

A New Device for Percutaneous Elevation of the Depressed Fractures of Tibial Condyles

V.S. Ravindranath¹, Madhusudan Kumar¹, G.V.S.Murthy¹

Abstract

Introduction: Monocondylar tibia plateau fractures with non-comminuted fragments can be treated using percutaneous screws. Currently indirect methods of reduction are used and thus the technique is limited to fragments with less than 5 mm depression. The first author has designed a device for direct elevation and reduction of the fragments thus potentially expanding the indications of percutaneous screws to fragments with >5mm depression

Technical Note: A total of ten cases were treated by this method of percutaneous elevation of the depressed fractures of lateral condyles of the Tibia using this device. Device was inserted through a bony window on the anteromedial surface of tibia. The inner piston of the device is slowly hammered inside thus elevating the depressed fragment. Elevation of fragment could be achieved in all the cases. The fractures were fixed with cancellous screws applied percutaneously. There were no cases with loss of fixation or subsidence of the fragment. All cases achieved radiological union and have good knee function at follow up

Conclusion: The new device is able to elevate unicondylar tibia plateau fragments with no subsidence or loss of fixation in our series. A longer follow up in a larger sample will be needed to establish the technique.

Keywords: Depressed lateral condylar fractures of Tibia, new device.

Introduction

The tibial plateau fractures are still a challenging problem and demand an aggressive management as any other intra-articular fractures of the joints. Before the advent of the recent advances conservative management was the treatment of choice resulting in joint stiffness which was very crippling to the patient. The thorough understanding of the classification the Tibial plateau fractures based on the recent investigations, has opened the gates for better management. The amount of depression and the displacement of the condylar fractures, articular incongruity can be well assessed nowadays. Schatzker classification is the most accepted classification currently

and type I to IV fractures are associated with angulated or depressed fractures of either of the one condyle [1]. In cases with large single peripheral fractures a closed reduction may be attempted with percutaneous fixation in these unicondylar fractures [2,3]. Most papers describe indirect method of reduction of these fragments via ligamentotaxis and thus limit themselves to depression <5 mm [4]. We designed a new device to achieve direct elevation of these fragments and thus use the percutaneous technique in depression >5mm. The present paper discusses the usefulness of the device in elevation of the depressed condyles with a small window (very minimal incision).

Technical Note

Device: The device is designed by first author [VSR] indigenously with 316 SS alloy. It has two components: an outer sleeve and an inner piston. The diameter of outer sleeve is 11mm and the wall thickness of the sleeve is 1mm. The diameter of the solid piston is 10mm and it freely moves to and fro in the outer sleeve (Fig. 1)

¹Osmaia Medical College, Hyderabad, Andhra Pradesh, India

Address of Correspondence

Dr. V. S. Ravindranath, MS (ortho),
Plot No: 50, Srinivasa nagar Colony West,
S.R. Nagar, Hyderabad, 500038, AP.
E-mail: drravivutukuru@gmail.com
Phone No: 98493 86816.



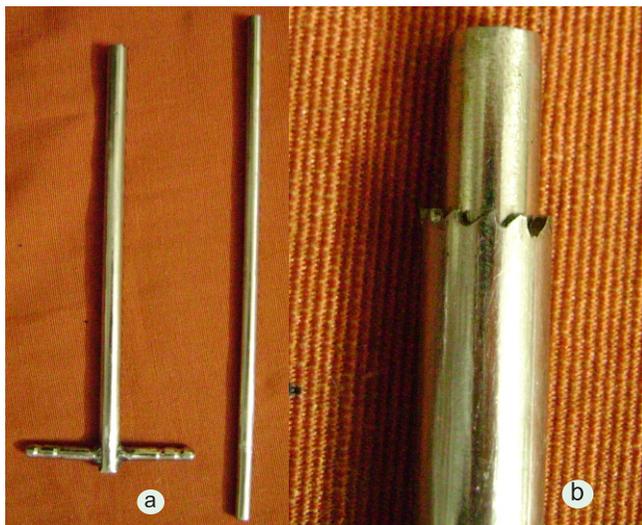


Figure 1. a- The device with the sleeve and the piston. b- closer view of the tip of the device. The serrated edges of the sleeve help in insertion in the metaphyseal area

