One-stage bilateral total hip arthroplasty: Functional outcomes and complications in 112 patients

C. Trojani\textsuperscript{a,}*, T. d’Ollonne\textsuperscript{a}, D. Saragaglia\textsuperscript{b}, C. Vielpeau\textsuperscript{c}, M. Carles\textsuperscript{a}, J.-L. Prudhon\textsuperscript{d}, the French Society for the Hip and Knee (SFHG)\textsuperscript{1}

\textsuperscript{a} Department of Orthopaedics and Sports Trauma, De l’Arche Medical Center, 151, route de Saint-Antoine-de-Ginestière, 06200 Nice, France
\textsuperscript{b} Department of Orthopaedics and Sports Trauma, South Hospital, Grenoble Teaching Medical Center, avenue de Kimberly, 38434 Echirolles, France
\textsuperscript{c} Department of Orthopaedics and Traumatology, Côte de Nacre Hospital, Caen Teaching Medical Center, avenue de la Côte de Nacre, 14033 Caen, France
\textsuperscript{d} Cedars Private Hospital, 48, avenue de Grugliasco, 38130 Echirolles, France

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Bilateral total hip arthroplasty; One-stage surgery; Complications

Summary
Background: Advantages of one-stage bilateral total hip arthroplasty (THA) include a single hospital stay, a shorter rehabilitation time, and decreased management costs per patient. However, concern about a possible increase in the perioperative complication rate has limited the use of this strategy. Here, our objectives were to evaluate morbidity and mortality, as well as functional outcomes, in patients managed with one-stage bilateral THA.

Hypothesis: The complication rate after one-stage bilateral THA is not significantly different from that after unilateral THA.

Materials and methods: Four French surgical centres participated in a retrospective observational study of patients managed with one-stage bilateral THA. The 112 included patients (55 women) had a mean age of 59 years (range, 22–84) and a mean follow-up of 30 months (6–103).

Results: Mean hospital stay length was 10.8 days (6–27), mean operative time was 162 minutes (95–270), and mean haemoglobin levels were 14.3 g/dL preoperatively and 10.1 g/dL postoperatively. No perioperative deaths were recorded. Deep vein thrombosis occurred in eight (7.1%) patients and pulmonary embolism in six (5.4%). The Merle d’Aubigné score improved from 9.25 ± 2.9 (3–16) preoperatively to 17.5 ± 1 (14–18) at last follow-up. All but three patients (109/112, 97%) said they would choose the same operation again and 102/112 (91%) said they would recommend it to a family member.

\* Corresponding author. Tel.: +33 4 92 03 64 97/+33 4 92 03 61 31; fax: +33 4 92 03 59 62.
E-mail address: trojani.c@chu-nice.fr (C. Trojani).
1 56, rue Boissonade, 75014 Paris, France.

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Introduction

The benefits of total hip arthroplasty (THA) have been abundantly documented [1,2]. However, 10% of patients require contralateral THA within 1 year after their first THA procedure [3]. In addition, optimal functional outcomes are obtained only after bilateral THA [4]. One-stage bilateral THA (1bi-THA) has several advantages including a single hospital stay, a shorter rehabilitation time [5], and lower management costs per patient [6]. Concern about a possible increase in perioperative complications after 1bi-THA and, in France, the absence of a dedicated Diagnosis-Related Group in the nationwide hospital database and the statutory health insurance system policy of reimbursing only 75% of the cost of the second procedure have limited the use of 1bi-THA.

Here, our working hypothesis was that 1bi-THA, in appropriately selected patients, was a valid alternative to two-stage bilateral THA. The two main study objectives were to evaluate the morbidity and mortality rates and to measure the functional outcomes after 1bi-THA.

