Total hip arthroplasty with monobloc press-fit acetabular components and large-diameter bearings for atypical acetabula is safe: a consecutive case series of 125 hips with mean follow-up of 9 years

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Background: Large-diameter head (LDH) total hip arthroplasty (THA) with a monobloc acetabular component improves hip stability. However, obtaining initial press-fit stability is quite challenging in atypical acetabula. The purpose of this study was to assess primary and secondary fixation of monobloc cups in atypical acetabula.

Methods: In this consecutive case series, the local arthroplasty database was used to retrospectively identify patients with secondary osteoarthritis who underwent primary hip replacement with press-fit only LDH monobloc acetabular components between 2005 and 2018 and who had a minimum of 2 years of follow-up. Radiographic evaluation was performed at last follow-up, and patient-reported outcome measures (PROMs) were assessed with the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), the Forgotten Joint Score (FJS), and the Patient's Joint Perception (PJP) question.

Results: One hundred and six LDH THAs and 19 hip resurfacings were included in the study. Preoperative diagnoses included hip dysplasia (36.8%), Legg–Calve–Perthes disease (32.0%), osteoarthritis with acetabular deficiency (17.6%), periacetabular osteotomy (8.0%), arthrodesis (4.0%), and osteopetrosis (1.6%). After a mean follow-up of 9.2 years, no aseptic loosening of the acetabular component was recorded nor observed on radiologic review. There were 13 (10.4%) revisions unrelated to the acetabular component fixation. The mean WOMAC and FJS scores were 9.2 and 80.9, respectively. In response to the PJP question, 49.4% of the patients perceived their hip as natural, 19.1% as an artificial joint with no restriction, 31.5% as an artificial joint with restriction, and none as a non-functional joint.

Conclusion: Primary press-fit fixation of monobloc acetabular components with LDH implanted in atypical acetabula led to secondary fixation in all cases with low revision and complication rates and great functional outcomes. With careful surgical technique and experience, systematic use of supplemental screw fixation is not essential in THA with atypical acetabula.

Contexte : L'arthroplastie pour prothèse totale de la hanche (PTH) avec tête de grand diamètre (LDH, pour large-diameter head) et composant acétabulaire monobloc améliore la stabilité de la hanche. Par contre, en présence d'un acétabulum atypique, il est assez difficile d'obtenir une stabilité mécanique directe par effet « press-fit » (cupule impactée en force dans la cavité acétabulaire préalablement préparée). Cette étude avait pour but d'évaluer la fixation primaire et secondaire de cupules acétabulaires monoblocs en présence d'acétabulums atypiques.

Méthodes : Pour cette série de cas consécutifs, nous avons utilisé la base de données locale sur les arthroplasties afin d'identifier rétrospectivement les personnes atteintes d'arthrose secondaire ayant subi entre 2005 et 2018 une arthroplastie primaire pour prothèse de hanche avec composants acétabulaires LDH monoblocs et fixation press-fit uniquement, et qui ont pu être suivis pendant une période d'au moins 2 ans. Au moment du dernier suivi, des radiographies ont été effectuées et nous avons évalué les mesures des résultats déclarés par la patientèle (MRDP) au moyen de l'indice WOMAC (indice d'évaluation de l'arthrose des Universités Western Ontario et McMaster), du score de l'articulation oubliée (FJS, pour Forgotten Joint Score), et de la question sur la perception articulaire PJP (Patient's Joint Perception).

Résultats : L'étude a regroupé 106 PTH avec LDH et 19 resurfaçages de la hanche. Les diagnostics préopératoires incluaient dysplasie de la hanche (36,8 %), maladie de Legg–Calve–Perthes (32,0 %), arthrose avec insuffisance acétabulaire (17,6 %), ostéotomie périacétabulaire (8,0 %), arthrodèse (4,0 %), et ostéopétrose (1,6 %). Après un suivi moyen de 9,2 ans, aucun descellement aseptique du composant acétabulaire n'a été signalé ou observé à la radiologie. On a dénombré 13 (10,4 %) révisions sans lien avec la fixation du composant acétabulaire. Les scores WOMAC et FJS moyens ont été de 9,2 et 80,9, respectivement. En réponse à la question PJP, 49,4 % des personnes ont déclaré avoir la perception d'une hanche naturelle, 19,1 % d'une hanche artificielle sans restriction, et 31,5 % d'une hanche artificielle avec restriction; aucune des personnes interrogées n'a eu la perception d'une hanche non fonctionnelle.

