EXPERT OPINION ON PUBLISHED ARTICLES

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Intertrochanteric fractures: Ten tips to improve results

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This article forms part of the Instructional course lectures from the American Academy of Orthopaedic Surgeons under the editorial supervision of FM Azar, and is a practical guide to the treatment of intertrochanteric fractures. As our population ages, and with ever-increasing fracture systems available from the industry, it is imperative that the basic principles of treating these specific fractures are reviewed. The article further contains a good discussion with clinical X-rays.

Tip 1: Tip-to-apex distance

When inserting a central lag screw (nail or plate) the maximal distance from the tip of the lag screw to the apex of the femoral head is 25 mm (ideal <20 mm). The placement of a posterior-inferior lag screw is incorrect.

Tip 2: No lateral wall, no hip screw

If the fracture destroys the lateral wall of the proximal femur (reverse obliquity or transtrochanteric) a laterally placed hip screw is biomechanically unsound and will lead to deformity, non-union and screw cut-out. These should de treated with a cephalomedullary nail. The role of proximal locking plates is still controversial, as they may provide a prosthetic lateral wall.

Tip 3: Patterns of instability

Certain fracture types are very unstable and need to be treated with cephalomedullary nailing. This is due to continued inter-fragmentary instability following fixation. These are: reverse obliquity, transtrochanteric fractures, fractures with a large posteromedial fragment (medial calcar lost) and fractures with subtrochanteric extension. Laterally placed hip screws create too great a lever arm.

Tip 4: Beware of femoral bowing

With increasing age the anterior femoral bowing increases. The locking screws of anteriorly placed intramedullary nails create stress risers in the distal femur. Some bowing will not allow distal nails and can lead to impingement, perforation or even iatrogenic fractures. The ideal radius of curvature of intramedullary nails should be <2 m.

Tip 5: Medial entry

Lateralisation of the entry point often occurs during surgery (drapes, subcutaneous tissue, reamer trajectory, etc.). This leads to lateral wall damage, varus malreduction and high lag screw placement. An initial starting point slightly medial to the tip of the greater trochanter can avoid this.

Tip 6: No pre-reaming

Contrary to diaphyseal fractures, the nail cannot reduce the fracture. Reaming of the proximal fragment prior to anatomical reduction will lead to malreduction. Attempts at reduction with a proximally introduced tool or nail will often fail due to the soft proximal bone. The fracture should be reduced using closed methods with or without percutaneous hooks and clamps.

Tip 7: Nail insertion technique

The soft proximal bone can be compressed during nail insertion, leading to an oval entry point and malreduction around the nail. The nail should therefore be inserted directly down the reamed trajectory. The nail should never be hammered into position. The author recommends over-reaming by 1 mm.

Tip 8: Avoid proximal varus

Intra-operative varus can often be difficult to detect. Know the angle of the device being used and use the trochanter-head relationship to aid reduction. The level of the tip of the greater trochanter and the centre of the femoral head should be coplanar. If the trochanter is above the centre of the head then the proximal fragment is in varus. Pre-operative X-rays allow measurements of the contralateral side. Varus fixation leads to higher failure rates.

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Tip 9: Consider long nails

Although short nail designs have changed to decrease proximal stress risers, the author advocates the use of long interlocked nails for all unstable intertrochanteric fracture patterns. This is due to the fact that these are osteoporotic fractures, a condition that affects the entire bone. Furthermore, the population being treated is prone to falls. Short nails can be considered in undisplaced, minimally displaced and stable fracture patterns.

Tip 10: Avoid distraction

Transverse and reverse obliquity fractures are prone to over-distraction. This happens during reduction in the traction table. Prior to distal locking the traction should be released and the limb manipulated until bone-to-bone contact is achieved.

Dissection through the muscle fibres should ideally be blunt dissection along the fibres of the muscle, avoiding indiscriminate coagulation

Additional key points

Although the article presents these tips in a well-structured format, there are some additional key points that are not addressed. The following additional key points should be remembered when treating these fractures.

Key point 1: Injury to the superior gluteal nerve

Especially in obese patients the proximal cutaneous entry point needs to be advanced more proximally. Dissection to the trochanter can endanger the superior gluteal nerve and lead to postoperative weakness and a Trendelenburg gait. Great care must be employed and the dissection through the muscle fibres should ideally be blunt dissection along the fibres of the muscle, avoiding indiscriminate coagulation. This entry point should then be protected during the entire procedure with a sleeve. (Hoppenfeld S, de Boer P. *Surgical exposures in Orthopaedics: The anatomic approach.* Lippincott Williams & Wilkins;2003.)

Key point 2: Proximal fixation in poor bone

Severe osteopaenia can lead to improper purchase of the lag screw in the proximal fragment. Acrylic cement is often advised, but can lead to non-union of the fracture. We have found injectable radio-opaque calcium phosphate or apatite useful in this scenario. (Eriksson F, Mattsson P. The effect of augmentation with resorbable or conventional bone cement on the holding strength for femoral neck fracture devices. *Journal of Orthopaedic Trauma* May 2002;**16**(5):302-10.)

Key point 3: Contralateral limb positioning

Obtaining good intra-operative fluoroscopic images of the femoral neck in both the anterior-posterior as well as the lateral views is essential. Hip arthritis, arthroplasty and other conditions in this population group often make positioning of the contralateral limb in flexion and abduction impossible. Obtaining a 15° sagittal shoot-through lateral with the ipsilateral limb in 10-20° of flexion and the contralateral limb in 10-20°of extension can often provide adequate exposure for fluoroscopic imaging. (Jahangir A, Russell T. Intramedullary nailing of subtrochanteric fractures – relevant anatomy and entry portals, supine, or lateral positioning techniques. *Orthopaedics* 2008;**23**(2).)

Key point 4: Primary arthroplasty as a surgical option

Although well established in treating femoral neck fractures, the use of primary arthroplasty following intertrochanteric fractures remains controversial, even though the incidence of ipsilateral osteoarthritis is higher in the intertrochanteric group. If the ipsilateral hip joint is severely arthritic and ankylosed, the lever arm forces placed on the instrumentation become very great. In these cases arthroplasty could be considered. (Faldini C, Giannini S, *et al.* Total hip arthroplasty as treatment option for surgical treatment of intertrochanteric fractures. *Journal of Bone & Joint Surgery - British Volume* 2004;**86-B** (Supplement III):226.)

Key point 5: Proximal blocking screws

Several authors advocate the use of proximal anteroposterior blocking screws in the area of the medial calcar. This is to maintain valgus orientation while awaiting fracture consolidation. Iatrogenic surgical neck fractures during screw placement have been reported with this technique. (Pape H-C, Tarkin I. Intraoperative reduction techniques for difficult femoral fractures. *J Orthop Trauma* 2009;**23**:S6–S11.)

Key point 6: Circlage wiring

Attempts at stabilising the proximal fragment with circlage wiring or cables can be problematic. The femoral head's blood supply from the deep branch of the medial circumflex artery (MCFA) is in close relation to the sub- and intertrochanteric area. Published distances vary from 18.2 mm at the level of the lesser trochanter to 8.8 mm at the level of the insertion of the obturator externus tendon in the piriform fossa. The insertion and tension of cables or wires potentially damages this blood supply leading to femoral head necrosis and instrument failure. (Tile M, Helfet D, *et al. Fractures of the pelvis and acetabulum,* Third edition. Lippincott Williams & Wilkins, 2003)