Materials and methods

Four French surgical centres were invited to participate in an observational retrospective study of patients managed with 1bi-THA. For each patient, the following data were collected: hospital stay length; operative time; preoperative and postoperative haemoglobin levels; homologous blood transfusions; vital status; and complications including pulmonary embolism, surgical site infection, dislocation, revision, leg length discrepancy, and other intraoperative and postoperative complications. Doppler ultrasonography was performed routinely after surgery. Functional outcomes were assessed using the Postel-Merle d’Aubigné (PMA) score [7] before surgery, 6 months after surgery, and at last follow-up. An anteroposterior pelvic radiograph and two Lequesne false-profile radiographs were obtained preoperatively and postoperatively (Fig. 1). A subjective evaluation was performed by asking the patients whether they would be willing to undergo the same procedure again and whether they would recommend it to a family member.

We included patients in American Society of Anesthesiologists (ASA) [8] categories 1, 2, and 3 who had bilateral hip disease with no evidence of infection. Exclusion criteria were a history of hip fusion, ASA category 4 or greater, and revision surgery.

Of the 112 included patients, 42 were ASA 1, 63 ASA 2, and seven ASA 3. The male/female ratio was 1 (57/55). Mean age was 59 years (range, 22–84). The initial diagnosis was hip osteoarthritis in 77 patients, avascular necrosis of the femoral head in 24, rapidly destructive hip disease in six, sequelae of congenital hip dysplasia in three, and rheumatoid arthritis in two. The posterolateral approach was used in all patients. The two hip replacements were performed sequentially by the same surgical team, with the same main operator. General anaesthesia was used in 41 patients, spinal anaesthesia in 23, epidural anaesthesia in 15, and combined general and epidural anaesthesia in 33. At the end of the procedure, a pelvic radiograph was obtained in the operating room. All patients had a suction drain placed in each hip and received prophylactic antibiotic therapy, as well as thromboembolism prevention with low-molecular-weight heparin for 30 days.

The statistical analysis relied on the non-parametric Fisher exact test. P value inferior to 0.05 was considered significant.

Discussion: The results of this multicentre retrospective study indicate that one-stage bilateral THA is a valid alternative to two-stage bilateral THA in ASA 1 and 2 patients with a preoperative haemoglobin level of about 14 g/L. The major complication rate was 7.1%, which was slightly higher than after unilateral THA, and the main complications were deep vein thrombosis and pulmonary embolism.

Level of evidence: Level IV (multicentre retrospective observational study).

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thrombosis in eight patients (7.1%) and pulmonary embolism was confirmed by contrast-enhanced computed tomography in six (5.4%) patients, including two ASA 3 patients with severe symptoms.

Of the seven ASA 3 patients, three (42.8%) experienced deep vein thrombosis with pulmonary embolism, compared to five (4.7%) with deep vein thrombosis and three (2.8%) with pulmonary embolism among the 105 ASA 1/2 patients ($P < 0.006$). No significant differences in complication rates were found across reasons for THA (hip osteoarthritis vs. other) or anaesthesia techniques (general anaesthesia, spinal anaesthesia, epidural anaesthesia, or combined general and epidural anaesthesia).

The PMA score improved from $9.25 \pm 2.9$ (3–16) preoperatively to $17.5 \pm 1$ (14–18) at last follow-up. All but three patients (109/112, 97%) said they would be willing to undergo the same procedure again and 102/112 (91%) said they would recommend the procedure to someone else.

### Discussion

This multicentre retrospective case-series study establishes 1bi-THA as a valid alternative to two-stage bilateral THA, since the safety profile was good in our population of selected patients [9]. The risk of major complications did not seem increased with 1bi-THA, despite continuing controversy about the pulmonary embolism rate and relative risk of death associated with this procedure [10–13]. Berend et al. [11] reported a higher pulmonary embolism rate among 450 patients managed with 1bi-THA, but their comparison group was composed of patients who underwent unilateral THA and not two-stage bilateral THA. Saito et al. [13] and Kim et al. [12] found no increase in complication rates with 1bi-THA compared to two-stage bilateral THA. Aghaev et al. [13] even reported fewer complications with the one-stage procedure. In our study, the main complications were deep vein thrombosis and pulmonary embolism. These are the two most common complications after all forms of THA (unilateral THA, two-stage bilateral THA, and 1bi-THA) [14,15].