Conclusion : La fixation press-fit primaire de composants acétabulaires monoblocs avec LDH implantés dans des acétabulums atypiques a été suivie d'une fixation secondaire dans tous les cas; les taux de complications et de révisions ont été faibles et les résultats au plan du fonctionnement ont été très bons. Avec une technique chirurgicale minutieuse et de l'expérience, l'ajout systématique de vis de fixation n'est pas essentiel pour la PTH dans les cas d'acétabulums atypiques.

Patients may have atypical acetabular anatomy secondary to childhood hip diseases such as developmental dysplasia of the hip (DDH), Legg–Calve–Perthes disease, or other conditions such as septic arthritis, pelvic osteotomy, or trauma. These atypical acetabula are often wide and shallow and have poor underlying bone quality,[1,2] and it is technically challenging to obtain initial acetabular press-fit fixation during total hip arthroplasty (THA).[3] As such, it is standard practice to use additional screw fixation in cases where impaired primary stability is expected. THA is often required at a younger age, when these patients are relatively active, increasing the risk of instability and accelerated wear.[4,5] Large-diameter head (LDH) THA is an appealing option to address these issues because it offers increased range of motion, improved joint stability, and reduced component impingement.[6–8] The design of the monobloc acetabular component with LDH THA allows the thickness of the acetabular wall to be kept to a minimum, permitting the use of maximum bearing diameter. As no supplementary screw fixation is possible, primary stability of these components relies solely on implant press-fit into the acetabular cavity.[9–12]

LDH THA can be defined as femoral head diameter greater than or equal to 36 mm or wall thickness of the acetabular cup less than or equal to 12 mm.[13] LDH THAs are available in different designs: hip resurfacing (HR), LDH metal-on-metal (MoM), LDH ceramic-on-ceramic (CoC), and dual mobility (DM) articulation. HR allows the preservation of femoral bone stock and the restoration or preservation of proximal femoral anatomy. On the other hand, it may limit the range of motion through bony impingement of the femoral neck.[14–16] All LDH THAs have shown increased range of motion and improved stability versus standard head diameter THA.[17,18] MoM LDHs have demonstrated great functional outcomes; however, they have been abandoned because of high failure rates secondary to trunnionosis and local adverse reactions to metal debris (ARMD).[19,20] Ceramic-on-ceramic LDHs provide a safe and durable bearing surface, offering excellent clinical outcomes while avoiding ARMD caused by trunnionosis at the modular taper junction.[21–23] Dual mobility bearings also offer great stability and a substantially reduced risk of dislocation. However, their long-term survival in young and active patients has yet to be investigated to address any remaining concerns about their polyethylene component.[24–26]

Promising results have been obtained with press-fit only fixation of acetabular components on dysplastic hips.[9] However, few studies have reported the results of press-fit fixation of monobloc acetabular components of LDH primary prostheses in atypical acetabula and they are mostly with MoM LDH and HR prostheses.[10,12] The primary objective of this study is to assess the mid-term aseptic loosening rate of LDH monobloc press-fit acetabular components implanted in atypical acetabula. Secondary objectives are to assess complications by cause, to report radiologic signs of implant dysfunction, and to measure patient-reported outcome measures (PROMs). The hypothesis is that LDH monobloc components implanted in atypical acetabula offer a satisfactory survival rate and clinical outcomes.

Methods

In this consecutive case series, we used the local arthroplasty database to retrospectively identify patients with secondary osteoarthritis (OA) who underwent primary THA with press-fit only LDH monobloc acetabular components between 2005 and 2018. We included patients with a minimum follow-up of 2 years and for whom preoperative, postoperative, and last follow-up hip radiographs were available. Preoperative radiographs were reviewed by 3 experienced arthroplasty surgeons (M.-O.K., M.S., P.-A.V.). They identified, by consensus,

cases with atypical acetabula in which obtaining a press-fit primary fixation would be challenging.[27] Ethical approval was provided by the research ethics board of Centre intégré universitaire de santé et de services sociaux de l'Est-de-l'Île-de-Montréal (2021–2469), and patients' written consent was obtained.

