



Use of Poller Screw in The Management of Distal Tibial Fractures Treated With Intramedullary Nails

KEYWORDS

tibia, intramedullary nail, poller screw

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ABSTRACT *Introduction : Intramedullary nailing of distal tibial metaphyseal fracture may be result in deformity secondary to instability and ambulation after fixation. Our aim was to evaluate the use of poller screws(blocking screws) as a supplement to stability along with statically locked intramedullary nail for distal tibial metaphyseal fractures.*

Materials and methods :We prospectively evaluated 15 patients of distal tibial fractures treated with poller screws along with interlocking nails for a period of 12 months

Result : all fractures are united with a mean varus valgus alignment of -1° (-5-3) and mean antecurvatum recurvatum alignment of 1.4(-6-10). There was no complications related to poller screw. clinical outcome was assessed using the karstrom-olerud score

Conclusion : Poller screws, placed adjacent to the nail and perpendicular to the interlocking screw holes, usually in an anteroposterior direction, have been suggested as one possible method for improving the stability of metaphyseal fractures, and have been described as a reduction tool used to overcome the displacing forces at the time of introduction of the intramedullary nail.

Introduction :

Unlike intramedullary fixation of diaphyseal fractures of the tibia, nailing of metaphyseal fractures with a short distal fragment is associated with an increase in malalignment, particularly in the coronal plane. The cause has been attributed both to displacing muscular forces and residual instability. As there is a large difference between the size of the implant and the metaphyseal diameter with no nail-cortex contact, the nail may translate laterally along coronally placed locking screws. Poller screws acting as blocking screws, placed adjacent to the nail, have been proposed as a possible solution by preventing translation. The term 'Poller' is derived from small metal devices placed in roads to block or guide traffic. These Poller screws decrease the width of the medullary cavity, physically block the nail, and increase the mechanical stiffness of the bone-implant construct. The efficacy of blocking screws, in terms of clinical outcome, has not been described. Our aim was to evaluate the use of Poller screws as a supplement to the fixation of fractures of the distal third of the tibia treated with intramedullary nails of small diameter

Materials and methods :

We studied prospectively 15 fractures of the distal tibia 22 between 2013-2016, Poller screws were selected for use by the surgeon for one or more of the following reasons: 1) to correct alignment after insertion of the nail 2) to maintain alignment or to improve the stability of the bone-implant complex and 3) to control the nail during insertion. In all cases, the screws were placed during the nailing procedure. In 12 fractures a single Poller screw was used, placed on the concave side of the deformity. In the rest of the cases, either two or three Poller screws were placed. The patients selected for placement of Poller screws had displaced fractures of the distal third which were either extra-articular or had a non-displaced intra-articular extension. The metaphyseal fractures were stabilised with a statically locked tibial nail of small diameter placed using an

unreamed technique, on a standard radiolucent table with manual traction.

The implants used were stainless steel. Depending on the amount of correction needed, the screws used for 'blocking' were locking screws of different sizes 3.5mm cortical screws or other types of screw (4.5mm cortical screws or 6.5mm cancellous screws

Operative technique:

The Poller screws were placed on the concave side of the deformity between the cortex and nail. In all cases, placement was carried out using image intensification. In cases of malalignment and instability, the screw holes were drilled with the nail in place while applying manual over-correction. For fractures which were stable, but malaligned, the nails were temporarily removed, the Poller screws were placed, and the nails re-inserted

Postoperative treatment :

After operation, patients were partially weight-bearing for six to eight weeks.

Thereafter, weight-bearing was increased based on the absence of pain and a study of the radiographs on follow-up

Complications :

Complications were divided into those which were related to the Poller screws and those which were not. Potentially related complications included mechanical instability leading to nonunion, new fracture lines through the holes for the Poller screws, nail failure due to damage by the drill and breakage of the Poller screws. Nerve, tendon or vascular injury would be considered related, whereas all other complications related to the fracture or intramedullary nail such as compartment syndrome, infection, rotational malalignment, breakage of the locking screw and nerve or vascular injuries, present before insertion of the Poller screws,

were not considered to be related to them.

Follow-up :

Patients were followed through to union of the fracture with clinical and radiological examinations at intervals of six or eight weeks and always at a year

After.

Follow-up assessment included neurovascular examination, evaluation of the axial alignment and a functional analysis. The functional outcome was quantified using the Karlström-Olerud score. The radiographs obtained preoperatively, postoperatively and at each follow-up included anteroposterior and lateral views of the whole tibia with the knee and ankle. In the 15 fractures in which the Poller screws had been placed at the initial fixation, the postoperative and follow-up radiographs were analysed for coronal and sagittal alignment. Varus and antecurvatum angulation were expressed as positive values and valgus and recurvatum as negative values. The radiographs were also analysed for correction, maintenance of position or loss of reduction. A fracture was defined as healed when the patient was able to bear full weight on the limb without pain and without support, and when radiographs showed callus bridging three of four cortices.

Results :

All fractures are united with a mean varus valgus alignment of -1° (-5-3) and mean antecurvatum recurvatum alignment of 1.4(-6-10). There was no complications related to poller screw. clinical outcome was assessed using the karstrom-olerud score No complications with the Poller screws were observed during or after the operation. None of the nails or blocking screws broke. Two nails have since been removed and, apart from minor surface scratches, no changes were observed. At follow-up, the skin wound for each insertion site of the screw had healed uneventfully. There was no evidence of injury to tendons or arteries.

Three patients reported decreased sensation in some parts of the distribution of the superficial and deep peroneal nerve.

Fig1
fig 2
Fig3
fig 4
Fig5
fig 6

Discussion :

The stabilisation of fractures of the Distal tibia is associated with a high incidence of malalignment. This has been attributed to muscular forces which displace the fracture and to instability which results from the play of a nail along the interlocking screws. Contributing factors include poor bone-nail contact in the metaphysis and nails with locking screw holes placed in a single plane. Since the locking screws are usually orientated in the coronal plane, varus-valgus malalignment may follow. Deformities in the sagittal plane, usually better tolerated, are less common if the fracture is reduced at the time of initial locking

Poller screws, placed adjacent to the nail and perpendicular to the interlocking screw holes, usually in an anteroposterior direction, have been suggested as one possible method for improving the stability of metaphyseal fractures and have been described as a reduction tool used to overcome the displacing forces at the time of introduction of

the intramedullary nail. The screws functionally decrease the width of the metaphyseal medulla and are particularly useful with nails of smaller diameter. The same technique described here for the tibia has been used for the femur. All fractures are united with a mean varus valgus alignment of -1° (-5-3) and mean antecurvatum recurvatum alignment of 1.4(-6-10). There was no complications related to poller screw. clinical outcome was assessed using the karstrom-olerud score. These results appear to be superior to others reported for the stabilisation of metaphyseal fractures with intramedullary nails.

Conclusion :

The current study has several limitations. It is a nonrandomised, non-controlled clinical trial. There were several different surgeons carrying out the technique, although, given the good results of our study, the relative simplicity of the techniques is demonstrated. We conclude that Poller screws can correct and maintain alignment, improve the primary stability of the bone-nail complex, and enhance the surgeon's ability to perform effective nailing of fractures of the distal third of the tibia



Figure 1. Pre op x ray of distal tibia Fracture - AP view



Figure 2. Pre op x ray lateral view



Fig 3. Post op ap view after fixation with interlocking nail along with two poller screws



Fig 4. Post op lateral view



Fig 5. Preop picture of distal tibial fracture(2nd case)



Fig 6. Post op picture after treating with a poller screw on the concave side of deformity along with interlocking nail.(2nd case).

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