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Total Hip Arthroplasty in Haemophilic Patients with Modern Cementless Implants

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ABSTRACT

Hip arthropathy due to recurrent haemarthrosis in patients with haemophilia can be disabling. When severe degeneration occurs, total hip arthroplasty is indicated. Reported outcomes are variable and out of date. The aim of this study is to evaluate the survivorship of Total Hip Arthroplasty performed in a patient population with modern cementless implants. Twenty-three haemophilic patients were treated and followed by a multidisciplinary team dedicated to haemophilia. The mean age was 40.6 years. No failures or complications were recorded at a mean follow-up of 8.1 years (range: 3.1–13.7). A multidisciplinary team and the use of modern cementless implants may represent the keys to achieve good outcomes, fewer complications, and better survivorship in the approach to these difficult cases.

Haemophilia is an uncommon inherited blood disorder consisting of a lack of specific coagulative factors, leading to frequent haemorrhage and haemarthrosis in male subjects beginning in childhood [1]. Modern haematological care and prophylaxis have significantly reduced haemorrhage and articular bleeding, which currently represent the most common complications, inducing severe degenerative changes in specific joints, named "target joints"[2]. Blood induces a direct degenerative action on articular cartilage, as it negatively alters joint fluid and synovial tissue, particularly in knees, ankles, and elbows, where the synovia is highly represented. Hips are not typical target joints, given the paucity of synovial tissue, however, the involvement of the hip induces significant impairment, similar to other joints. Several conservative approaches have been reported during recent years with high rates of clinical success before surgery; most of these approaches are indicated for the early stages of arthropathy of the knees, elbows, and ankles, mainly targeting the synovial tissue [3–5]. These treatments have not shown the same effects in the hip, thus only a Total Hip Arthroplasty (THA) is considered useful, as reported by several series [6–8]. Historically, the results of this surgery in haemophilic patients have shown acceptable rates of success, despite the high risk of complications related to comorbidities, mostly coinfections (HBV, HCV, HIV), liver disease, and septic or aseptic loosening due to further bleeding [6–12]. Most of these outcomes have been due to the use of old generation cemented implants in a limited series of patients.

The aim of this retrospective study is the mid-term to long-term evaluation of the outcomes of Ceramic-on-PolyEthylene THAs with modern cementless implants, and their survival rates in a series of consecutive haemophilic patients affected by severe hip arthropathy at a single institution.

Patients and Methods

A series of 23 haemophilic patients were treated with a cementless THA at the authors' institution, in close collaboration with the Agency for Haemophilia and Bleeding Disorders, between 2000 and 2012. Eighteen patients were affected by severe haemophilia (15 patients with A type, 3 with B type); five patients presented a mild to moderate factor deficiency (4 A type, 1 B type). No patients presented inhibitors for VIII or IX factors. The mean age of patients at the time of surgery was 40.6 years (range: 28–60). The mean Body Mass Index (BMI) was 25.4 kg/m^2 (range: 21.1–27.5). Eight patients presented a non-active Hepatitis C infection, while one presented non-active HCV and HIV infections.

All patients were clinically evaluated before surgery for all target joints and for their global functional ability using a specific score: the Haemophilic Joint Health Score (HJHS) [13]. An ultrasound (US) examination was then conducted for all the target joints following the criteria of a previously published US score [14]. Finally, a radiographic study was performed with standard weight-bearing AP and lateral projections, evaluated by the Petterson Score [15]. Inclusion criteria for THA scheduling were: severe arthropathy (persistent symptoms and functional disability referred by the patients during daily life activities, Petterson score > 9), limited range of motion (ROM), and a flexion contracture > 15° with an associated functional limb length discrepancy.

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Exclusion criteria were: patients with suboptimal control of bleeding, unbalanced or active coinfections, a more severe involvement of the ipsilateral knee (Petterson > 9, varus or valgus alignment > 10°, and a flexion contracture of the knee >15°). A tailored haematological protocol with preoperative doses of the recombinant coagulative factor was prepared by the haematologists on the basis of the deficient factor and its kinetics. Specifically, a prophylactic treatment of intermittent bolus infusion of FVIII/IX concentrates and tranexamic acid was performed to prevent bleeding 1 h before surgery, and targeting a preoperative FVIII peak of 100%–120% and FIX of 60%–80%. Postoperatively, boli of 30 U/kg of VIII or IX factors and 2 g of tranexamic acid were administered every 12 h for at least 3 days to reach levels of 60%–80%. A daily blood dosage was then performed to assess FVIII/IX levels, maintaining a daily level of both factors of 40%–60% in the 7–15 days following surgery. No form of antithrombotic prophylaxis was used.

After surgery, all patients were periodically evaluated by the HJHS score and a standard radiographic study. Periacetabular radiolucencies were assessed according the criteria of DeLee and Charnley [16], and radiolucencies around the stems were analysed by the criteria of Gruen, adapted for cementless components [17]. Cup inclination was assessed in the anterior–posterior projection, measuring in degrees the angle formed by a line drawn along the bottom of the acetabular component intersecting with the horizontal interteardrop line. Hip centre restoration was assessed calculating the perpendicular distance from the prosthetic centre of rotation to a horizontal line drawn between the tips of the teardrops. Finally, the presence of periarticular ossification was also evaluated by the Brooker's classification [18]. All surgical procedures were performed by the senior surgeon, using a direct lateral approach in supine position, and checking the correct positioning of the components using an intraoperative x-ray.