We reviewed medical files to gather perioperative data and to identify complications during follow-up. Revisions or reoperations for any cause were recorded. Preoperative pelvis and hip radiographs were reviewed by authors P.-A.S. and M.S., who assessed the degree of dysplasia with the Crowe classification,[28] the vertical centre-edge (VCE) angle,[29] and the acetabular roof angle.[30] Dysplasia was defined as a VCE angle of 20° or less or an acetabular roof angle of 10° or more.[31] Except for hip arthrodesis, in which VCE and acetabular roof angle cannot be measured, radiographic measurements were performed on all other hips. The caput-collum-diaphyseal (CCD) angle was measured and the coxa valga was defined as greater than 140°.[30] The presence of acetabular protrusion was recorded.[32] Postoperative and last follow-up radiographs were reviewed for any signs of aseptic loosening of the acetabular component, that is, presence of radiolucent lines, or acetabular component migration. Periacetabular radiolucent lines of more than 2 mm were described with the DeLee and Charnley classification.[33] Cup migration was evaluated using the technique described by Massin and colleagues.[34] Substantial horizontal or vertical migration was defined as greater than 3 mm[35] and substantial variation of the acetabular inclination was defined as greater than 5°.[34] Heterotopic ossification was described according to the Brooker classification.[36] When the uncovered proportion of the acetabular component was not reported in the surgical protocol, it was estimated by the technique described by Li and colleagues.[37] Functional outcomes were assessed at last follow-up with the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC, best score is 0),[38] the Forgotten Joint Score (FJS, best score is 100),[39] and the Patient's Joint Perception (PJP) question.[40] Continuous variables were described using means, standard deviations, and ranges. Categorical variables were described using absolute and relative frequencies.

Surgical technique

The procedures were performed by 5 experienced arthroplasty surgeons (including M.-O.K. and P.-A.V) in our academic institutions. All THAs were performed using a posterior approach. Acetabular component press-fit fixation was obtained by 1- to 2-mm underreaming versus the implant outside diameter. Because of frequent superior rim deficit, press-fit between the anterior and posterior acetabular rims was sought. If needed, deepening of the acetabular cavity was performed, medializing the implant to increase anterior and posterior rim contact. When superior rim deficit was present, to preserve the anterior and posterior acetabular rim and optimize press fit, surgeons did not try to obtain contact superiorly by increasing reamer diameter. Instead, to optimize superior contact, surgeons preferred to elevate the hip centre of rotation by up to 10 mm. Examples of these principles are shown in Figure 1 and Figure 2.

