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### A study of management of fracture proximal tibia by different modalities

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#### Abstract

In the 1990s, Krettek *et al.* popularized Minimally Invasive Percutaneous Plate Osteosynthesis Techniques using conventional implants placed through small incisions and submuscular (subcutaneous) tunnels. Cadaveric studies demonstrated better preservation of periosteal vasculature with these minimally invasive methods than with standard open exposures for internal fixation. As part of the continued development of Biologically Friendly Plating, and to facilitate Minimally Invasive Plating Techniques, the use of plates that allow screws to lock into the plate to create a fixed angle construct is gaining popularity nowadays. Several different surgical approaches have been described for Proximal Tibial fractures (medial, lateral and combined) depending on the location of the fracture. Combined extensive approaches, in particular, are associated with high complication rates, possibly due to compromised soft tissue perfusion and/or extensive soft tissue stripping from bone fragments. A review of the recent literature demonstrates a trend toward increasingly limited open reduction and internal fixation, often in association with some form of external stabilization. Minimally invasive techniques have also been described for intra-articular fractures (metaphyseal and diaphyseo-metaphyseal) of the proximal tibia. These techniques avoid the long incisions and extensive soft tissue stripping associated with conventional techniques and are best used with shorter, lower profile plates.

**Keywords:** Proximal, tibia, modalities of treatment, fracture

#### Introduction

In the 1990s, Krettek *et al.* popularized Minimally Invasive Percutaneous Plate Osteosynthesis Techniques using conventional implants placed through small incisions and submuscular (subcutaneous) tunnels. Cadaveric studies demonstrated better preservation of periosteal vasculature with these minimally invasive methods than with standard open exposures for internal fixation. As part of the continued development of Biologically Friendly Plating, and to facilitate Minimally Invasive Plating Techniques, the use of plates that allow screws to lock into the plate to create a fixed angle construct is gaining popularity nowadays. Several different surgical approaches have been described for Proximal Tibial fractures (medial, lateral and combined) depending on the location of the fracture. Combined extensive approaches, in particular, are associated with high complication rates, possibly due to compromised soft tissue perfusion and/or extensive soft tissue stripping from bone fragments. A review of the recent literature demonstrates a trend toward increasingly limited open reduction and internal fixation, often in association with some form of external stabilization. Minimally invasive techniques have also been described for intra-articular fractures (metaphyseal and diaphyseo-metaphyseal) of the proximal tibia. These techniques avoid the long incisions and extensive soft tissue stripping associated with conventional techniques and are best used with shorter, lower profile plates.

The knee joint is complex joint and is also commonly injured joint because of increased vehicular trauma and sports related injuries. Being superficial joint and more exposed to external forces, this joint easily gets injured <sup>[1]</sup>. The knee joint is one of the three major weight bearing joint in the lower extremity. Fractures that involve proximal tibia affect knee function and stability. These fracture can either be intraarticular or Extraarticular <sup>[2]</sup>. Intra-articular fractures of proximal tibia are difficult to treat. Age, skin conditions, osteoporosis further increase the obstacles in the healing process. Various modalities of treatment are available but no ideal treatment has yet evolved.

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At the Chicago Orthopedic society in 1956 Manson Hole has rightly mentioned that “these fractures are tough” Complex kinematics of its weight bearing position and complex ligamentous stability and articular congruency are the main reason why these fractures are of concern to surgeon and cause disability to the patients. The mobility and stability of the lower limbs mostly depends upon a stable and functional knee joint. Various studies have been carried out and different treatment modalities have been advised, consensus has not been reached. Emphasizing on good functional outcome being most satisfying for the patient, we started our study with an aim to study different available modalities for treatment of intraarticular proximal tibia fracture and observe functional outcome after their implication. Extraarticular fractures of proximal tibia occur only in 5% to 11% of all tibial shaft fractures. As they often are the consequence of high energy transfer, a highly unstable situation with bone fragmentation and extensive soft tissue damage may result [3]. Treatment of these injuries is challenging and is associated with higher rates of complications than diaphyseal tibia fractures [4]. The goals of surgical management include correction and maintenance of sagittal and coronal alignment, restoration of length and rotation, and early functional knee and ankle range of motion. Treatment options include medullary implants, half pin external fixation, hybrid or thin wire external fixations, plate fixations, or combination techniques [5]. Recent design changes to intramedullary nails (IMNs) and adjunctive fixation techniques have definitely increased the popularity of IMN for the treatment of this fracture. Similarly the development of percutaneous biological plating has allowed surgeons to treat these complex fractures without the need for large incisions or fear of soft tissue stripping with subsequent failure due to infection and non-union [6]. In most instances, intramedullary nailing has become the method of choice for the fixation of diaphyseal tibial fractures and has been extended to the treatment of proximal fractures. Reports have show a high incidence of malalignment and loss of fixation associated with intramedullary nailing of proximal metaphyseal fractures [7]. Minimally invasive plate osteosynthesis techniques have recently been applied to fractures of proximal and distal tibia. Recently, the use of plate fixation utilizing minimally invasive techniques has been put forward as one way maintaining alignment in proximal tibial fractures [8]. The purpose of this study is to study the available modalities of treatment of proximal tibia fracture in this institute and observe their functional result.

