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Technical Note

Expanding indications of the horizontal belt plate: A technical note

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ABSTRACT

Background: Although the standard treatment for articular fractures usually involves open anatomic reduction and internal fixation with the concept of absolute stability, achieving adequate fracture stabilisation in multifragmentary patterns is always challenging. Several anatomical implants were developed to increase stabilisation and improve clinical outcomes in articular fractures. However modern implants, especially in developing countries, are expensive and not always available for routine use. Horizontal rafting plate has recently emerged as an alternative technique to treat complex tibial plateau fractures using simple implants that function as a large washer.
Objective: This technical note aims to describe horizontal belt plate use for treatment of periarticular fractures including the tibial plateau, thereby expanding its initial indication.
Conclusion: Horizontal belt plate is an effective, safe, and inexpensive treatment alternative for complex articular fractures. However, the surgeon must carefully analyse the fracture pattern to verify if the horizontal belt plate can be used alone or with traditional techniques.

Introduction

Articular fractures require absolute stability that can be achieved using open or percutaneous reduction, interfragmentary compression, and early mobilisation. However, in multifragmentary patterns, fracture compression is contraindicated due to articular surface shortening [1–5]. In this situation, positioning screws can be applied to sustain the reduction. Several modern periarticular precontoured locking compression plates were developed to fix periarticular fractures. Implants with low profile, anatomical shape, and several locking screws in different planes promote adequate stability, allowing early articular mobilisation and ultimately improving functional outcomes.

However, sophisticated implants are frequently unavailable for fracture fixation, especially in countries with limited financial resources.

Bermúdez et al. [1] described the use of a horizontal rafting plate for treatment of complex tibial plateau fractures. In the original technique, the authors bent a traditional reconstruction plate contouring the tibial plateau. The implant functioned as a large washer. The objective of the technique was to enable several screws in different planes through the plate, functioning as a raft to prevent articular depression. The authors also emphasised the possibility to avoid additional posterior approaches for complex tibial plateau fractures when using this technique.

The present study aims to report horizontal belt plate use in periarticular fractures including the tibial plateau, consequently expanding its indication.

Discussion

The standard treatment for articular fractures is anatomical reduction and fracture compression achieving absolute stability [6,7].

Precontoured locking plates increase stability and allow early articular mobilisation, improving functional outcomes. However,

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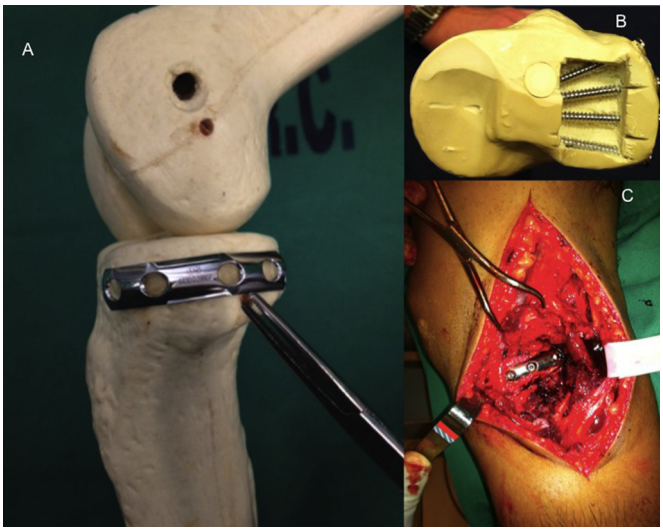

Fig. 1. (A) 1/3 tubular plate bent around the tibial plateau, functioning as a large washer. (B) Positioning screws in different planes, working as a subchondral raft. (C) Perioperative image showing fibular neck osteotomy and fixation of the tibial plateau with the horizontal rafting plate.

due to their elevated cost, sophisticated implants are sometimes unavailable for the orthopaedic surgeon.

Horizontal rafting plate has emerged as an inexpensive and effective technique, using traditional bent plates to follow the epiphyseal outline. Since the horizontal rafting plate description by Bermúdez et al. [1], its use has gradually become more popular among orthopaedic surgeons worldwide.

The technique consists of fracture reduction and temporary fixation with K-wires. Subsequently, the fracture is fixed with 1/3 tubular plate which is bent to follow the epiphyseal outline, thereby functioning as a large washer. This construction increases stability with several screws in different planes, avoiding secondary fracture depression (Figs. 1 and 2).