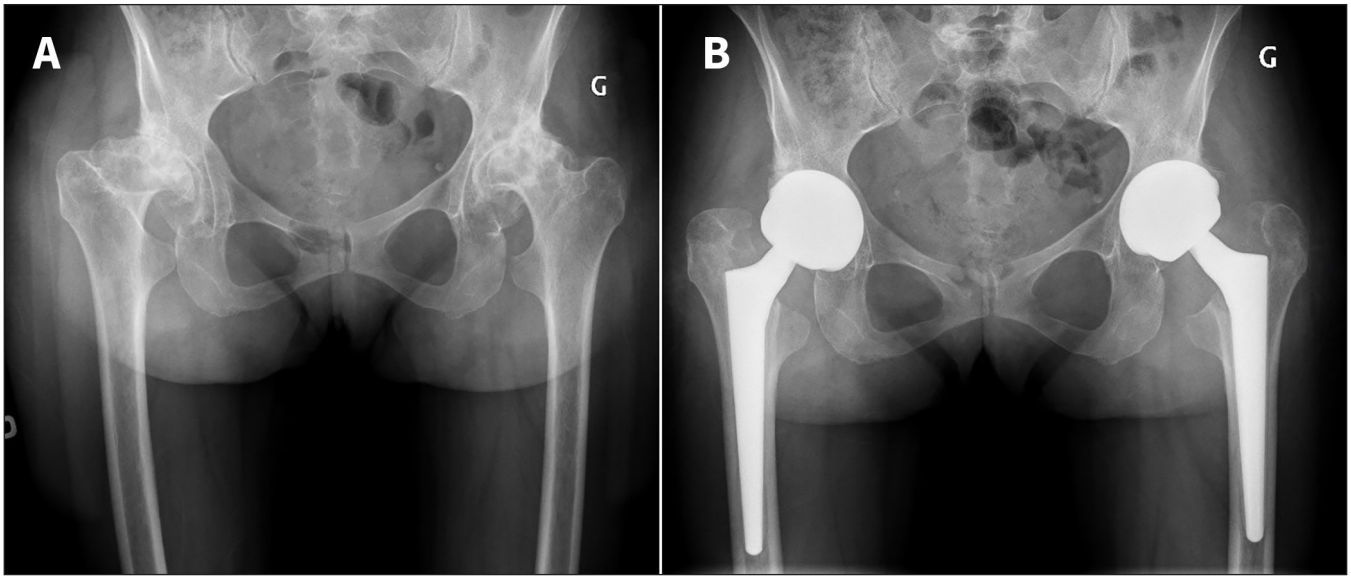

Fig. 1. Preoperative anteroposterior radiograph of a 47-year-old woman with bilateral hip dysplasia (A). Bilateral ceramic-on-ceramic large-diameter head total hip arthroscopy was performed in 1 stage (B). Cup medialization with slight high hip centre was performed bilaterally to obtain adequate primary press-fit fixation. The bilateral hip arthroplasties remain uncomplicated 8 years postoperatively. G = left (for "gauche" in French).

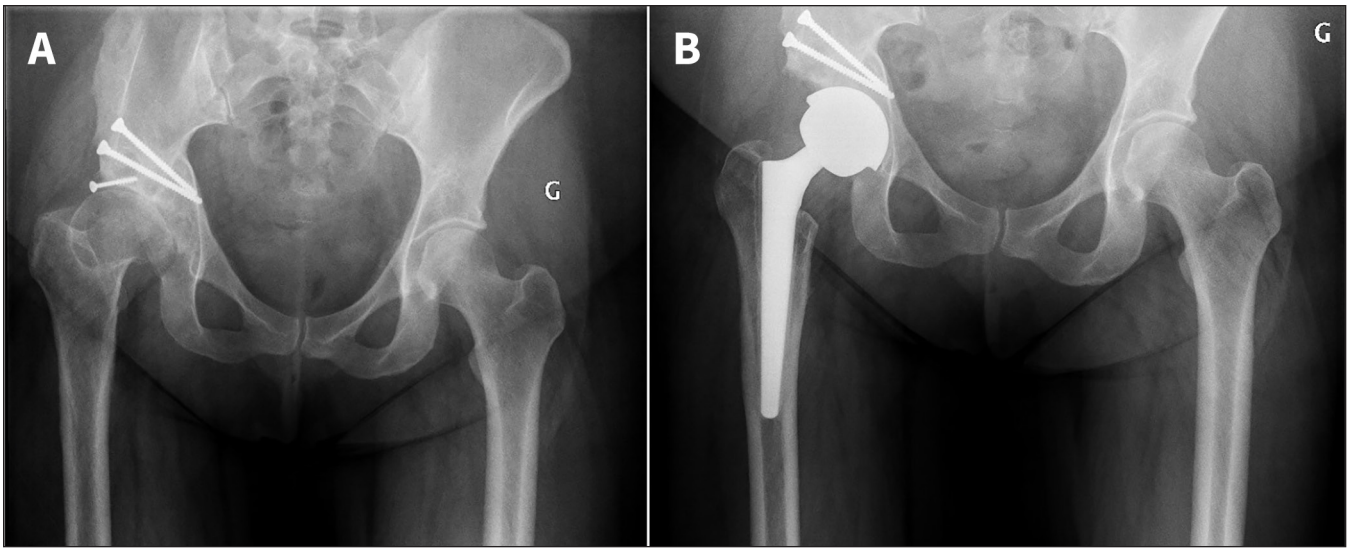

Fig. 2. Preoperative anteroposterior radiograph of a 34-year-old female with left hip dysplasia with periacetabular osteotomy performed several years earlier (A). Metal-on-metal large-diameter head total hip arthroplasty was performed (B). Superolateral acetabular implant uncoverage was estimated to be 20%. Adequate implant press-fit was obtained between the anterior and posterior walls. Hip arthroplasty remained uncomplicated 9 years postoperatively. G = left (for "gauche" in French).

Results

Preoperative radiographs of 253 cases were reviewed, of which 128 did not have atypical acetabula (50.6%). A total of 125 cases (105 patients) were identified with atypical acetabula in which obtaining a press-fit primary fixation would be challenging; these cases were included in the study (Figure 3). Clinical and radiologic follow-up data were available for all of the included cases, and PROMs were available for 89 (71.2%) of them.

