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Extended Trochanteric Osteotomy in Revision Total Hip Arthroplasty

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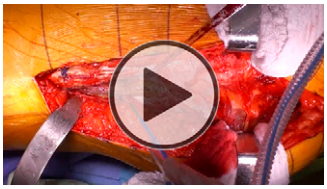

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Abstract

Background: Removal of well-fixed femoral components during revision total hip arthroplasty (THA) can be difficult and time-consuming[1], leading to numerous complications, such as femoral perforation, bone loss, and fracture. Extended trochanteric osteotomies (ETOs), which provide wide exposure and direct access to the femoral canal under controlled conditions, have become a popular method to circumvent these challenges. ETOs were popularized by Wagner (i.e., the anterior-based osteotomy), and later modified by Paprosky (i.e., the lateral-based osteotomy)[2].

Description: The decision to utilize the laterally based Paprosky ETO versus the anteriorly based Wagner ETO is primarily based on surgeon preference, the location and type of in situ implants, and the osseous anatomy. Typically, a laterally based ETO is most facile in conjunction with a posterior approach and an anteriorly based ETO is most commonly paired with a lateral or anterolateral approach. Attention must be paid to maintaining vascularity to the osteotomy fragment, including minimizing stripping of the vastus lateralis from the osteotomy fragment and maintaining abductor attachments to the osteotomy fragment. When utilizing a laterally based ETO, the posterior border of the vastus lateralis must be carefully elevated to provide exposure for performance of the osteotomy. When an anteriorly based osteotomy is performed, the surgeon may instead extend the abductor tenotomy proximally with use of a longitudinal split of the vastus lateralis distally, which helps to keep the anterior and posterior sleeves of soft tissue in continuity. In either approach, dissection of the vastus lateralis involves managing several large vascular perforators. We prefer performing careful blunt dissection to identify the perforators and prophylactically controlling them, with ligation of large vessels and electrocautery of smaller vessels. Vascular clips are also available in case difficult-to-control bleeding is encountered. In general, an oscillating saw (with preference for a thin blade) is utilized to complete the posterior longitudinal limb of the ETO, extending approximately 12 to 16 cm distally from the tip of the greater trochanter. Although a 12 to 16-cm zone is required to maintain maximum vascularity to the osteotomized fragment, the osteotomy length must ultimately be determined by (1) the length of the femoral component to be removed; (2) the presence of distal bone ingrowth, ongrowth, or cement;

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and (3) the presence of distal hardware or stemmed knee components. A smaller oscillating saw is then utilized to complete the transverse limb at the previously identified distal extent. A high-speed pencil-tip burr is utilized to complete the corners of the osteotomy in a rounded configuration, and a combination of saws and pencil-tip burrs is utilized to create partial proximal and distal anterior longitudinal limbs of the osteotomy to the extent allowed by the soft-tissue attachments. The anterior longitudinal limb may be further weakened in a controlled fashion with use of serial drill holes. The anterior longitudinal limb then undergoes controlled fracture by placement of 2 to 4 broad straight osteotomes in the posterior longitudinal limb. These osteotomes are carefully levered anteriorly in unison with a gentle, steady force. After the ETO is completed, intramedullary prostheses, hardware, and cement are removed; the acetabulum is addressed as needed; and a final femoral stem is implanted, if appropriate. After completion of the osteotomy, the osteotomized fragment must be retracted gently, with care taken to avoid a fracture and maintain vascularity. To this end, debridement of the endosteum of the osteotomized fragment, including any cement removal, should be avoided until the end of the procedure, when the osteotomy is ready to be closed. Our preferred method for closure is to place 1 prophylactic cable 1 cm distal to the osteotomy, 1 to 2 cables along the diaphyseal segment of the osteotomy, and 1 Luque wire above the less trochanter. A Luque wire is our specific choice for the location above the lesser trochanter because it sits in the effective joint space; however, the use of Luque wires distal to the lesser trochanter is also acceptable. A strut allograft or locking plate can be utilized to reinforce the osteotomy in rare cases or to bridge interprosthetic stress risers. Trochanteric implants are typically avoided because of the low rate of clinically relevant trochanteric migration with this closure technique and because of the high rate of symptomatic implants with trochanteric claws or plates.

Alternatives: An alternative osteotomy of similar exposure is the transfemoral osteotomy. Additionally, a variety of non-extended trochanteric osteotomies, such as trochanteric slide osteotomies, offer more limited exposure.

Rationale: Femoral surgical exposure for revision THA can be aided by performing transfemoral osteotomies, but these provide less precise control of the separate proximal femoral osteotomized segment(s), and healing and fixation can be less reliable. Less invasive osteotomies such as non-extended trochanteric osteotomies typically do not provide adequate exposure in challenging cases for which ETO is being considered.

Expected Outcomes: ETOs have high union rates, and notable trochanteric migration is infrequent. The most common complications are fracture of the osteotomy fragment intraoperatively or postoperatively. Radiographic and clinical union is achieved in 98% of patients. The mean proximal trochanteric osteotomy fragment migration prior to union is 3 mm. ETO fragment migration of >1 cm occurs in just 7% of hips. Postoperative greater trochanter fractures occur in 9% of hips. The 10-year survivorship free of revision for aseptic femoral loosening, free of femoral or acetabular component removal or revision for any reason, and free of reoperation for any reason is 97%, 91%, and 82%, respectively[3].

Important Tips:

- Attention should be paid to patient anatomy, deformity, surgical approach, and implant type when choosing to perform a laterally based Paprosky or anteriorly based Wagner ETO.
- Appropriate length of the posterior longitudinal limb of the ETO is approximately 12 to 16 cm distally from the tip of the greater trochanter.
- Attention must be paid to maintaining vascularity to the osteotomy fragment, including minimizing stripping of the vastus lateralis from the osteotomy fragment and maintaining abductor attachments to the osteotomy fragment.
- A high-speed pencil-tip burr should be utilized to complete the corners of the osteotomy in a rounded configuration in order to avoid stress risers.
- The anterior longitudinal limb is completed by controlled fracture of the remaining intervening segment in order to maintain vastus lateralis attachments and vascular supply to the osteotomy fragment.
- The ETO is closed with use of cerclage cables and/or double-stranded Luque wires, typically utilizing a total of 3 to 4 in order to obtain secure fixation without compromising local biology.

Acronyms and Abbreviations:

- MFT = modular fluted tapered

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