Complex fractures of the distal femur are sometimes difficult to fix, even using modern implants. Considering the Hoffa pattern present in 38% of distal femur fractures, treatment remains challenging and almost always requires different techniques to fix all fracture fragments [4]. Especially in this particular fracture pattern, the horizontal belt plate is a valuable treatment alternative in combination with traditional anterior to posterior fixation using lag or positioning screws (Fig. 3).

The same concept could be applied to tibial pilon fractures. High-energy trauma usually leads to complex fracture patterns (AO type C), and the treatment can require more than one approach and several plates in different positions [8]. The horizontal plate can be either used isolatedly or in combination with other implants as an alternative method, notably in comminuted fractures involving the anterior rim of the tibial pilon (Fig. 4).

Another unusual application of the horizontal belt plate is to improve stability in fractures around intramedullary implants and periprosthetic fractures. In these cases, the fixation is frequently possible only using unicortical locking screws. Depending on the screw number in the proximal part of the locking compression plate, cerclage wiring may be necessary to complement fixation, achieving adequate stability. Alternatively, the horizontal belt plate can be used perpendicularly over the locking compression plate, allowing fixation with bicortical screws at the anterior and posterior cortices of the femur (Fig. 5).

The present study showed the broadening of horizontal belt plate use, not only applied to tibial plateau fractures, but also to tibial pilon, distal femur, proximal humeral fractures (Fig. 6), and

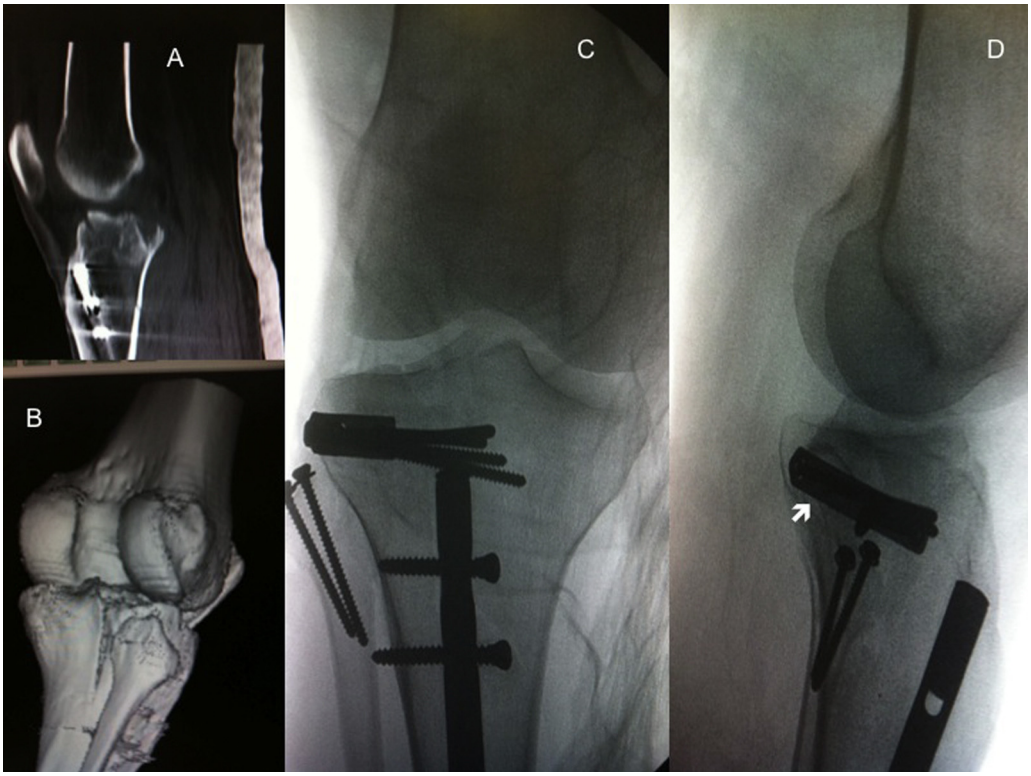

Fig. 2. (A and B) CT scan showing posterior fracture of the tibial plateau in a patient with healed tibial shaft fracture treated by intramedullary nailing. (C and D) Postoperative images in anteroposterior and lateral views showing the horizontal plate with satisfactory reduction of the tibial plateau. Bone graft was necessary to fill the subchondral gap (white shadow). The fibular neck osteotomy was fixed with two lag screws.

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