International Journal of Orthopaedics and Traumatology

ISSN Print: 2664-8318
ISSN Online: 2664-8326
Impact Factor: RJIF 5.42
IJOT 2023; 5(1): 01-06
www.orthopedicsjournal.in
Received: 01-11-2022
Accepted: 05-12-2022

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Early revision of primary total hip replacements in Yaounde: incidence, indications, surgical techniques and results

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DOI: https://doi.org/10.33545/26648318.2023.v5.i1a.20

Abstract
Introduction: Total hip replacements are becoming more common in our environment due to an aging population and an overall improvement in the provision of healthcare. They remain costly and at the expense of the patient, making any failure of the intervention dramatic. Early revision surgery is a devastating complication, exacerbating morbidity, mortality and cost. The aim of this study was to determine the rate of early revision of total hip replacements (THRs) in Yaounde and to describe their etiologies, indications and short-term results.
Patients and Methods: All records of patients operated for a primary THR in hospitals in Yaounde during the period from January 2015 to December 2021 were collected, and retrospectively analyzed to recruit those who had been reoperated on the same hip in the year after the first THR surgery. Data on the etiology of the revision surgeries, therapeutic indications, and results at one year of follow up were collected.
Results: Out of a total of 117 primary THRs performed during this period, 10 cases of early revision surgeries were performed, representing an early revision rate of 8.5%. The initial indications for primary THR were coxarthrosis (5 cases), osteonecrosis (3 cases) and complex hip fractures (2 cases). The etiologies of early revisions were infection in 6 (60%) cases, irreducible or uncontrollable dislocations in 3 (30%) cases, and periprosthetic fracture in 1 (10%) case. The therapeutic indications were debridement with maintenance of the implant in 2 cases, debridement with implant explantation – sterilization – then reimplantation of the same implant in 2 cases, debridement and exchange of the implant in 2 cases, open reduction with repositioning of the acetabulum in 3 cases, and osteosynthesis by cerclage wiring in 1 case. The immediate results were favorable in 3 (30%) cases, while 4 required a second revision surgery. The functional evaluation at one year follow up which was assessed using the Postel-Merle d'Aubigné (PMA) score was 11.5 [7-15].
Conclusion: The rate of early revision surgery of primary THR remains relatively high in our environment, when compared to developed countries. Infections and hip joint instabilities are the main etiologies. Their management deserves to be improved in order to optimize the results in this setting.

Keywords: Total hip replacement, early revision, prognosis, developing countries

Introduction
Total hip replacement is one of the most common procedures in the world and has been described as one of the 3 most successful surgeries since its inception in the 1960s [1, 2]. The demand for total hip replacements (THRs) is steadily increasing over the years, especially due to the aging of the population in industrialized countries (in France, 10% increase between 2011 and 2015) [3]. A successful THR allows for functional restoration and improved quality of life for the next 15 to 20 years before any changes are considered. However, complications may occur, involving the prognosis and requiring a re-intervention (or revision surgery) with or without change (partial or total) of the prosthesis. Bozic *et al*. in the United States found an incidence of early revisions at one year of 2.03%, in a cohort of 56,030 THRs between 1998 and 2010 [4]. In France, an ANSM study found a rate of early revision surgeries at 33 months to be less than 3.1% [3].

In a meta-analysis in 2021, Pai *et al*. found a rate of 5.5% of early revisions of dual-mobility THR between 2000 and 2020 [5]. Periarticular infection represents the most devastating etiology of early THR revision surgeries [6]. Other common causes are aseptic loosening of prosthesis, instability (dislocation) and peri-prosthetic fractures. The frequency of different etiologies of revision surgeries varies between studies and countries [1, 3, 7-9].

In Cameroon, total hip replacements are becoming more and more common due to the aging of the population and an overall improvement in the provision of healthcare. They remain costly and at the expense of the patient, making any failure of the intervention dramatic. Early surgical revision is a devastating complication, exacerbating morbidity, mortality and cost. In a series of 115 THRs performed from 1990 to 2017, there were 15.6% of complications that may require early revision surgery [10]. However, we found no studies in Cameroon on early revision surgery of THR, including their incidence, etiologies, therapeutic indications and results obtained.

The aim of this work was therefore to determine the rate of early revision of total hip replacements (THRs) in Yaounde and to describe their etiologies, indications and short-term results.