**Aims and Objectives**

To observe functional outcome of each modality used for treatment of intraarticular and extracapsular proximal tibia fractures.

**Materials and Methods**

This study was done in the Department of Orthopedics, Kanachur Institute of Medical Sciences, Mangalore. The study was done from 2014 to 2015. The functional outcome was measured and reported.

**Exclusion criteria**

- Patients on immunosuppressants

**Results**

**Table 1:** Intra-articular fractures

Sex	Males	Females	Total
No	18	9	27

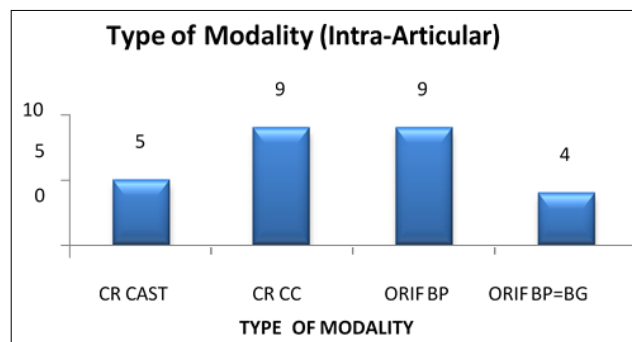
**Table 2:** Extra-articular fracture

Sex	Male	Female	Total
NO	16	7	23

**Treatment Modalities**

**Table 3:** Intra-articular fractures

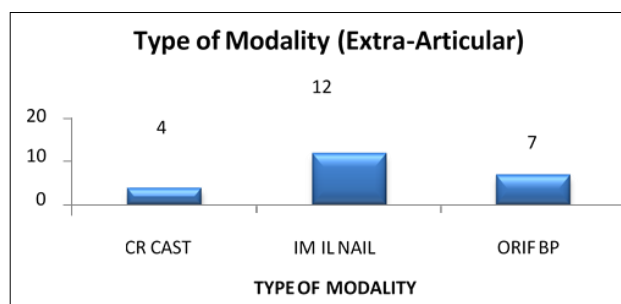
Type of Modality	CR CAST	CR CC	ORIF BP	ORIF BP+BG	Total
No	5	9	9	4	27



