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TECHNICAL NOTE

Total hip revision using a cup design with a peg to treat severe pelvic bone defects

P. Desbonnet[a,*], **H. Connes**[b], **P. Escare**[c], **J.L. Tricoire**[d], **J. Trouillas**[e]

[a] *Private hospital du Parc, 50, rue Émile-Combes, 34170 Castelnau-le-Lez, France*
[b] *Chemin des Bouysses, 12100 Millau, France*
[c] *Le Rabelais, 3, avenue d'Oc, 34500 Béziers, France*
[d] *Department of orthopaedic surgery, Rangueil hospital, 1, avenue du Professeur-J.-Pouilhes, 31000 Toulouse, France*
[e] *Saint-Louis private hospital, 2, place Joseph-Boudouresque, 34190 Ganges, France*

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Iliac isthmus;
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Summary When dealing with severe bone loss during acetabular revision of a total hip arthroplasty, it can be difficult to find a reliable anatomical structure to ensure high-quality primary fixation of the cup. Since 2003, we have been using an implant with a long peg that is anchored into the iliac isthmus. This structure is usually intact, even in the most severe situations of bone loss. The use of this specially designed component provides satisfactory mechanical reconstruction in cases that can be quite challenging (Paprosky and SOFCOT stage 3). The length and postoperative care for the procedure remain the same and early weight bearing is possible. The specific principles applying to this procedure, along with the anatomical features of the iliac isthmus, the implantation technique and our initial results are described in detail.

Introduction

During total hip revision, the fixation of a new acetabular component [1] can be a challenge when potential fixation sites are no longer intact. A number of implants are available that can be screwed or impacted into the remaining surrounding structures, either directly [2—4] or through the use of a reinforcement ring [5—7]. Bone defects in the area can be rebuilt with autologous grafts or allografts. However, when the bone loss is severe and the acetabular component has migrated, massive structural grafts [8—13] or morselized, impacted grafts [2,11,14—16] must be used, which increases the risk of early failure [4,17,18]. We wanted to find a reliable anatomical structure that would still be intact in the most severe cases of bone loss. The iliac isthmus meets these requirements. We developed a revision cup with a peg that is anchored into the intramedullary space of this isthmus. The goal of this technical note is to provide the anatomical basis for this cup, describe the surgical technique and report on our initial results with this device.

* Corresponding author.
E-mail address: docteur.desbonnet@wanadoo.fr (P. Desbonnet).

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Figure 1 CT scan image of the iliac isthmus (iliopubic beam).

Anatomical basis

The iliac isthmus (or iliopubic beam) is the lateral part of the upper segment of the ilium between the roof of the acetabulum and the sacroiliac joint. Testut and Latarjet [19] describe this structure as a long bone with a short diaphysis and a medullary canal. It has also been described by Michele [20] and Judet and Letournel [21].

Tricoire et al. [22,23] also evaluated this isthmus on cadavers, dry bones and pelvic CT scans (Fig. 1). It is a concave structure, oriented upwards, backwards (30°) and inwards (10°) along the axis of the sacroiliac joint that transmits the forces between the lower limb and spinal column. The isthmus has a curvilinear diabolo shape that flares out at both ends onto two articular surfaces, the upper pole of the acetabulum and the sacroiliac joint. The average length is 69 mm, with a range of 55 to 80 mm. The medullary canal is 19 mm in diameter at its narrowest point; the cortex is between 3.5 and 4.0 mm thick. This iliac isthmus appears to be a reliable, extremely solid structure. It has been found to be intact in revision arthroplasty cases, even in the most severe cases of osteolysis [24—26].

Description of the Integra cup with peg

The Integra cup with peg (Lépine, Genay, France) is a cementless, dual mobility implant [27]. The cup has three parts (Fig. 2):

- the shell of the cup, which is symmetric and has a long peg. This titanium shell is coated with porous titanium and 80 μm hydroxyapatite. It is available in four sizes; there are four holes that can be used for additional stabilization screws. The 50 mm long peg has an epicycloidal cross-section that is 11 mm in diameter or 8 mm when not including the ridges. The peg has a 55° angle relative to the opening of the cup;
- a stainless steel insert that is impacted into the bottom of the cup and articulates with the polyethylene liner;
- a constrained polyethylene liner that allows for dual mobility. The two smaller sizes accept 22 mm femoral heads and the two larger sizes accept 28 mm heads.

Figure 2 The Integra cup with peg has three components: the acetabular shell, mobile metal insert and dual mobility polyethylene liner.

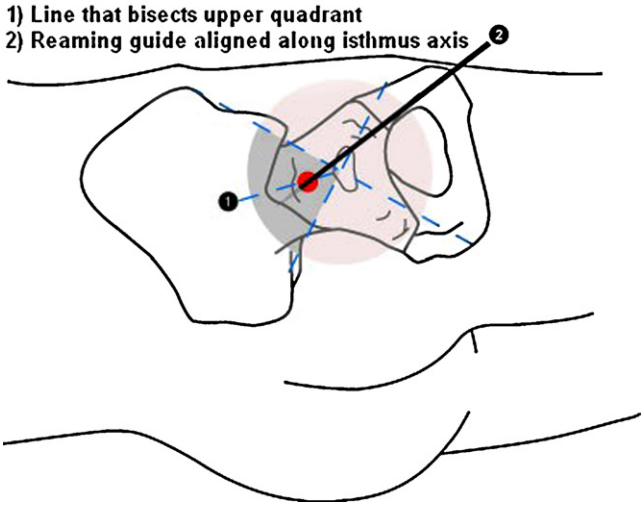

Figure 3 The entry point into the isthmus is located in the middle of a line that bisects the upper (iliac) quadrant.

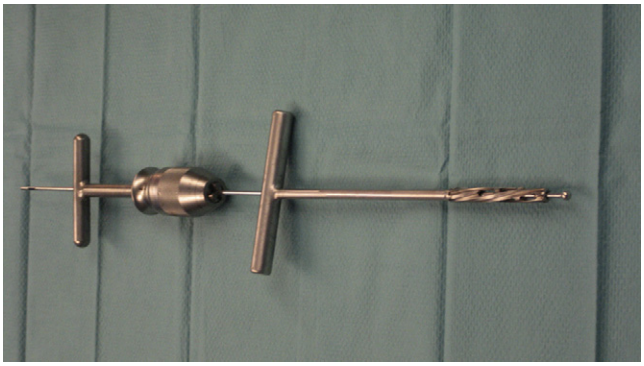

Figure 4 Alignment instrumentation: short reaming guide and manual cannulated reamer.