Patients and Methods

We conducted a retrospective cohort study in 4 hospitals in Yaounde (General Hospital, Déo Gratias Medical Center, Yaounde Emergency Center and FROT Foundation). All records of patients operated for primary THR during the period January 2015 to December 2021 were collected. Those who had been reoperated from the same surgical site in the year following the initial placement of primary THR were sorted and their files analyzed.

We identified 117 primary THRs performed during the study period. The indications were primary coxarthrosis in 60 (51.2%) cases, aseptic osteonecrosis of the femoral head in 32 (27.6%) cases, femoral neck fracture in 10 (8.5%) cases, complex pertrochanteric fracture in 2 (1.7%) cases, coxofemoral dislocation fracture in 8 (6.8%) cases, hip sequelae dysplasia in 5 (4.4%) cases. The surgical approach first used was Hardinge's transgluteal lateral approach in 71 (60.7%) cases followed by Moore's posterior approach in 40 (34.2%) cases. The friction torque used was metal-polyethylene. The prostheses were cemented in 5 (4.2%) cases, hybrid in 8 (6.8%) cases and uncemented in 104 (88.9%) cases.

For each patient who had an early revision of his THR, data concerning the etiology of the revision, the therapeutic indication posed and realized, and results at one year of follow up were collected. Prosthetic joint infection was defined according to the criteria developed by the Musculoskeletal Infection Society [11]. The instability of the prosthesis was defined by recurrent, incoercible or irreducible closed-focus dislocations. Periprosthetic fractures were classified according to the Vancouver classification [12].

Patients were contacted for final evaluation and the result of the surgical revision was considered "good" after one year if all the following conditions were met: no new surgical intervention, disappearance of the signs that justified the revision surgery (absence of signs of infection, absence of new dislocation, consolidation in case of fracture). The functional evaluation at the one-year follow-up was carried out using the Postel-Merle d'Aubigné score.

Results

Out of a total of 117 primary THRs performed during the period, 10 cases of early surgical revision were performed, representing an early revision rate of 8.5%. There were 9 men and one woman, with an average age of 49 [23-62] years. Initial indications for primary THR in these patients were primary coxarthrosis (4 cases), aseptic osteonecrosis of the femoral head (3 cases) and complex hip fractures (3 cases), including 1 case of a high-energy comminuted cervicotrochanteric fracture with gluteus medius disinsertion and 2 cases of acetabular fracture with neglected coxofemoral dislocation. The primary prostheses were initially all uncemented, without double mobility, with a metal-polyethylene friction torque. Table 1 presents the 10 cases of early revision surgeries in this series. The etiologies of early revision surgeries were prosthetic joint infection (PJI) in 6 (60%) cases, incoercible dislocations (instability) in 3 (30%) cases, and periprosthetic fracture Vancouver type B3 in 1 (10%) case. The average revision time was 48.6 [1-180] days. It was longer for surgical site infections (75.5 vs 8.25 days).

The surgical therapeutic indication during the revision surgery for infection (Table 2) was Debridement, Antibiotics and Implant Retention (DAIR) in 2 cases, debridement with explantation – sterilization – then re-implantation of the same implant (DAIS) in 2 cases, debridement and exchange of the implant in 2 steps in 1 case (DAIEx-2), debridement and exchange of the implant in 1 step (DAIEx-1) in one case, associated in all cases with an antibiotic therapy adapted over a period of at least 6 weeks. The evolution was marked by the total control of the infection obtained only in the 2 cases where the prosthesis had been immediately explanted and sterilized. One patient amongst these 2 died of pulmonary embolism at 4 months after the revision surgery, where he had fully resumed his activities, and walked without crutches for 2 months. In one case after failure of the DAIR, a second revision surgery with sterilization of the implant was performed, this time which permitted total control of the infection. At the last follow up of the remaining 3 patients, there was persistent evidence of prosthesis infection in 2 cases (intermittent productive fistula), and a Girdlestone procedure was done on one patient after 2 failed revision surgeries (DAIR).

