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Research Article

Minimally Invasive Techniques in Proximal Tibial Fracture

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Abstract: A series of 20 patients of proximal tibial fractures treated with minimally invasive techniques have been reviewed after surgery. All the operations were performed using image intensification to aid reduction of the fracture by ligament taxis and to guide screw placement. 16 patients with minimally displaced or undisplaced fractures were treated with closed reduction and internal fixation with cannulated or cancellous screw. 4 patients with comminuted fractures were treated with buttress plating. Out of 20 patients, 16 had excellent results, 3 had good results and 1 patient had a fair result. Two patients had superficial wound infection and two patients had palpable screw. This minimally invasive technique avoids many of the complications of both conservative and operative treatment and will have an expanding role to play in the management of these fractures.
Keywords: Minimally invasive technique, proximal tibia, buttress plating.

INTRODUCTION

Fractures of the proximal tibia continue to be challenging clinical problems. Although techniques of open reduction and internal fixation have progressively evolved, these injuries often present particular difficulties [1-4]. The overlying soft tissues are thin and do not accommodate significant amount of hardware well. Swelling, as well as associated contusions and abrasions, may jeopardize the soft tissue flaps typically necessary for adequate exposure. Extensive stripping of the bone has the potential for avascular necrosis with subsequent collapse. In addition, these fractures often occur in older individuals, wherein osteopenia may make extensive internal fixation difficult [5-6]. Minimally invasive techniques are being developed and utilized in all branches of surgery. The advantages of reduced morbidity and decreased hospital stay are well documented [7-12]. Minimally invasive techniques and its usefulness in proximal tibial fracture is presented here in this article.

MATERIAL AND METHODS

Twenty patients with proximal tibial fractures were treated with minimally invasive techniques in Department of Orthopaedics, Government Medical College, and Jammu. Patients ages ranged from 20 to 56 years (average: 36 years). There were 17 males and 3 females. Thirteen fractures occurred in motor vehicle accidents, 5 in falls and 2 in direct blow. Patients were operated under general or spinal anaesthesia. The tibia could be reached easily through an antero medial approach without damaging any important structures. The patients were placed supine on a fracture table. Incision was made proximal to the fracture site and buttress plate inserted through this incision, slided subcutaneously across the fracture site to reach distal fragment. This plate was contoured precisely to conform to the condyle and proximal metaphysis and secured to the condyle with appropriate cannulated and cancellous screws of sufficient length to engage the opposite cortex. In the distal fragment the plate was secured with a minimum of three cortical screws, thus bypassing the fracture. If fracture consisted of only single fragment with no comminution, with little or no depression, percutaneous fixation with cannulated screws/cancellous screws was done. In case of osteoporotic bone, washers were used [7-13]. The postoperative regimen was individualized depending on the patient's age, quality of bone and stability of fixation. In general the policy was for early range of motion, exercise and non-weight bearing for 2 month period. Final evaluation was done at 9 months as per 100 point scale. 45 points were given to function, 30 points to subjective factors, and 25 point to anatomical restoration [14].

100 POINT RATING SCALE FOR PROXIMAL TIBIAL FRACTURES

A. SYMPTOMATIC (MAX. OF 30 POINTS)

1. Pain (max. of 20 points)	Points
None	20
Wet weather ache	18
After hard use	16
Limits use	14
Painful walking	10
Limits walking	05
Continuous pain	00

2. Activity level (max of 5 points)	Points
Unlimited	5
Limited in sports	4
Limited in jogging	3
Limited in walking	2
Cane/Brace needed	0

3. Patient Assessment (max. of 5 points)	Points
Normal knee (100%)	5
Near normal (90%)	4
Good (>75%)	3
Fair (50-75%)	1
Poor (<50%)	0

B. FUNCTIONAL (MAX. OF 45 PONITS)

1. Knee Flexion (max. of 30 points)	Points
> 135 degrees	30
120-134 degrees	26
105 – 119 degrees	23
90 – 104 degrees	20
75 – 89 degrees	15
60 – 74 degrees	10
< 60 degrees	05
Ankylosed	00

2. Extension (Max. of 10 points)	Points
Full extension	10
Lacks 1 – 5 degrees	05
Lacks 6 – 10 degrees	02
Lacks more than 10 degrees	00
3. Crepitus (Max. of 5 points)	Points
No crepitus	05
Clicking	04
Occasional locking	03
Constant crepitus	01

C. ANATOMIC (MAX. OF 25 POINTS)

1. Angular deformity (max. of 10 points)	Points
No deformity	10
5 degrees	08
10 degrees	05
15 degrees	02
20 degrees or more	00
2. Instability (Max. of 10 points)	Points
No instability	10
5 degrees	08
10 degrees	05

15 degrees	02
20 degrees or more	00
3. Arthritis (Max. of 5 points)	Points
None	05
Mild	04
Moderate	02
Severe	00

RESULT:	POINTS
Excellent	90-100 points
Good	80-89 points
Fair	70-79 points
Poor	Less than 70 points

RESULTS

Most of the patients were in age group of 20-40 years (70%) with mean age of 36.1 years. Male predominate the study (70%). Road traffic accidents were found to be the commonest mode of trauma (65%). Right limb was involved more often (60%) than the left. CRIF with buttress plate was done in 16 cases and CRIF with cannulated screws was done in 4 cases. The time taken for partial weight bearing ranged from 6 weeks to 14 weeks. The mean time for starting partial weight bearing was 9.85 weeks. The time taken for full weight bearing ranged from 12 weeks to 22 weeks. The mean time for starting full weight bearing was 17.15 weeks. The time interval for complete union ranged from 13 weeks to 22 weeks. The mean interval for radiological union was 17.55 weeks. Full range of knee flexion was achieved in 13. No case had flexion less than 105˚. Two cases had extensor lag of 5˚ and full extension was achieved in 18 cases. There were 2 cases of superficial wound infections and one case of protruding screw which caused irritation. Overall there were 16 excellent, 3 good and 1fair results. No case had poor result.

DISCUSSION

Minimally invasive methods of fixation are newer and technically more demanding. Indirect reduction techniques were developed to reduce soft tissue elevation at the fracture site and to improve the rate of fracture healing [11]. These techniques in addition reduce the overall incidence of infection, refracture and need for autogenous bone grafting [1, 2, 15] as is seen in our study. The perforators as well as the nutrient arteries are well preserved by this method if plate is inserted carefully [10-13].

Fig-1: X-ray showing proximal tibial fracture

Fig- 2: X-ray showing union

The bone healing is excellent with this type of fixation because the stresses are distributed over a longer segment of bone and the stress per unit area on the plate is lower if the segment without screws is longer. Thus, the good results obtained by this method as evident from this study also can be explained by a combination of rapid fracture consolidation due to preserved vascularity and a greater resistance of plate of fatigue, since the stress is distributed over a longer length of plate [1,3,15]. This technique can be used in fractures where locked nailing cannot be done like vertical slit and markedly comminuted fractures [16]. There is rapid fracture consolidation due to preserved vascularity. There are fewer incidences of delayed union and non-union. There is decreased need for bone grafting. There is less incidence of infection due to limited exposure as is seen in this study in which only 2 cases of superficial wound infection. There are less chances of refracture. There is no chance of vascular complication by carefully inserting the plate sub muscularly through limited incisions. There is no need of any specialized instrumentation and the method is less time consuming and cost effective [9, 17]. Although minimally invasive technique is still in its infancy, it is expected to develop rapidly because the method seems to avoid major soft tissue complications and shortens the length of the patient's stay in the hospital.

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