Surgical steps: Ten male patients (age between 25-40 years) were operated using this device. There were 4 Schatzker type II and 6 type III fracture. All patients were operated early within day 2 to day 3 post-injury. We excluded cases with comminuted fracture fragments. Under aseptic conditions and under image control first the direction elevation was assessed by a guide wire passed through a drill hole on the antero medial aspect of the upper one fourth of the Tibial metaphysis (Fig. 2a,b). A small incision of two centimeters was made over the drill hole. A bone window sufficient to accommodate the outer sleeve is made round the guide wire. The sleeve is directed over the guide wire. The sleeve was advanced 1cm into the intramedullary canal. Then the piston was pushed into the sleeve and the piston was tapped towards the depressed fracture carrying a cylindrical cancellous plug of the bone to elevate the fracture condyle till plateau is congruous which was checked under the C-arm image in both views (Fig. 2c). Next again under C-arm control a guide was

passed perpendicular to the fracture line of the condyle keeping the piston in the intramedullary canal. A cancellous screw was threaded over the guide wire to fix the fracture (Fig. 2d). We had used two screws in majority of the cases with one screw used in one case, depending on size of the fragment. The device was withdrawn after the fracture fixation. We were able to achieve good articular reduction in all our cases by use of this technique. Skin incisions were closed (Fig. 2e). Only soft padding dressing was applied. Post operatively non weight bearing ROM started on the 2nd day onwards. Weight bearing was allowed after the radiological union was present i.e after 8 weeks. In this buttressing with a plate was not needed as we felt the fixation achieve was stable enough and also weight bearing was delayed allowing for healing of the fracture. Early results are encouraging with all cases achieving radiological union and good knee range of motion. There were no cases of loss of reduction or any other complications although a longer and more detailed prospective follow up will be required to establish the potential clinical importance of the device.

Discussion

Percutaneous screw fixation in cases on monocondylar tibia fractures will prevent the morbidity associated with open procedure and is less expensive too [5]. A lot of case series describe percutaneous screw fixation however these are based on indirect reduction techniques and are limited to depression less than 5 mm [1-6]. We felt a device which can directly help in elevating the fragment to achieve intraarticular reduction will definitely expand the indication of this minimally invasive technique. Our device is simple and can be inserted using small incision. The solid inner rod compresses the metaphyseal cancellous bone thus “compacting” it below the subchondral area. This is enough to help in elevating an

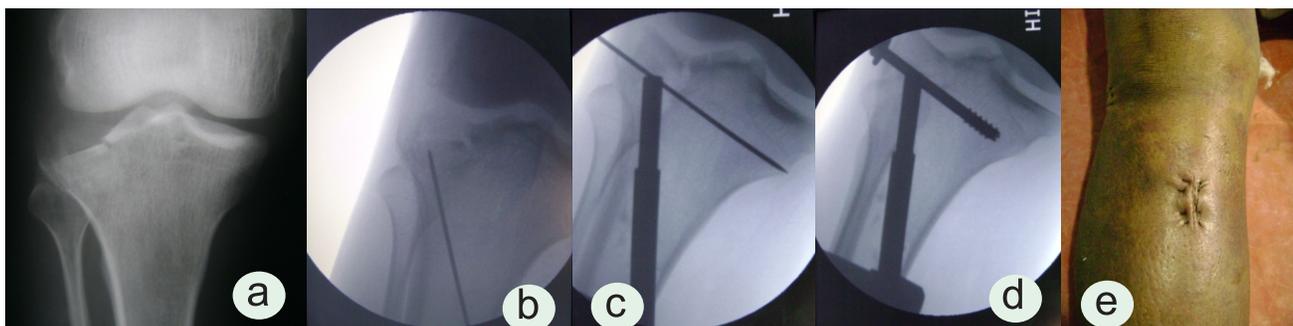


Figure 2. a-Lateral condyle tibia fracture. b-guidewire passed through the anteromedial cortex of tibia reaching the depressed fragment. c- the sleeve is then inserted over the guidewire through cortical window. After elevation of the fragment another guidewire is passed through the fragment over which a 6mm cannulated cancellous screw is passed percutaneously-d. closure of the wound.

entire segment or condyle. We found this technique to be useful in 10 of our patients to achieve reduction. However most of our patients were young and were operated within a day or two of injury, thus usefulness of this device in older injuries and older patients (with osteoporosis) is yet to be defined. A long term follow up, a larger size sample and report of reproducibility of this device by our peers will be essential to confirm the potential usefulness of this device.

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