With regard to instability (Table 3), 3 cases were observed in patients operated by Hardinge's approach, 2 of which were related to a malposition of the acetabulum and the third related to muscular insufficiency resulting from a tear of the gluteus medius muscle (Figure 1). One of the cases had an immediate dislocation within one hour of surgery. The revision surgery was carried out at the 6th hour and the intraoperative discoveries were a significant comminuted fracture of the greater trochanter and an irreducible retraction of the gluteus medius muscle. The revision surgery consisted of an open reduction and an unsuccessful attempt to reintegrate the gluteus medius by transosseous points. The evolution was marked by the re-dislocation and infection of the prosthesis, which was taken care of on Day 7 by a 2nd revision surgery with debridement, explantation – sterilization – reimplantation of the same prosthesis. The aftermath was marked by full control of infection at the minimum follow up period, but uncontrollable dislocation of

the hip prosthesis. After the follow up period, the patient resumed his professional activity and walks, with crutches for partial weightbearing. The other 2 cases of uncontrollable dislocation were related to a malposition including verticalization of the acetabular cup implant. The revision surgery was performed three weeks after the primary THR surgery, with repositioning of the uncemented acetabulum and screwing. The consequences were marked by the persistence of hip joint instability in the patient, justifying the installation of a new dual-mobility prosthesis.

We observed 1 case of peri-prosthetic fracture of the femoral diaphysis classified as Vancouver B3 indicating early revision surgery. It occurred intraoperatively during the reaming of the femoral shaft. The revision surgery consisted of osteosynthesis of the femoral diaphysis by cerclage wiring with retention of the implant. The evolution was marked by the occurrence of a prothesis joint infection on the 15th postoperative day, which posed an indication for a new revision surgery for debridement and maintenance of the implant. At the last follow up, there was a persistence of infection with intermittent productive fistula.

The average PMA score at the last follow up was 11.5 [7-15].

Discussion

This study on early revision surgery of total hip replacements in our environment to the best of our knowledge, is the first specifically dedicated to this topic. This study shows that the rate of early revision surgery after a THR is relatively high (8.5%) compared to developed countries where the rate varies between 1 and 4.5%. Joint prosthesis infection (JPI) is the leading cause (60%) of early revision surgery within an average of 75 days, followed by prosthetic instability (30%) within 8 days, and peri-prosthetic fractures (10%). The therapeutic indications for revision surgery met international recommendations in only 2 out of 6 cases in case of JPI, 0 out of 3 cases in case of instability, and 1 out of 1 case in case of fracture, giving an overall rate of good indications of 30%. The results at the last follow up were good in 30% of cases.

Several studies in the Western world report early surgical revision rates of THR on much larger samples. Ferguson *et al*. in 2019 reported an incidence of revision surgery of primary THR at 3 months postoperative of 1.1% in Geneva (Switzerland) and 0.9% in Sweden [13]. In a series of 6894 primary THRs carried out between 2007 and 2014 in the USA, Angerame *et al*. found an early revision rate of 2.2% [1]. In an analysis of primary THR for 122345 cases in Australia from 2015 to 2018, the rate of early revision surgery with respect to the approaches was 2% for posterior approach, 2.2% for lateral approach, and 2% for anterior approach [14]. Another analysis of 2906 consecutive primary THRs found 140 cases of early revision surgery within one year, or 4.5% [15]. A study in New York found that the probability of undergoing aseptic early revision surgery and early septic revision surgery was 4% and less than 1% at 5 years [16]. This relatively high rate of primary revision surgery in our environment may be due to conditions related to practice, including operating room conditions that do not meet standards for optimal asepsis. Also, the high cost of THR still makes this procedure inaccessible, thus reducing the number of cases per surgical team and particularly lengthening the learning and experience curve, which would increase the frequency of complications. In addition, the various technical platforms, tools for planning and assisting in the near-perfect and ultra-fast implementation of THRs in developed countries are non-existent in our environment. The implementation of universal health coverage allowing an explosion of cases and therefore a greater exposure of practitioners, the improvement of technical platforms and the optimal training of complete arthroplasty teams would certainly reduce these rates of early revision surgery.

Regarding the etiologies of early revision surgeries in Western literature, they are dominated by dislocations, infections, fractures and loosening. In a retrospective analysis of 60 cases of revision surgeries within 90 days after primary THR, 65% were related to dislocation and 32% to periprosthetic fractures [17]. Of the 2472 early revision surgeries performed following 122345 primary THRs in Australia between 2015 and 2018, the main etiologies were infection (29%), dislocation (22.6%), periprosthetic fractures (21.8%) and early prosthesis loosening (14.5%) [15]. In a cohort of 402 patients who had early aseptic revision surgeries in the United States in 2020, the etiologies were mainly dislocation (41.5%), periprosthetic fractures (38.1%) and mechanical loosening (17.4%) [18]. In our environment, early revision surgeries are dominated by infections at the expense of fractures, mechanical loosening and dislocations. This could be related to the fact that our population is relatively young compared to these countries where patients are relatively older with potentially more risk of osteoporosis and muscle tone weakness.