Patient and hip characteristics are summarized in Table 1. Preoperative diagnoses included hip dysplasia (36.8%), Legg–Calve–Perthes disease (32.0%), osteoarthritis with acetabular deficiency (17.6%), periacetabular osteotomy (8.0%), arthrodesis (4.0%), and osteopetrosis (1.6%). One hundred and six LDHs THAs and 19 hip resurfacings were included in the study. Allografts and autografts were used in 4 (3.2%) and 2 (1.6%) hips, respectively.

Primary fixation leading to secondary fixation was obtained in all 125 cases. After an average follow-up of 9.2 years (standard deviation [SD] 4.0, range 2.2–15.8 yr), no aseptic loosening of the acetabular component was observed. There were 13 (10.4%) revisions of the acetabular component for causes unrelated to its fixation, including 9 (7.2%) ARMD, 2 (1.6%) deep infections, 1 (0.8%) aseptic loosening of the femoral stem, and 1 (0.8%) immediate postoperative reimplantation of a malpositioned cup.

There were 9 (7.2%) reoperations that did not necessitate acetabular component revision: 2 (1.6%) traumatic periprosthetic femoral fractures, 1 (0.8%) sciatic neuropathy that required a distal femoral-shortening osteotomy, 1 (0.8%) HR femoral stem breakage, 1 (0.8%) internal fixation for non-union of a perioperative greater trochanter fracture, 1 (0.8%) infection, 1 (0.8%) aseptic loosening of the femoral stem, 1 (0.8%) Brooker class IV heterotopic ossification, and 1 (0.8%) immediate postoperative removal of retained intra-articular loose body.

There were 8 (6.4%) peroperative complications, including 6 (4.8%) femoral fissures managed with cerclage wiring, 1 (0.8%) deep femoral artery laceration and 1 (0.8%) acetabular fracture in a patient with osteopetrosis for whom the bone defect was grafted with HydroSet (Stryker) and remained stable 6 years after surgery. No hip dislocations were reported.

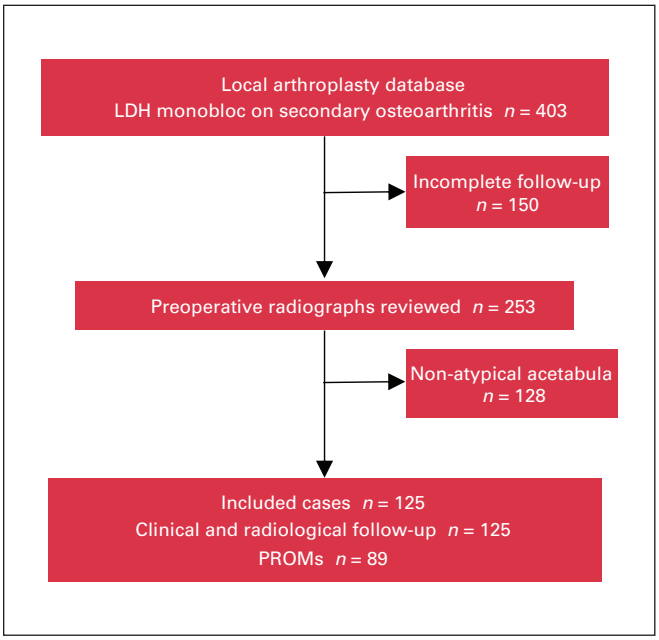

Fig. 3. Study flow diagram. LDH = large-diameter head; PROMs = patient-reported outcome measures.

