20.1	13.3	0	0	13.3	0

**Comparison to Previous Studies**

From the above table multiple factors like type of G and A, union, non-union, infection, malunion and joint stiffness compartment syndrome are compared with similar studies, our study results and observations are comparable with these studies except in one or two parameters due to less number of cases in our study group. Comparison to previous studies.

	No.	Type	Union (wks)	Infection (%)	Non-union (%)	Malunion (%)	Joint Stiffness (%)	Compartment Syndrome (%)
Court-Brown et al	41	G II-IIIb	33.2	9.7	36.3	4.9	36.6	0
Keating et al	47	G I-IIIb	30.2	6.4	9	4.2	28	2.1
Keating et al	112	G I-IIIb	32.8	5.4	8	6	14	7
Present Study	30	G I-II	20.11	13.3	0	0	13.3	0

**Compound Fracture Tibia treated by Reamed Interlocking Intramedullary Nailing**

From the above table we can observe that union, type, infection, non-union, malunion, joint stiffness etc. of our study is comparable to similar International studies.

**DISCUSSION**

Regarding Gustilo and Anderson Classification, Type II fractures predominated with 63.3% and Type I fractures comprised 36.7%. This is not coinciding with the finding of International study groups. In this study all the cases united irrespective of the G and A, OTA classification, Level of fracture and Mode of injury. Time of union ranges between 15 to 24 weeks with mean time of union is 20.10. Shortest time for a union was within 15 weeks (1 case), which was grade I G and A, middle 3<sup>rd</sup>, transverse, OTA-A fracture. Only 4

out of 30 cases were infected and they were all superficial infections. Those cases which were infected belonged to G and A type II, middle 3<sup>rd</sup> fractures. It is observed that deformities are very less with ILN tibia in the frontal plane. Mobility was assessed as a part of functional outcome evaluation serially at regular intervals after the surgery. Mild limping persisted in many of the patients due to lack of confidence, because all other parameters are within normal limits which will improve with time. Strenuous activities possible in 27 (90%) and limited in only 3 (10%). It is evident that ILN tibia is the implant of choice in type I and type II G

and A compound fracture tibia. The main complication of tibial nailing is knee pain. In this study, 11 (36.7%) patients have pain and 19 (63.3%) have no such pain. There is as yet no satisfactory explanation as to why patients get knee pain following tibial nailing.

When union rate correlated with G and A classification, it is evident that majority of type I fractures united after 18 weeks and type II united at 18 - 20 weeks. In our study we also analysed the influence of age in the final rating of outcome, it is observed that young age was found to be more responsive to the treatment as less than 40 years' age group comprised maximum of excellent rating category.

On analysing influence of level of fracture in final functional outcome, every patient responded well which was evident by the outcome rating both from functional as well as radiological scoring. Most of the patients were rated excellent after treatment. Irrespective of their level of fracture, they responded to the treatment well. Even though Chi-square analysis showed no significant (P value= 0.660) influence of level of fracture in the final rating of outcome, middle 3<sup>rd</sup> and upper 3<sup>rd</sup> fractures found to be more responsive to the treatment, as both these groups formed maximum of excellent rating category.

We also studied the relationship between G and A classification and functional outcome: It is found that most of the patients were rated excellent after treatment. Irrespective of G and A classification, they responded to the treatment. Even though Chi-square analysis showed no significant (P value= 0.149) influence of G and A classification in the final rating of outcome, grade I compound fractures were found to be more responsive to the treatment as grade I fractures formed maximum of excellent rating category. As per association of fracture pattern and the outcome although statistics showed no significant association, transverse fracture showed excellent outcome, but it was not evident in statistics because there were only 2 cases. Spiral fractures also had a better outcome.

In this study, association of functional outcome with level of fracture and G and A classification was also observed: Middle 1/3 fractures had a better outcome with type I constituting majority. Upper 1/3 ranked 2<sup>nd</sup> followed by lower 1/3.

## CONCLUSION

In this study, with regard to the use of interlocking intramedullary nailing in Gustilo and Anderson type I and type II compound fractures tibia the following conclusions are drawn.

Closed interlocking intramedullary nailing is an effective method of treatment for Gustilo and Anderson type I and II compound tibial diaphyseal fractures. It is based on the principle of promoting biological healing and allows gradual weight bearing. Closed nailing and static locking is a technically demanding procedure. Risk of exposure to radiation is there. This method offers the possibility of maintenance of length, alignment and rotational stability in fractures of the tibial shaft while preserving the biological environment of fracture healing. The fixation is rigid, hence there is no need for external immobilisation prior to callus formation and weight bearing.

Regarding wound management in type I and II fractures can be managed by emergency thorough wound debridement and lavage followed by serial debridement and wound care, antibiotics according to culture and sensitivity, infection rate was found 13.3%, all were only superficial infection.

Most common complication following IL nailing tibia is anterior knee pain (36.7%) followed by screw discomfort and superficial infection (13.3%).

To conclude the results in our study and other data support, the view that reamed locked intramedullary nail is a safe and effective technique for the management of Gustilo and Anderson type I and II open tibial fractures. It has the advantage over external fixation of being associated with a lower rate of malunion and need for bone grafting.

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