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Review article

# Selecting the surgical approach for revision total hip arthroplasty



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## ABSTRACT

Selecting the approach for revision total hip arthroplasty is a crucial step in pre-operative planning. Whether the surgical objectives can be reached via a conventional approach or require a specific approach must be determined. The best approach depends on multiple factors including the reason for revision, patient's characteristics, implants requiring removal, previous approach, soft tissue and bone lesions, and surgeon's level of experience. These factors are discussed herein, as well as the potential and limitations of conventional approaches and the indications for specific approaches.

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## 1. Introduction

The plethora of publications on surgical approaches for primary total hip arthroplasty (THA) is in striking contrast to the scarcity of articles on approaches for revision THA. A 1998 study by Materson et al. [1] of the factors influencing surgical approach selection for revision THA is still relevant today. In 2004, Glassman [2] described his strategy for choosing among four approaches, ranging from a simple posterior approach to extended trochanteric osteotomy, depending on the complexity of the problem to be treated. A 2006 instructional course lecture on revision THA strategies written by Puget [3] emphasises the need for discernment in selecting the best approach. Paumier and Doré [4] wrote a comprehensive and detailed review of trans-osseous approaches in 2010. Here, revision THA approaches are discussed based on an analysis of the literature and personal experience.

Revision THA involves building a new artificial hip whose architecture and fixation will restore function for many years. Revision THA is usually a lengthy and technically demanding procedure.

Optimal pre-operative planning is crucial. The surgical objectives must be defined, any difficulties anticipated, specific implants obtained, and a need for grafting recognised. The approach must be selected with discernment as it influences the conduct of all the steps of the procedure.

To be optimal, the approach must meet a number of specific criteria. To ensure that no further damage is inflicted, the approach must adequately expose the components to be removed (implants and cement within or outside the bone tissue). In addition, the approach must allow the reconstruction not only of all the bony defects identified pre-operatively, but also of those discovered

intra-operatively. Finally, preservation of bone and soft tissue must be as complete as possible.

The present article has three parts. The first part discusses the pre-operative factors that influence surgical approach selection. The second reviews the main approaches used for primary THA and details the advantages and drawbacks of each for revision THA. Finally, the third part focusses on the approaches developed specifically for revision THA and describes the situations in which these approaches must be used. A technical description of all the available approaches would be beyond the scope of this article, and detailed information on the approaches mentioned in this article can be found in excellent papers written by Nazarian and Müller [5] in 1998 and by Paumier and Doré [4] in 2010.

## 2. Pre-operative factors that influence selection of the surgical approach

Based on an evaluation of these factors, the surgeon can determine whether the revision procedure can be performed via a conventional approach, which may be the approach used for the primary procedure or another more appropriate approach; or whether the use of a specific approach should be considered from the outset.

### 2.1. Reason for revision surgery

Depending on the reason for revision surgery, removal of one or two well-fixed implants may be required.

Aseptic loosening, the leading reason for revision THA in France [6], is usually due to polyethylene wear and chiefly affects the cup. Isolated exchange of the cup is an attractive option, as it limits the aggressiveness of the procedure for the patient and the technical difficulties encountered by the surgeon. Nevertheless, care must be taken to ensure that this option is reasonable:

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the pre-operative evaluation must check the absence of femoral metaphyseal osteolysis; determine whether the femoral component is a monoblock or modular implant, verify its compatibility with the new cup; and assess the need for correcting a pre-existing architectural abnormality related to the femoral component such as inadequate anteversion, leg length inequality, or inadequate femoral offset restoration. These factors limit the indications for isolated cup revision, as shown by De Thomasson et al. [7]. When the appropriateness of isolated cup revision is confirmed, use of the previous approach may be a good option to avoid further soft tissue damage, provided the exposure will be sufficient to perform all the steps of the acetabular revision and the surgeon is experienced in the use of the approach.

Acute infection is generally treated via the initial approach, as the revision is usually a simple procedure aimed at excision of the infected tissues. Implant exchange is rarely needed, although the acetabular insert and femoral head may need to be changed to allow optimal cleansing. Chronic infection raises different issues: concomitant implant loosening and spread of the infection to the soft tissues is a common situation that requires complete excision of all intra-osseous and extra-osseous lesions. For this reason, the initial approach is suitable only if it can be easily extended proximally and distally to allow thorough cleansing.

Revision procedures for instability and for leg length inequality share common features. An essential step is identification of the cause of the problem, which determines whether the revision can be confined to a single component or whether both components must be changed. In the event of instability or leg length inequality requiring shortening, gluteal muscle tension must be increased, which requires a trans-trochanteric approach with lowering of the trochanter [8].