Table 1. Characteristics of 125 hips in 105 patients

Characteristic	No. (%) of hips*
Patient age at surgery, yr, mean ± SD (range)	46.0 ± 11.5 (17.4–69.9)
Patient sex	
Female	73 (58.4)
Male	52 (41.6)
Side	
Right	65 (52.0)
Left	60 (48.0)
Patient body mass index, kg/m^2, mean ± SD (range)	27.8 ± 5.6 (19.1–46.9)
Diagnosis	
Dysplasia	46 (36.8)
LCP	40 (32.0)
OA with acetabular deficits	22 (17.6)
Previous periacetabular osteotomy	10 (8.0)
Arthrodesis	5 (4.0)
Osteopetrosis	2 (1.6)
Crowe type	
I	39 (84.8)
II	3 (6.6)
III	2 (4.3)
IV	2 (4.3)
VCE angle, °, mean ± SD (range)	13.6 ± 10.2 (0.0–45.0)
Acetabular roof angle, °, mean ± SD (range)	26.6 ± 9.7 (10.0–49.3)
CCD angle, °, mean ± SD (range)	138.7 ± 8.3 (120.0–161.0)
Coxa valga	56 (44.8)
Acetabular protrusion	16 (12.8)
Prosthesis	
CoC LDH	
Maxera (Zimmer Biomet)	48 (38.4)
MoM LDH	57 (45.6)
Durom Metasul (Zimmer Biomet)	41 (32.8)
M2a-Magnum (Zimmer Biomet)	12 (9.6)
ASR (DePuy)	3 (2.4)
BHR (Smith & Nephew)	1 (0.8)
Hip resurfacing	19 (15.2)
Durom Metasul (Zimmer Biomet)	15 (12.0)
BHR (Smith & Nephew)	4 (3.2)
Dual mobility	
Polarcup (Smith & Nephew)	1 (0.8)
Femoral head diameter, mm, mean ± SD (range)	45.5 ± 5.4 (32.0–58.0)
Follow-up, yr, mean ± SD (range)	9.2 ± 4.0 (2.2–15.8)

CCD = caput-collum-diaphyseal; CoC = ceramic on ceramic; LDH = large-diameter head; LCP = Legg–Calve–Perthes disease; MoM = metal on metal; OA = osteoarthritis; SD = standard deviation; VCE = vertical centre edge.

*Unless indicated otherwise.

Analysis of last follow-up radiographs revealed no cases of acetabular component aseptic loosening. The mean acetabular component abduction angle was 47.1° (SD 7.1°, range 30.0°–67.0°). The uncovered proportion of the acetabular component was 0%–5% in 57 hips (45.6%), 6%–10% in 26 hips (20.8%), 11%–15% in 24 hips (19.2%), 16%–20% in 14 hips (11.2%), and 21%–25% in 4 hips (3.2%). At last follow-up, heterotopic ossification was categorized as Brooker class I for 15 hips (12.0%), class II for 7 hips (5.6%), class III for 3 hips (2.4%), and class IV for 2 hips (1.6%). Results for PROMs are reported in Table 2. The mean WOMAC and FJS scores were 9.2 and 80.9, respectively. In response to the PJP question, 49.4% of the patients perceived their hip as natural, 19.1% perceived it as an artificial joint with no restriction, 31.5% perceived it as an artificial joint with restriction, and none perceived it as a non-functional joint.

Table 2. Functional outcomes

Criterion	Finding
Functional score, mean ± SD (range)	
WOMAC	9.2 ± 14.6 (0.0–65.6)
FJS	80.9 ± 22.6 (2.1–100.0)
Response to PJP question,* no. (%) of hips	
Natural hip	44 (49.4)
Artificial hip with no restriction	17 (19.1)
Artificial hip with minor restriction	24 (27.0)
Artificial hip with major restriction	4 (4.5)
Nonfunctional hip	0 (0.0)

FJS = Forgotten Joint Score; PJP = Patient's Joint Perception; SD = standard deviation; WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

*Patients were asked: "How do you perceive your operated hip?"

Discussion

This study was designed to assess the primary and secondary fixation of LDH monobloc acetabular components at midterm in patients with atypical acetabula in whom press-fit primary fixation would be challenging. In the 125 complex cases in our sample, sufficient primary press-fit fixation was obtained, leading to secondary fixation in all cases. After an average follow-up of 9.2 years, no aseptic loosening of the acetabular component nor hip dislocation were recorded, there were low revision rates excluding revision for ARMD, and functional outcomes were very good.

Because joint degeneration in patients with atypical acetabula is mostly attributable to childhood disease, our patients' mean age at surgery was less than 50 years. Total hip arthroplasty in young patients with secondary joint degeneration is associated with increased risk of peroperative and postoperative complications, such as component wear and instability.[4,41,42] Moreover, these patients' hip anatomy may present pathologic changes, such as femoral head subluxation, leg-length discrepancy, acetabular retroversion, deficient anterior wall, poor underlying bone quality, and shallow and enlarged acetabulum.[1,2,43] These anatomic changes make it technically challenging to obtain optimal component positioning for advantageous range of motion and implant survivorship.[22]

Different component and fixation methods can be considered for atypical acetabula. The use of ceramic or metal liners embedded in cemented polyethylene has been reported with limited success.[44] Eswaramoorthy and colleagues

evaluated the performances of 104 THA with MoM liners imbedded in polyethylene (52 cemented, 52 with uncemented metal back) and found radiolucencies at the implant–bone interface of 14 cemented versus 3 uncemented acetabular components.[45] Additionally, in metal or ceramic on cemented polyethylene, bearing diameter is limited by the required minimal polyethylene and cement thicknesses.

