



Role of Fibular Osteotomy in Achieving Tibial Union

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KEYWORDS

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ABSTRACT:

Background: Tibial shaft fractures are among the most common long bone fractures, and early weight-bearing has been shown to increase the rate of bony union. However, an intact fibula can serve as a strut that distracts the tibial fragment and delays or prevents union. To address this issue, a fibular osteotomy has been performed, in which a segment of fibula measuring 1-2.5 cm in length is removed from middle one third of fibula and the patient is allowed weight bearing with PTB cast. This procedure has been effective in treating delayed and hypertrophic non-union by redistributing axial tibial loading.

INTRODUCTION:

Tibial shaft fractures are a frequent injury, early weight bearing can actually speed up healing. Here's the catch: a non fractured fibula or early union of fibula can act as a distracting device, which keeps the fractured fragments of the tibia separated, hindering or even preventing them from union. To overcome this obstacle, surgeons may perform a fibular osteotomy. In this procedure, a small section (1-2.5 cm) of the fibula near the fracture site is removed (close to middle one third of fibula), followed by PTB cast and weight bearing mobilization to tolerated level. By taking away this splinting effect, the fractured ends of the tibia can come into contact and result in union of tibia. This compression at the fracture site is key for stimulating bone growth and promoting healing. The osteotomy also disrupts the blood supply to the fibula, potentially redirecting blood flow and essential nutrients towards the tibia to further aid its healing process. This approach proves valuable in treating delayed unions (when healing takes longer than expected) and non-unions (complete failure to heal after a certain timeframe) of the tibia. It can even be beneficial in situations with excessive bone formation (hypertrophic non-union) that doesn't create a stable union. Overall, a fibular osteotomy helps by removing the barrier to proper

alignment and compression of the fractured tibia, ultimately promoting bone healing through both docking effect and potentially redirected blood flow.

MATERIALS & METHODS

Evaluation:

Upon their arrival, patients were evaluated to determine the cause of nonunion, specifically whether it was due to an intact fibula or a united fibula with a non-union tibia. Infection was also considered as a possible cause. To investigate the issue, X-rays of the leg were taken in anteroposterior and lateral views. Standard surgical profile were performed on all patients. Pre-operative anaesthetic and physician fitness assessments were conducted. The patients and their relatives were informed about the procedure, and written informed consent was obtained.

Surgical management:

A segment of bone measuring 1.5 to 2 centimeters long is removed from the middle third of the fibula. If an infected implant is present, it is removed. Additionally, if an infected pin tract or infected external fixator is present, it is removed and Patellar Tendon Bearing (PTB) cast is applied with a window for dressing for infected cases. If a non-infected dynamic interlocking nail is



present, nail is retained and proximal screws are removed and allowed to dynamization.

Post operative period:

According to POD #3 or POD #4, patients are permitted to bear weight as tolerated with a PTB cast. If an Interlocking nail is retained, patients are allowed to bear weight with it after dynamization of the nail by removing the proximal screws.

Inclusion criteria:

- Operated/non-operated patients with nonunion of tibia with intact fibula/ united fibula.
- Patients diagnosed with Tibial nonunion or delayed union, treated by interlocking nailing or external fixator.
- Infected nonunion.

The collected data was entered in Microsoft Excel. Coding of the variables was done. Analysis was done using SPSS software (Version 27, IBM). Descriptive statistics was used. Association between categorical test. The outcomes of the treatment groups were compared using a test to reach the hypothesis, P value less than 0.5 was considered significant.

RESULTS:

In this study, a summary of 20 cases of fibular osteotomy-treated non-union or delayed union of the tibia is given. Dynamic interlocking nailing or a PTB cast were sometimes used in conjunction with this treatment approach. In one non-union case, fibular osteotomy and TENS nailing to preserve position, in addition to a PTB cast, were used to address the condition because nailing was not recommended.

Table 1: Distribution based on age group

Age Group	Frequency
40-45	2
45-50	7
50-55	7
>55	4
Total	20

The data presented in the table categorizes a group of 20 individuals into different age ranges based on frequency. There are four age groups listed: 40-45, 45-50, 50-55, and those older than 55 years. The distribution shows that the 45-50 and 50-55 year age groups each contain the

highest number of individuals, with 7 people in each group. The 40-45 year age group has the fewest individuals, with only 2 people falling into this category. Additionally, there are 4 individuals who are older than 55 years.

Table 2: Distribution based on gender

Gender	Frequency
Male	12
Female	08
Total	20

Group consisting of 20 individuals, distinguishing between males and females. There are 12 males and 8 females in the group. This frequency distribution

highlights a slight gender imbalance in favour of males who constitute 60% of the total group, while females make up the remaining 40%.

Table 3: Distribution based on presenting side

Side	Frequency
Right	09



Side	Frequency
Left	11
Total	20

This information reveals a slightly higher inclination towards the left side within the group.

Table 4: Distribution treatment pattern

Treatment pattern	Number of cases
Fibular Osteotomy with Dynamic Interlocking Nailing	7
Fibular Osteotomy with PTB CAST	12
Fibular Osteotomy with TENS nailing and PTB CAST	1
Total	20

The distribution of treatment patterns for a group of 20 cases where different methods involving fibular osteotomy were used. Of these, 7 cases underwent treatment through fibular osteotomy combined with dynamic interlocking nailing, making this the second most common treatment method. The most frequent approach, used in 12 cases, was fibular osteotomy accompanied by a PTB (Patellar Tendon Bearing) cast. This indicates a preference or suitability of this method for a majority within this sample. Only 1 case was treated using a combination of fibular osteotomy with TENS (Titanium Elastic Nailing System) nailing and a PTB cast, suggesting this method is less common or selectively applied. This distribution provides insights into the prevalence and choice of treatment options in clinical practice for conditions involving the fibula.

DISCUSSION:

The present study provides an overview of 20 cases in which non-union or delayed union of the tibia was treated with fibular osteotomy. In certain instances, this treatment modality was combined with either a PTB cast or dynamic interlocking nailing. One case involving non-union, where nailing was contraindicated, was managed with fibular osteotomy and TENS nailing to maintain position, along with a PTB cast. All of these cases achieved union within six months, as demonstrated by the radiographic disappearance of the non-union site's gap. It is noteworthy that no bone grafting was required in any of these cases. Upon clinical evaluation, the patients reported no pain or tenderness at the non-union site and were able to bear weight without discomfort. Additionally, they experienced no limitations in knee or ankle movements.



Both bone leg – IL nailing done elsewhere. Nail removed due to infection



Fibular osteotomy done , PTB cast with window for dressing. Union in progress



Complete union achieved

Patient is able to weight bear and walk without pain

All patients underwent dynamization following Fibular Osteotomy, which led to the collapse of the tibial non-union site and subsequent bony union of the tibia was seen on serial X-rays.

Conclusion:

Fibular Osteotomy is a proven and straightforward technique for achieving Tibial union.

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