The results after early revision surgery in our study were generally poor, marked by a high rate of new infections or persistence of infection, or persistence of dislocation. This may be partly related to the fact that revision surgery did not comply with international recommendations in 70% of cases [19-23]. Nevertheless, even in developed countries, post-recovery results return to higher complication rates. Patients who undergo early revision surgery of the primary prosthesis within 90 days postoperatively have a high risk of recovery and infection at 2 years [18, 24]. One study reports an infection rate of 33% after early revision surgery [17].

This study has limitations: its retrospective nature, the small number of revision cases, the small series of primary THRs performed over the study period, and the lack of standardization of early revision surgical procedures. However, this is a pioneering study on the subject in our resource-limited environment, which provides valuable original data, giving us the potential to evaluate all future actions to improve arthroplasty in this context.

Table 1: Individual patient data from the early revision surgery following THR. (DAIR: Debridement Antibiotics and Implant Retention; DAIEx: Debridement Antibiotics and Implant Exchange; DAIS: Debridement Antibiotics and Implant Sterilization; THR: total hip replacement).

Cas	Age	Gender	Primary THR indication	Surgical approach	Comorbi-dities	Etiology of the early revision surgery	Delay before revision surgery (in days)	Therapeutic Indication	Evolution	Results after last follow up
1	62	M	Primary coxarthrosis	Moore	No	THR infection	28	DAIS	Infection control	Good
2	23	M	Acetabulum fracture + dislocation	Moore	No	Instability	21	Repositioning of same acetabular component	Persistence of instability	Bad
3	39	M	Osteonecrosis	Moore	No	THR infection	180	DAIEx in 1 step	Persistence of fistula	Bad
4	60	M	Comminuted cervicotrochanteric Fracture.	Hardinge	No	Instability	1	Reduction + gluteus medius reinsertion	Infection / 2nd revision surgery	Bad
5	34	M	Osteonecrosis	Moore	Gout Obesity	THR infection	05	DAIR	Infection / 2nd revision (DAIS)	Good
6	48	M	Primary coxarthrosis	Hardinge	No	Peri-prosthetic Fracture	1	Cerclage wiring on the same prosthesis	Infection / 2nd revision DAIR	Bad
7	54	M	Coxarthrose primitive	Hardinge	No	THR infection	90	DAIR	Persistence of infection	Bad
8	56	M	Osteonecrosis	Moore	HIV	THR infection	60	DAIS	Infection control	Good
9	58	F	Primary coxarthrosis	Hardinge	Morbid Obesity	Instability	10	Repositioning of the same acetabulum	Persistence of instability - New dual mobility THR	Death from pulmonary embolism
10	56	M	Acetabulum fracture + neglected hip dislocation	Hardinge	No	THR infection	90	Explantation Debridement – cement	Persistence of infection	Bad

Table 2: Comparison of Techniques used in early revision surgeries for JPIs (Joint Prosthesis Infections) versus literature recommendations and results at the last phase.