Two types of implants were used over the years: a monoblock TMT® cup (Zimmer, Warsaw, IN) and a PPF® stem (Biomet, Warsaw, IN) were implanted in 9 patients in the period between 2000 and 2008. In the remaining (after 2009), a Regenerex® cup and a Taperloc® stem (Biomet, Warsaw, IN) were implanted. All the components were uncemented, and a Ceramic-on-PolyEthylene (PE) coupling was chosen. All the procedures were performed in general anaesthesia, and with an antibiotic prophylaxis as per the standard of our institution (Vancomicine 1 g and Amikacin 500 mg), prolonged for two days. The haematological prophylaxis was prolonged for at least four weeks, in order to cover the whole rehabilitative protocol. Parameters such as blood loss (following the method proposed by Liu and colleagues [19]), surgical time, and intraoperative and postoperative complications were recorded. All patients were discharged after 7 to 10 days postoperatively (mean duration: 8.4 days) and sent to the rehabilitative agency of our institution to complete their functional recovery. The overall mean hospital stay was 27.3 (24–36 days). All patients were included in a follow-up protocol with clinical and radiologic evaluations at 3, 6, 12 months, and then with a yearly interval.

The statistical analysis was conducted by a Kaplan–Meier survival curve with two distinct endpoints: revision for any causes or loosening of one or both components, based on progressive and >2 mm radiolucency lines at the radiologic follow-up.

Results

The mean follow-up was 8.4 years (range: 3.1–13.7 years). The mean Petterson score was 11.3 (range: 10–13). No failures were recorded, and no complication was documented. No patient was lost at follow-up. The mean surgical time was 58.4 min (range: 50–115). The mean blood loss was 320 cc (range: 250–800). All patients were able to begin the rehabilitation protocol starting within two days after surgery, and to perform weight-bearing exercises before discharge to the rehabilitative agency. At the time of discharge from hospital, all patients were able to walk with full weight-bearing, with or without crutches. The mean cup inclination was 42.7° (range: 41°–48°). An adequate hip centre restoration was achieved in 20 cases (Fig. 1). A suboptimal hip centre was achieved with a consequent limb length discrepancy <1.5 cm in the remaining subjects (Fig. 2). However, due to the mid to severe involvement of other target joints, patients did not complain of significant impairments. The mean preoperative HJHS score was 12.5 (range: 10–22); postoperatively at the last follow-up, the mean score was 1.5 (range: 1–5). Excellent outcomes were recorded in all cases, however, given the involvement of the ipsilateral knee and/or ankle, in four cases the scoring was good rather than excellent. Symptoms and functional impairments were improved in all cases, and patients referred no complaints within 6 months. No flexion contractures of the hip or significant ROM limitations were recorded. No alterations of the periprosthetic space or radiolucencies around the components were found at the x-ray study, except in two cases with radiolucent lines in zone 2 of the acetabular component. They were <1 mm in width and not progressive at radiologic follow-up: none of these components were considered unstable or loose, and furthermore no complaints by the patients were referred at the latest clinical evaluation. Periarticular ossifications were found in 3 cases (Brooker stage 1 in one case, stage 2 in two cases) and not referred as symptomatic (Fig. 2).

The overall survivorship of the implants was 100% at the last follow-up period for all patients.

Discussion

Recurrent bleeding in joints of patients affected by haemophilia induces direct damage to the articular cartilage and indirect abnormal activation of the synovial tissue, leading to synovial hyperplasia and secondary alterations of the other intra-articular structures, such as subchondral bone, ligaments, capsule, menisci, labrum and tendons [1, 2]. The result is a complete disruption of the shape and function of the involved joint, which implies that haemophilic patients often need joint arthroplasty as a unique solution, despite their very young age [6–8].

Prophylactic treatment by administration of recombinant coagulative factors beginning in childhood is now considered the gold standard to prevent general complications and articular sequelae [2, 6]. However, minimal bleeding (usually posttraumatic) may be subclinical and patients may not complain about early symptoms: these conditions may lead to a slow deterioration of the joint, later inducing arthropathy. The conservative management of the haemophilic arthropathy has demonstrated an efficacy in the delay of the progression of arthropathy, and is now the goal of the orthopaedic treatment: this approach implies early administration of hyaluronic acid and/or Rifampicine (*chemical synoviortesis*), injections of radiocolloids (*radiosynoviortesis*), maintenance of physical activities, and permanent avoidance of high-impact practices [3–5]. This strategy has demonstrated positive outcome in knees, ankles, and elbows, but poor success in hips. The quick progression of hip arthropathy associated with severe symptoms or functional impairment often induces surgeons to choose a hip arthroplasty. This procedure has shown substantially positive outcome [6–12], however, it has also been associated with significant rates of complications, mostly related to the high risk of haemarthosis, infections, and aseptic loosening [9–11]. Given the fact that haemophilia is an uncommon disease, few papers have been published, and very few series have been reported on the surgical management of hip arthropathy. Moreover, the largest series was regarding cemented implants, mostly of old design and outdated coatings. Recent experience with modern implants reported good results with small study populations, however, acceptable survivorship has generally been reported with titanium components with metal-PE or metal-on-metal couplings, and only a few ceramic-PE couplings [6, 9, 11, 20–23].

Luck et al reported their experience on 13 haemophilic patients treated with cemented components with 20 years of follow-up, with unspecified survivorship of the implants: failures were mainly related to infections and aseptic loosening [6]. Nelson et al reported a series of 39 patients with a survivorship of 70% at 8 years. The rate of