

Extraction of Fixed Uncemented Stems Using Slot Osteotomy: Technical Note

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ABSTRACT

The removal of a fixed uncemented femoral stem during revision surgery is a challenging task, even for experienced surgeons. The most well-known and commonly used technique is the extended trochanteric osteotomy (ETO), but it is not without complications. Therefore, the aim of this report is to describe the slot osteotomy technique for the extraction of fixed uncemented stems as a less invasive yet highly effective alternative to ETO.

Keywords: Hip; total hip replacement; revision surgery; femoral stem revision.

Level of Evidence: IV

Extracción de tallos no cementados fijos mediante osteotomía en ranura. Nota técnica

RESUMEN

La extracción de un tallo femoral no cementado fijo en la cirugía de revisión es una tarea desafiante para los cirujanos, aun en manos experimentadas. La técnica más difundida y ampliamente utilizada es la osteotomía trocantérica extendida, la cual no está exenta de complicaciones. Dicho esto, el objetivo de esta nota técnica es realizar una descripción de la técnica de osteotomía en ranura para la extracción de tallos no cementados fijos, como una alternativa menos invasiva, pero, a su vez, muy útil, a la osteotomía trocantérica extendida.

Palabras clave: Cadera; reemplazo total de cadera; cirugía de revisión; revisión de tallo femoral.

Nivel de Evidencia: IV

INTRODUCTION

In femoral revision surgery, the removal of a partially or completely fixed uncemented stem is a complex and laborious process, accounting for a significant portion of the total surgical time. The most widely used techniques for femoral stem removal are Wagner's transfemoral osteotomy¹ and, primarily, the extended trochanteric osteotomy (ETO), first described by Glassman et al.² and later validated by Younger et al. for the removal of cementless stems with proximal porous coating.³

The main advantage of ETO is the direct visualization of the entire stem, which reduces the risk of intraoperative periprosthetic fractures or perforations. However, the procedure is not without complications. The reported rates of pseudarthrosis range from 5% to 11%, while proximal migration of the osteotomized fragment reaches 6.6%. Additionally, complications such as cerclage wire breakage, trochanteric bursitis, and abductor muscle weakness have been documented.⁴⁻⁶ This technique also imposes limitations on the use of distal fixation implants.

A valuable alternative to ETO is the slot osteotomy (SO), first described by Bauze et al.⁷ and later refined through various modifications.⁸ This technique involves a single cut on the posterior aspect of the femur, adjacent to the linea aspera. Its key advantage is that it preserves the abductor mechanism, maintains bone stock, and carries an almost negligible risk of pseudarthrosis, as it involves an isolated, incomplete, monocortical cut supported by a cerclage wire. Furthermore, because no secondary fragment is generated, there is no risk of migration. Unlike

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How to cite this article: Albani Forneris A, Lucero C, Slullitel P, Zanotti G, Buttaró M, Comba F. Extraction of Fixed Uncemented Stems Using Slot Osteotomy: Technical Note. Technical note. *Rev Asoc Argent Ortop Traumatol* 2024;89(5):553-558. <https://doi.org/10.15417/issn.1852-7434.2024.89.5.2013>

ETO, this osteotomy allows for femoral reconstruction with a metaphyseal or distal fixation stem.

The aim of this article is to describe the SO surgical technique for the removal of partially or completely fixed uncemented stems as an alternative to ETO.

SURGICAL TECHNIQUE (Video)

With the patient in the lateral decubitus position, a posterolateral approach is made to the affected hip, preferably using the previous surgical scar, if feasible. After dislocating and removing the femoral head, the proximal metaphysis is adequately exposed to assess the interface between the prosthesis and the femur, clearly identifying the greater and lesser trochanters. Next, to release the stem proximally, a Lambotte or thin osteotome is placed at the interface and directed distally, maintaining close contact with the prosthesis. Care should be taken not to apply excessive force to avoid fractures (Figure 1).



Figure 1. Proximal release using a Lambotte or thin osteotome at the interface between the bone and the femoral component.

If the femoral component cannot be removed, a minimally invasive posterior slot osteotomy (SO) is performed using an oscillating saw or chisel. The cut is aligned with the posterior border of the vastus lateralis and positioned slightly lateral to the linea aspera. The osteotomy is performed incompletely, monocortically, with a length of 5 to 10 cm, depending on the design of the stem to be removed, and extends proximally to reach the level of the neck osteotomy. It is essential to emphasize that the osteotomy should not be directed towards the greater trochanter, in order to preserve the insertion of the gluteal and pelvic rotator tendons (Figure 2).



Figure 2. Incomplete, monocortical slotted femoral osteotomy, measuring between 5 and 10 cm in length.

Next, two chisels, up to 2 cm wide, are inserted through the osteotomy and placed perpendicularly on both sides of the stem. Gentle lever maneuvers are performed from medial to lateral and from lateral to medial, aiming to release the junctional interface between the bone and the femoral stem. The stem is progressively loosened by dilating the previously virtual cavity in the metaphyseal-diaphyseal region of the prosthetic interface (Figure 3).

Finally, the stem is impacted from the osteotomy or proximally from the prosthetic taper. If it remains fixed, the process may be repeated in the same order until all adhesions between the stem and the femur are released (Figure 4).

After removal, the necessary cerclage wires are placed according to the size of the osteotomy. The femur can then be reconstructed using a metaphyseal fixation stem, following standard techniques commonly described for this procedure.



Figure 3. Stem release maneuver by dilating the metaphyseal-diaphyseal region of the prosthetic interface.



Figure 4. Stem release maneuver: (A) from the slot osteotomy or (B) from the prosthetic taper.

Postoperative Rehabilitation Protocol

If distal fixation implants were used during the revision surgery, full weight-bearing is recommended as tolerated by the patient. On the other hand, if metaphyseal fixation components were used, partial weight-bearing with crutches or a walker is advised for up to 45 days postoperatively, limiting weight-bearing to a maximum of 20 kg. Mobility exercises, including fixed flexion up to 90°, external rotation up to 30°, and abduction up to 30°, are recommended, while internal rotation should be avoided. Isometric contraction of the gluteus medius is encouraged. Full weight-bearing is authorized six weeks after surgery, based on the evaluation of control radiographs, though there is no standardized protocol. During the first month, the use of a crutch is suggested, with a gradual progression towards unassisted ambulation.

Complications Associated With Slot Osteotomy

SO is a reproducible and versatile technique, and no specific complications associated with it have been reported. As it involves an incomplete, monocortical osteotomy protected with a cerclage wire, there is minimal risk of pseudarthrosis. However, in cases where the osteotomy extends due to untimely maneuvers with chisels during the release of the bone-stem interface, it may behave similarly to an extended trochanteric osteotomy (ETO).

Tips and Tricks

- Planning the surgery with calibrated radiographs is essential to estimate the appropriate length of the slot osteotomy (SO).
- Avoid directing the SO towards the greater trochanter.
- Be mindful not to compromise the insertions of the vastus lateralis and abductors; the linea aspera serves as a useful reference point.
- If the proximal stem is loose, extending the osteotomy to the level of the femoral neck cut may be unnecessary.
- Applying a cerclage wire distal to the osteotomy is highly effective in preventing extension during stress maneuvers, especially in patients with poor bone quality.
- When performing the osteotomy with chisels, it is advisable to pre-mark the osteotomy line with multiple perforations using a fine drill bit or dowel.
- If a cemented stem is planned, it is crucial to prevent cement from entering the edges of the slot. In case of cement leakage, it must be completely removed from the slot, as this could impede proper consolidation.

Conflict of interest: The authors declare no conflicts of interest.

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