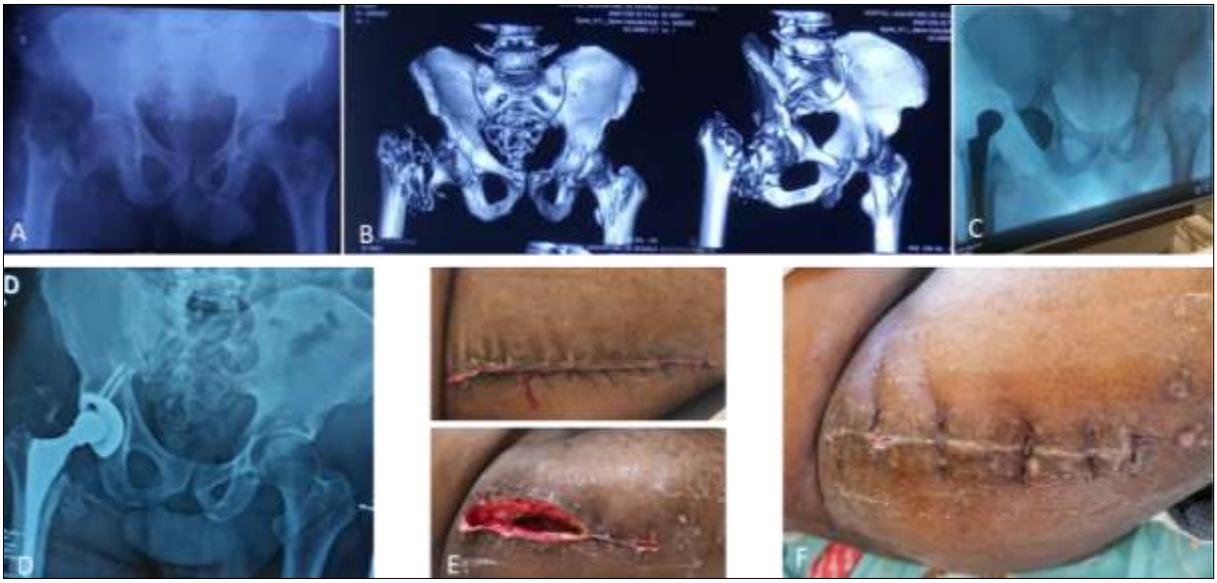
JPI (number of cases)	Technique used	Recommendations	References	Results at the last phase
JPI within 30 days or less than 3 weeks after symptoms on stable constructs without fistula(02)	DAIR: Early debridement, tba, retention of the prosthesis (01case)	Same	Osmon *et al*. (IDSA) [14]	Absence de signes d'infection cliniques et biologiques, PMA= 14
	DAIS: Debridement, ATB, explantation and reimplantation in 1 step with the same implant after sterilization (01cases)	DAIR		Absence of clinical and biological signs of infection PMA= 15
Late JPI on stable construct with satisfactory soft tissue without the need for bone grafting (04)	DAIEx: ATB debridement reimplantation of a new hip prosthesis in 1 step (non cemented) (1case)	Same	Osmon *et al*. [14]	Persistence of infection Girdlestone after 2 early revision surgeries, LDC= 8
	DAIR (1case)	DAIEx		Persistence of infection PMA = 12
	DAIS (01case)	DAIEx		Absence of signs of infection but death from late pulmonary embolism
	Debridement + ATB + cement spacer (1st time of the DAIEx in 2 steps) (1case)	DAIEx		Persistence of infection PMA= 8

Table 3: Comparison of techniques used in early recoveries for instability with literature recommendations and results at the last phase.

Instability	Technique used	Recommendations	References	Results at the last phase
Dislocation for malposition of the cup (02)	Reorientation of the same cup (2)	Reorientation and reimplantation with cemented double mobility cup	Neil Wheelton *et al*. 2019	Recurrent dislocation (1 case) PMA= 7 Dual mobility THR(1 case) PMA =14
Dislocations due to lesions on surrounding structures providing hip stability: gluteus medius (01)	Gluteus medius repair	Reimplantation with THR with dual-mobility cup	Favreau *et al*. 2020	Inveterate dislocation PMA = 11

Table 4: Comparison of techniques used in early revision surgeries for PPF (peri-prosthetic fracture) versus literature recommendations and results at the last phase.

PPF (number of cases)	Technique used	Recommendations	References	Results at the last phase
Femoral diaphysis fracture classified as Vancouver B3 (1 case)	Prosthesis retention + osteosynthesis by cerclage wiring	Same	Delauney *et al*. 2013	Persistent infection, 2nd revision DAIR, PMA = 15



A: post-trauma radiography,
B: images of reconstruction on CT scan,
C: Early postoperative dislocation noted on immediate postoperative radiography,
D: radiography post revision surgery for an open reduction and attempt (unsuccessful) to reinsert the gluteus medius,
E: infection of the incision site justifying a 2nd early revision surgery,
F: Day 15 post second revision surgery, skin healing.

Fig 1: Early revision for instability of the prosthesis by tearing the gluteus medius in a 60-year-old patient.

Conclusion

The rate of early revision surgery of primary total hip replacements remains relatively high in our environment, at a frequency of 8.5%, compared to western countries where it varies between 1 and 4.5%. Joint prosthesis infection and instability by malposition of the acetabular component are the main etiologies. Their management does not comply with international recommendations in 70% of cases, and therefore deserves to be improved. The results are generally good in 30% of cases, with a high rate of complications after early revision surgery of a THR in our environment. Early revision surgery of a primary THR in our environment therefore remains a dramatic situation that deserves to be prevented by all means, and treated rigorously according to the recommendations adapted to each situation.

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