**Graph 1:** Type of Modality (Intra-articular)

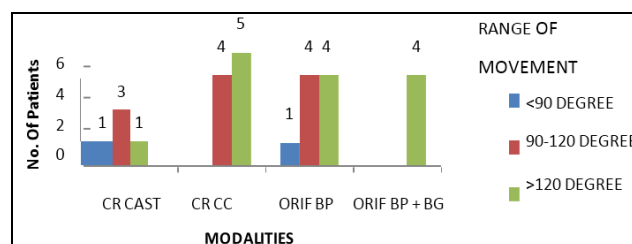
**Table 4:** Extra-articular fractures

Type Of	CR	IM IL	ORIF	Total
NO	4	12	7	23

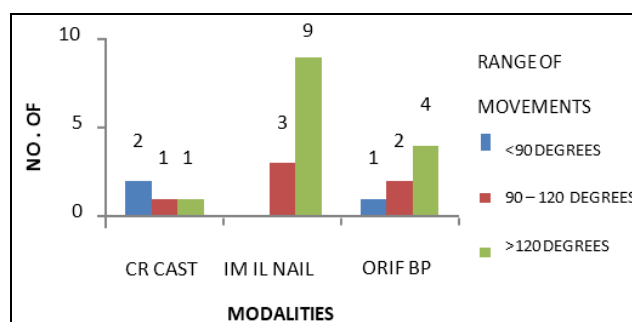


**Graph 2:** Extra-articular fractures

**Range of movements**



**Graph 3:** Intra-articular



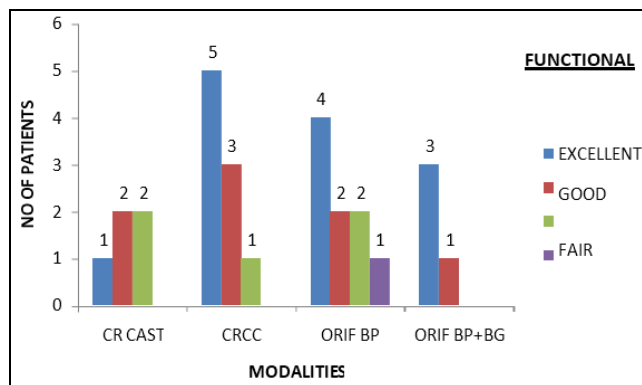
**Graph 4:** Extra-articular fracture

**Functional outcome**

Functional outcome was evaluated by modified Hohl M. And luck evaluation method. Outcome was classified as Excellent > Good > Fair > Poor

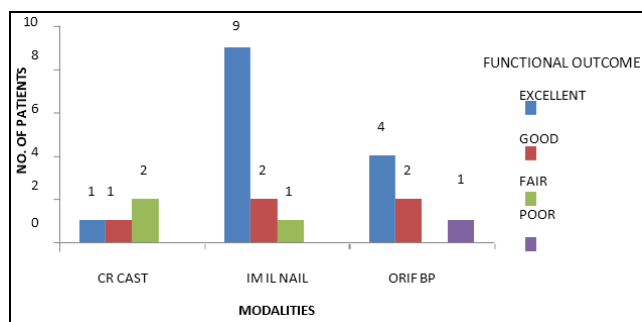
**Acceptable:** Excellent + Good

**Unacceptable:** Fair + Poor



Graph 5: Intra-articular fracture

**A. Extra-articular fracture**



Graph 6: Extra-articular fracture

**Discussion**

The knee joint is one of the three major weight bearing joint in the lower extremity. Fractures that involve proximal tibia affect knee function and stability. These fracture can either be intraarticular or Extraarticular. Intra-articular fractures of proximal tibia are difficult to treat. Age, skin conditions, osteoporosis further increase the obstacles in the healing process. Various modalities of treatment are available but no ideal treatment has yet evolved. At the Chicago Orthopedic society in 1956 Manson Hole has rightly mentioned that “these fractures are tough” Complex kinematics of its weight bearing position and complex ligamentous stability and articular congruency are the main reason why these fractures are of concern to surgeon and cause disability to the patients. The mobility and stability of the lower limbs mostly depends upon a stable and functional knee joint. In most instances, intramedullary nailing has become the method of choice for the fixation of diaphyseal tibial fractures and has been extended to the treatment of proximal fractures. Reports have show a high incidence of malalignment and loss of fixation associated with intramedullary nailing of proximal metaphyseal fractures [7]. Minimally invasive plate osteosynthesis techniques have recently been applied to fractures of proximal and distal tibia. Recently, the use of plate fixation utilizing minimally invasive techniques has been put forward as one way maintaining alignment in proximal tibial fractures [8]. The purpose of this study is to study the available modalities of treatment of proximal tibia fracture in this institute and observe their functional result.

Various modalities for the treatment of tibial plateau fractures have been proposed. Earlier the treatment of these fractures was mostly by closed reduction and immobilization with plaster cast. LaMotte 6 in 1890 treated oblique tibial intra articular fractures with wires and screws. Keetley [6] in 1899 described open reduction and wires for lateral condylar fractures. Sir Robert Jones [7] in 1920 noted in an article by W.H. Threthrowan, the importance of realigning the intra articular fractures of proximal tibia by open reduction and fixation by bone pegs and long screws. He also mentioned the need for elevating the depressed fragments from the tibial shaft. Wilsons and Jacobs [8] in 1952 used the articular surface of the patella for replacing the severely depressed comminuted fractures of lateral condyle. Graham Apley [9] in 1956 studied 60 cases of lateral condyle fractures with long term results. He managed these fractures conservatively with skeletal traction and physiotherapy without any internal fixation. One year follow up of 41 patients, 22 were excellent, 15 good and 7 fair and 1 poor. He recommended early motion with traction as a satisfactory method for the management of lateral condyle fractures. Rasmussen S. Poul [10] and Gothenburg in 1973 followed a series of 260 fractures of one or both condyles. The main indication for surgical treatment was evidence of instability of extended knee. They treated 44% of patients with either closed traction reduction or internal fixation using a wire loop or open reconstruction of joint surface using autogenous bone grafts. Follow up of 87% of these had an acceptable knee function.

**Conclusion**

ORIF BP is an effective modality for treatment of Extra-articular proximal tibia fractures, if used for less comminuted fracture types. Although detailed study with larger sample size will be necessary to confirm our result.

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