On the other hand, uncemented THA have demonstrated lower rates of aseptic loosening compared with cemented THA in patients under 65 years of age.[46] Takao and colleagues reported no revision or aseptic loosening of 98 cups implanted in dysplastic hips using the press-fit only technique at a mean 7.4-year follow-up.[9] Yalcin and colleagues analyzed the clinical outcomes of 75 patients with Crowe type I and II DDH treated with monobloc MoM LDH at a mean follow-up of 5 years and reported no aseptic loosening of the acetabular component.[10] Amstutz and colleagues analyzed the outcomes of 59 HR performed on dysplastic hips of Crowe types I and II with a mean follow-up of 6 years, and no aseptic loosening of the acetabular component occurred.[12] Interestingly, a higher rate of aseptic loosening of 5% for standard THA in patients with Legg–Calve–Perthes disease was reported in a systematic review conducted by Hanna and colleagues that included 245 hips with an average follow-up of 8.4 years.[2]

In cases with limited to moderate bone deficits that do not necessitate structural allograft, we believe that adequate press-fit of monobloc acetabular components can be obtained. If needed, the acetabular component should be medialized to optimize press-fit on the anterior and posterior acetabular rims and medialization should be prioritized over increasing cup size. A slight high hip centre of up to 10 mm can be maintained to obtain adequate fixation on the superior dome, as good superior cup–bone contact is essential for press-fit cup stability.[47] While reaming, surgeons should use increments of 1 mm when approaching the desired diameter to ensure sphericity. If needed, they could start with modular components without implementation of supplemental screws when adequate press-fit is obtained to gain experience before using monobloc acetabular components.

In our cohort, a total of 13 (10.4%) revisions of the acetabular component occurred. None of them were linked to the acetabular implant fixation. Most (9) were attributed to ARMD. This well-documented complication is associated with increased torque and corrosion at the head–neck junction of MoM LDH.[20] Shifting to a CoC bearing LDH design seems to prevent such ARMD, which could therefore be avoided in the future.[21,48] When excluding revisions for ARMD, our cohort has a 3.2% revision rate, which is, interestingly, within the range of 1% to 5% risk of revision reported in the literature for LDH THA on non-atypical acetabula.[49] In the current cohort, we had a 1.6% deep infection rate, which is slightly higher than our overall historical THA infection rate of 1.4%.[50] This is related to the level of complexity of these cases, as they usually required a longer operating time and more blood loss, and some required femoral-shortening osteotomy and hardware fixation. These are all factors that are known to increase the overall risk of infection. Sciatic nerve palsy following THA has a prevalence of 0.6%–3.8% and hip dysplasia is a recognized risk factor.[51] In our cohort, 1 patient (0.8%) with hip dysplasia experienced postoperative sciatic neuropathy that required a femoral-shortening osteotomy. Patients completely recovered after the femoral shortening.[52]

Similar series of LDH THAs on non-atypical acetabula have been reported by our institution. First, we reported 4 reoperations (1.4%) including 1 revision (0.4%) in 264 cases receiving LDH CoC THA with a mean follow-up of 5.5 years. The revision was for early loss of primary fixation of the acetabular component. Reoperations were for a suspicion of prosthetic joint infection, a femoral-shortening osteotomy for sciatic neuropathy and a periprosthetic femoral fracture. No hip dislocation was observed.[48] Second, in a randomized trial including 24 cases with MoM LDH and 24 MoM HR, all using the Durom Metasul (Zimmer Biomet) acetabular component, with a mean follow-up of 14 years, we reported 5 revisions (20.8%) for MoM LDH THA compared with 2 (8.3%) for MoM HR.[53] The HR revisions were for femoral stem loosening at 2.1 and 8 years postoperatively. The MoM LDH revisions were for 4 ARMD and 1 hematogenous deep infection at 8.8 years postoperatively. These series demonstrate the high prevalence of ARMD with MoM LDH and its absence with CoC LDH. A systematic review of LDH THA on non-atypical acetabula conducted by Neupane and colleagues confirmed that MoM prostheses are associated with the highest revision rate because of ARMD complications.[49]