Psoas syndrome is related to anterior overhang of the acetabular implant and is usually treated by isolated acetabular revision. This procedure can be performed via the initial approach in most cases.

Changing a non-cemented femoral implant responsible for thigh pain is difficult if osteo-integration of the implant has been achieved. Use of the initial approach is not always feasible and the need for a femorotomy to extract the implant must be anticipated.

## 2.2. Type of implant and fixation method

The type of acetabular implant has little influence on selection of the surgical approach. A cemented femoral implant is usually easy to extract, particularly if it is loose, regardless of the approach used. However, removal of the cement, particularly distally, may raise variable challenges depending on the approach. This point must be given consideration before the procedure in order to determine whether a conventional or specific approach is needed to allow cement removal with no risk of damaging the femur. Although rarely used in France, cemented rough femoral implants with surface grooves or notches or an outer layer of methylmethacrylate are difficult to remove when well fixed, and their tight connection to the cement may require a femorotomy.

The removal of a well-fixed non-cemented femoral component requires a detailed pre-operative evaluation of the implant characteristics including shape, flange, type and extent of surface coating, and contact with cortical bone. The ability to anticipate in part any difficulties raised by implant removal provides a rationale for either attempting the revision via a conventional approach or determining from the outset that a femorotomy is required.

## 2.3. Influence of the soft tissue and bone lesions

Deep soft tissue lesions fall into two categories: granulomas, which may be due to infection or to an aseptic reaction to particles;

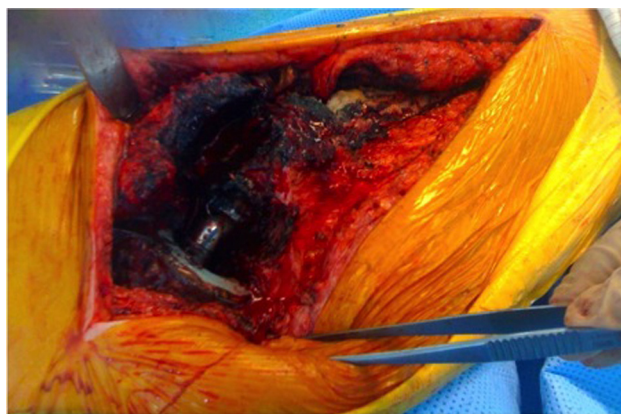


Fig. 1. Metallosis requiring an extensive approach to allow excision of the lesions.

and muscle lesions. The former should be removed and the latter repaired whenever possible.

Excision of a granuloma requires appropriate pre-operative imaging studies to determine the extent of the lesion, which governs the selection of the approach. Granulomas may spread in all directions, and a limited approach such as the anterior approach may fail to readily allow complete excision. In particular, metallosis (Fig. 1) can cause huge granulomas, whose excision requires extensive dissection. In this situation, a conventional approach allowing only limited extension is not adequate.

Muscle lesions are challenging to repair, as they are often related to tendon detachment or section and worsened by involution of the muscle belly. Repair options are limited. An imperfectly healed digastric flap after a trans-gluteal approach can be re-attached to the trochanter. Lowering the trochanter can improve the efficiency of a damaged gluteus medius muscle. To be optimally treated, these lesions must first be recognised and, therefore, the approach must allow their visualisation. For example, it seems unwise to perform revision surgery via an anterior approach after primary trans-gluteal THA, as this strategy would fail to allow the diagnosis of defective digastric flap healing.

Concomitant bone lesions are key to selection of the approach, which must allow their reconstruction.

The pre-operative evaluation must determine the location and size of any bone lesions in order to guide the choice of the approach. At the acetabulum, greater upwards and posterior extension of the lesions increases the need for approaches providing broad exposure of the upper iliac wing and posterior column. At the femur, distal osteolysis, cortical defects, and malalignment always require an approach that provides direct exposure of the femoral shaft.

## 2.4. Influence of previous incisions

The most common problem is a scar that seems to have shifted anteriorly or posteriorly. The previous incision may be used, the subcutaneous tissue detached from the aponeurosis, and the incision of the aponeurosis re-centred to obtain the optimal position for approaching the deep tissues. Excision of the scar and subcutaneous tissue, which are often sclerotic and tight, is useful to produce healthy margins, whose approximation allows suturing under good conditions. Finally, any dehiscence of the aponeurosis must be repaired.

## 2.5. Influence of patient characteristics

The specific characteristics of the patients may seem of limited importance and have little influence on selection of the approach.

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