Intra-Articular Cutout Of Locking Plate Into The Ankle Joint In An Osteoporotic Bone, An Unusual Complication

S Umrani, A Pispati

Citation

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Abstract

Locking plates are indicated for comminuted intra-articular fractures, peri-articular fractures and fractures in osteoporotic bones. We describe a case of an adult with osteoporosis and fracture of his left tibia & fibula, which was treated with a locking plate and report a cutout into the ankle. We try to determine its causes and suggest preventive measures in order to avoid the same.

STUDY CONDUCTED AT

Jaslok Hospital & Research Centre, Dr. G. Deshmukh Marg, Mumbai, 400 026. INDIA.

INTRODUCTION

A 50-year-old man presented with a grade I (Gustilo & Anderson) [12] compound fracture of distal fourth of his left tibia & fibula, which had been conservatively treated, wherein the wounds had healed but the fracture had failed to unite. His radiographs showed generalized osteoporosis in addition to failure of union.

Figure 1

Figure 1: Radiograph of left leg showing fracture of the distal fourths of the tibia and fibula with osteoporosis. (At the end of conservative treatment in plaster.)

He was then treated with open reduction & internal fixation

wherein his fibula was fixed with a one-third tubular plate and the tibia with a contoured combination locking plate. Both, tibia & fibula were grafted with autologous bone grafts from his iliac crest.

Figure 2

Figure 2: Radiograph of left distal tibia and fibula taken immediately after fixation and bone-grafting. The implant is in situ and the alignment is well maintained.

He was then immobilized in below-knee casts after his wounds healed and gradually mobilized thereafter. Four months since, he complained of pain in his right ankle, which was aggravated on walking & weight bearing. The radiographs taken subsequently showed that the distal locking screw had cut through the tibial plafond into the ankle joint and was leading to cartilage erosion of the talar dome.

Figure 3

Figure 3: Radiograph of left distal tibia and fibula taken four months post- operatively showing cutout of the distal screw into the ankle causing cartilage erosion of the talar dome.

DISCUSSION

A locking plate is one that allows the placement of fixed-angle/angular-stable screws. It does not require compression of plate on the bone; nor relies on friction at the bone-plate interface. So, the screws do not toggle and there is no plate loosening due to screw pullout. This feature allows unicortical or bicortical screws to be placed and the plate to be placed safely away from the bone thus preserving its periosteal blood supply. Thus, it becomes helpful in many problem situations like comminuted intra-articular fractures; short segment peri-articular fractures & fractures in osteoporotic bones which can be safely treated. [3] The fracture in our case was a delayed/nonunion in an osteoporotic bone in the metaphyseal region close to the tibial plafond. It was fixed using the bridging principle & bone grafted. This provided a very rigid stability & was expected to enhance the chances of its union. Also, the contouring of the combi-plate was done at the dynamic holes in order to minimize plate weakening, breakage or pullout of the construct.

A locked plate controls the axial orientation of the screw to the plate producing a single beam construct in which there is no motion between the components of the beam, i.e. the plate, the screws & the bone. This enhances the screw-plate-bone construct stability so much that the construct is four times stronger than load-sharing beam constructs where motion occurs between the individual components of the beam construct. [4] The stability across the fracture is a function of the mechanical properties of the plate, which acts as an “internal-external fixator”. Also, it is more rigid due to

its close proximity to the bone. [3,5,6]

We believe that a combination of multiple factors, viz., a construct which was too rigid for the given bone, a non-compliant patient bearing weight prematurely, and, a possibly poor hold in the metaphyseal bone resulted in the intra-articular cutout of the screw on early weight-bearing. Also, locking screws with cancellous threading were unavailable at the time of surgery leading to use of locking screws with cortical threading, which could have contributed to a poorer hold in the distal fragment. On the other hand, if a conventional plate or buttress plate had been used instead of a locking plate, the screws would have loosened and the plate would have backed out, but the screws would not have cut-out in to the ankle joint. [7]

As a single beam construct, a locked screw-plate acts as a fixed-angle device, which converts shear stress to compressive stress at the screw-bone interface. Thus, these fixed bolts experience a majority of the load perpendicular to their axes. [3] In a locked plate, the strength, the strength of fixation equals the sum of all screw-bone interfaces rather than single screws, thus increasing greatly their axial stiffness & pullout resistance as compared to unlocked plates. [3,7] Hertel et al [8] advised at least 3 cortices on either side of fracture whereas Gautier & Sommer [9] modified it to at least 2 screws per main fragment with purchase of at least 3 cortices for simple fractures & at least 4 cortices for comminuted fractures. We noticed that even after contouring the plate we could not place the screws in the distal fragment perpendicular to the long axis of the bone. This, combined with the resistance of the screw to pullout, could have forced the screw axially across the tibial plafond into the ankle. It now appears that anatomy specific plates with or without cancellous-threaded poly-axial screws allowing some toggle in order to place the screw perpendicular to the long axis of the bone (in the distal fragment) would have been a superior fixation if it had been available at the time of surgery. [10,11]

This is a first case-report describing cutout of locking screw in a weight-bearing joint in an osteoporotic bone. There is a reported case of cutout from distal end radius into the wrist, which was attributed strongly to the angular stability of the screws. [12] We believe that a surgeon using locking plates for fixation of metaphyseal peri-articular fractures in osteoporotic bones needs to keep in mind this unusual complication, its causes and preventive measures in order to avoid the same. Although locking plates are indicated for fractures in osteoporotic bones, they can cutout and patients need to be counselled regarding the same.

CORRESPONDENCE TO

Dr. Ameet Pispati, Consultant Orthopaedic Surgeon, Jaslok Hospital & Research Centre, Dr. G. Deshmukh Marg, Mumbai, 400 026. INDIA. Telephone No. : +91 98202 03160. Email : pispati@vsnl.com

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Author Information

Salil P. Umrani, MS (Ortho) (Mumbai), DNB (Ortho), FCPS (Ortho), D.Ortho.
Clinical Associate, Department of Orthopaedics & Traumatology, Jaslok Hospital & Research Centre, Dr. G. Deshmukh Marg

Ameet P. Pispati, MS Orth (Mumbai), M Med Sc Surgery of Trauma (UK), Dip Sports Medicine (UK), MSc Sports Injuries (USA), AO Fellow (Germany), MCh Orth (Liverpool, UK), FRCS Orth (UK)
Consultant Orthopaedic Surgeon, Jaslok Hospital & Research Centre, Dr. G. Deshmukh Marg