No deaths occurred in our population of selected patients. Among previous studies, some found an increase in the relative risk of death after 1bi-THA compared to unilateral THA [14,16], but another did not [12]. The risk of death after 1bi-THA may not be higher than the cumulative risk of death associated with two-stage bilateral THA [15,17]. Our results and those reported in the literature indicate that 1bi-THA should be reserved for ASA 1/2 patients: the complication rate is unacceptably high in ASA 3 patients, who have a three-fold higher relative risk of death.

Our work emphasises the crucial importance of the blood-sparing strategy. The most recent studies consistently found significant increases in homologous blood transfusion rates after 1bi-THA, of 20 to 40% [12,14–16]. Measures that should keep the homologous blood transfusion rate below 20% include preoperative erythropoietin treatment and iron supplementation to increase the haemoglobin level, use of a cell-saver with immediate reinfusion of autologous blood, and postoperative erythropoietin and iron therapy to ensure compensation of the intraoperative blood loss. Furthermore, autologous blood transfusion in the immediate

### Results

Mean follow-up was 30 months (range, 6–103), mean hospital stay length was 10.8 days (6–27), and mean operative time was 162 minutes (95–270). Mean haemoglobin levels were 14.3 g/dL (13.1–15.9 g/dL) preoperatively and 10.1 g/dL postoperatively (7.6–11.5 g/dL). Fig. 2 describes the blood-sparing strategy.

No perioperative deaths were recorded. Table 1 lists the complications. Doppler ultrasonography showed deep vein
One-stage bilateral THA

Postoperative period is associated with a significant decrease in the need for homologous blood transfusion [18].

Our study confirms the excellent functional outcomes after 1bi-THA [5,11,17], in keeping with data reported by Charnley and Jaffé as early as 1971 [5]. A recent study of a European registry [17] showed better functional outcomes after 1bi-THA compared to two-stage bilateral THA. Patient satisfaction is an important parameter, and 97% of our patients said they would be willing to repeat the same procedure. Thus, in patients who have no contraindications related to an unacceptably high surgical risk, 1bi-THA deserves consideration in two situations, namely, incapacitating bilateral hip disease with normal hip position and hip disease with bilateral abnormalities in hip position. In patients who have incapacitating bilateral hip disease with normal hip position, 1bi-THA optimises the functional outcomes [4], shortens the rehabilitation time [5], and decreases the cost of management [6]. Therefore, 1bi-THA deserves consideration in this situation as an alternative to two-stage bilateral THA. In patients who have bilateral abnormalities in hip position, most notably flexion contractures greater than 20°, 1bi-THA is highly desirable, as persistence of the flexion contracture on the unoperated side after unilateral THA precludes the resumption of walking and adversely affects the operated hip. Finally, given the cost-saving nature of 1bi-THA [3,6], reasonable measures would consist in creating a specific Diagnosis-Related Group for 1bi-THA and increasing the reimbursement of the second replacement from the current 75% to 100%.

Conclusion

Although our study has a number of methodological weaknesses including the multi-surgeon retrospective design, absence of a control group, absence of a cost evaluation, and small sample size, our results support the use of 1bi-THA in carefully selected patients. Thus, 1bi-THA is a valid alternative to two-stage bilateral THA in ASA 1/2 patients whose preoperative haemoglobin level is greater than 14 g/dL. The main complications are deep vein thrombosis and pulmonary embolism.

Disclosure of interest

Christophe Trojani declares no direct conflicts of interest related to this study but receives royalties from Tornier independently from the study. Dominique Saragaglia declares no direct conflicts of interest related to this study but receives royalties from B-Braun independently from the study. Jean-Louis Prudhon declares no direct conflicts of interest related to this study but receives royalties from Mathys and Dedienne Santé independently from the study. Claude Viefpeau declares no direct conflicts of interest related to this study but is a member of the Bayer scientific board and a scientific consultant for Sanofi and works in an institution that receives research grants from Stryker, Mathys, and Dedienne Santé. Thomas d’Ollonne and Michel Carles declare no conflicts of interest related or unrelated to this study.

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