LDH prostheses have been shown to provide better joint stability and lower dislocation rates.[6,7] These characteristics were reflected in this study, in which no hip dislocation was reported. This was also our experience with non-atypical acetabular cases, as no dislocation was observed in a group of 264 cases of CoC LDH THA in young and high-demand patients.[48] Similar results have been reported by Yalcin and colleagues, who analyzed the clinical outcomes of 75 patients with Crowe type I and II DDH treated with monobloc MoM LDH with a control group of 47 patients receiving standard THA at a mean follow-up of 5 years. No dislocations occurred in the MoM LDH group compared with 2 in the control group.[10] Additionally, Tao and colleagues compared the outcomes of 28 HR and 40 monobloc MoM LDH THA in younger patients with mostly secondary OA at a mean follow-up of 7.4 years and reported no dislocation in either group.[11] These results for LDH prostheses are better than for standard THA, for which dislocation has been reported to affect 0.2%–10% of patients.[54]

Proper acetabular component orientation is essential to enhance the outcomes of THA, but it can be challenging to obtain, particularly in atypical acetabula. Hip malformation has been associated with a greater risk of excessive abduction of the acetabular component,[55,56] which in return is associated with early aseptic loosening of the acetabular component and increased risk of dislocation.[57] The mean acetabular component inclination reported in this study was 47.1° (range 30.0°–67.0°). Because hard-on-hard bearings do not tolerate implant malposition, we performed an early reintervention to reorient a misaligned component. For the remaining cases, no component could be considered malpositioned. In a dysplastic hip, aiming for an ideal component inclination might reduce the acetabular coverage. Amstutz and colleagues suggested at least 60% coverage for HR implanted on Crowe type I and II dysplastic hips and managed to obtain excellent fixation of the acetabular component at 6 years' average follow-up despite incomplete lateral acetabular coverage.[12] More conservatively, Rogers and colleagues suggested that in atypical acetabulum such as dysplasia, the acetabular component should ideally have 75%–80% bone coverage and if at least 70% cannot be obtained, bone grafting should be considered.[4] In this study, the surgeons managed to obtain minimal uncoverage of the monobloc LDH acetabular components implanted on atypical acetabula. All acetabular components had host–bone contact of at least 75%, and the majority had 85% or greater host–bone contact.[4]

Interestingly, there were excellent results for the PROMs for the patients with secondary joint degeneration in the present study (mean WOMAC and FJS scores of 9.2 and 80.9, respectively), similar to the results of our earlier case series of 264 LDH CoC THA on standard arthritic hips (mean WOMAC and FJS scores of 7.7 and 88.5, respectively, after 5.5 years).[48] Similarly, after a mean follow-up of 3 years, Epinette and colleagues reported a mean WOMAC score of 8.9 for 342 standard hips treated with DM THA.[58] On the joint perception question, in our atypical acetabula cohort there was a slightly higher rate of patients reporting an artificial hip with major restriction (4.5%) versus 0.8% and 0.3% in 2 of our earlier studies.[48,53] Overall, considering that this study includes patients with challenging pathologic anatomies and often long-term disabilities, the joint perception and functional outcomes obtained were very good.

Limitations

This study has some limitations. First, subjective criteria were used to identify atypical acetabula in which press fit would be considered challenging, because no clear objective criteria were found in the literature. However, all preoperative radiographs were reviewed by 3 arthroplasty surgeons experienced with monobloc press-fit acetabular components. Second, our results might not be reproducible on a larger scale because the surgeries were performed in an academic medical centre by high-volume arthroplasty surgeons experienced with monobloc acetabular components. Lastly, because of the retrospective nature of this study, there were no specific criteria to guide the decision to use press-fit monobloc acetabular components during surgery. Atypical acetabula in which a modular acetabular component was implanted were not considered. The choice of implant type was based on the intraoperative judgment and technical abilities of the surgeon. Therefore, clear guidelines on the use of monobloc acetabular components in atypical acetabula cannot be stated.

Conclusion

Press-fit primary fixation of LDH monobloc components implanted in atypical acetabula was sufficient and led to secondary fixation. These acetabular components demonstrated good midterm results with no aseptic loosening of the acetabular component, no hip dislocation, low revision rates, and very good functional outcomes. With careful surgical technique and experience, systematic use of supplemental screw fixation is not essential in THA with atypical acetabula.

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