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Original Article

Total hip arthroplasty in patients with haemophilia – What are the risks of bleeding in the immediate peri-operative period?

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ABSTRACT

Background: Undergoing a major surgical intervention such as total hip arthroplasty (THA) with an underlying clotting disorder like haemophilia poses its own unique challenges. Despite the advances in factor replacement and medical management, the potential for excessive and uncontrolled haemorrhage still exists. The aim of this study was to quantify blood loss, peri-operative transfusion requirements and risk of haematoma formation in a cohort of patients with haemophilia undergoing THA.

Methods: All patients with haemophilia types A or B who had undergone THA in the previous 10 years were identified from the Hospital In-Patient Enquiry system and theatre logs. A comprehensive review of operative records, laboratory parameters and peri-operative haematological management was conducted.

Results: Eleven male patients (12 THA) were identified. The mean age was 56 years (range 28–76). The mean intra-operative blood loss was 502 ml (100–1250 ml) compared to an established normal blood loss of 400 ml. The mean drop in haemoglobin was 3.25 g/dl in 48 h. Only one patient required a post-operative transfusion of two units of red cell concentrate. There were no complications of haematoma formation.

Conclusion: The results in our institution compare favourably with the established blood loss reported in the literature and by assessment with International Guidelines. Average blood loss in patients with haemophilia was higher than the established normal, but there was no increased transfusion requirement.

1. Introduction

Undertaking a major surgical intervention such as total joint arthroplasty (TJA) in patients with an underlying clotting disorder such as haemophilia poses unique challenges, despite advances in factor replacement and perioperative medical management.[1] Patients with haemophilia suffer recurrent atraumatic joint haemarthroses due to their coagulopathy. This in turn leads to chronic synovitis that can progress to symptomatic haemophilic arthropathy and symptomatic arthritis.[32] Often these patients are younger, usually developing end-stage haemophiliac arthropathy between the ages of 20–40.[1,2] TJA is now an accepted treatment for symptomatic arthritis affecting the hip and knee, once other conservative treatments have been tried and failed.[3,4]

The knee is the most common joint affected and by inference a total knee arthroplasty (TKA) is the most common arthroplasty procedure in patients with haemophilia.[5] Much has been written about bleeding and complications for TKA with a risk of significant bleeding of up to 40% reported despite adequate factor replacement.[6–9]

Symptomatic, end-stage haemophilic arthropathy affecting the hip is less common and therefore there is a paucity of published data on bleeding risks following total hip arthroplasty (THA). The first documented THA in a patient with haemophilia was performed in 1967 using cryoprecipitate to manage bleeding. It was reported "there was no undue haemorrhage, and no transfusion was required".[10] Many recent outcome studies have focused on medium to long-term outcomes – that is infection and revision rates, with no study focussing on the assessment of bleeding risk as a primary outcomes measure.[2,11] Mann et al. reported an equivalent blood loss with routine THA for osteoarthritis.[1] However, others have shown an increased bleeding risk with a reported mean blood loss of 900 ml.[12] Nelson et al. reported the incidence of haematoma

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formation as high as 7.6% (3/39 patients).[13] None of the available studies in the literature have evaluated a drop in haemoglobin in the peri-operative period as a measure of blood loss.

The aim of this study was to determine the risk of bleeding in the peri-operative period, including the risk of haematoma formation and the peri-operative blood transfusion requirements in a cohort of patients with haemophilia undergoing THA. Secondarily we aimed to compare the results of our study to the available current published data.

2. Materials and methods

Ethical approval was obtained at the outset from the Hospital's Risk and Legal Department, which governs Hospital Clinical Audit and Internal Research.

This study was carried out at a national centre for coagulation disorders, which offers on-site specialised haematological and orthopaedic services. All patients with haemophilia (types A and B) who had undergone a THA in a 10-year period from September 2003 to May 2012 were identified from the HIPE (Hospital In-Patient Enquiry) database. The HIPE search output was cross-referenced with the theatre records to ensure accuracy, and to identify any additional patients. The inclusion criteria were any patient with haemophilia type A or B who had undergone a primary THA in the previous 10 years. Ten-year period was chosen as the cut off to reduce the variation in haematological practices in the peri-operative management over the study period. Exclusion criteria included bleeding disorder(s) other than haemophilia, children (age <18 years), revision hip replacement or other joint replacement.

Case notes were retrieved and reviewed to ascertain details of patient demographics – age, gender, haemophilia type and clinical type, inhibitor status and medical co-morbidities including HIV and hepatitis status. Haematological parameters were recorded from chart documentation and blood results on the Hospital EPR (Electronic Patient Record) system – details collected are shown in Table 1.

Intra-operative EBL is quantified by measuring irrigation fluid and blood in the calibrated suction container and weighing surgical gauzes used for blood and fluid collection during surgery. The known quantity of irrigation fluid is then subtracted from the total to give the estimated blood loss.

Our results were assessed using the International Guidelines from World Federation of Haemophilia (WHF), which objectively assesses outcomes in haemostasis by comparing blood loss in haemophilia to a normal/non-haemophiliac population (see Table 2).[14] Normal blood loss following THA was defined as 400 ml as per literature review.[25–27] As our hospital is a tertiary referral centre for patients with haematological conditions but otherwise conducts little elective orthopaedic surgery, as these cases are done in a separate institution, it was not possible to establish blood loss in a normal group of controls for comparison. The results of the study were analysed using the statistical package Minitab version 14.0®. For both the one tailed *t*-test and Pearson's coefficient a *p*-value of <0.05 was accepted as signalling statistical significance.

Table 1
Haematolic details collected from medical records.

Pre-operative haemoglobin and factor levels
Haematological factor replacement
Estimated intra-operative blood loss (EBL)
Use of post-operative drain and the documented blood loss into the collection bottle
Post-operative haemoglobin levels
Peri-operative transfusion requirements
Incidence of post-operative haematoma formation

Table 2
Definitions of adequacy of haemostasis for surgical procedures.[14]

Excellent	Intra-operative and post-operative blood loss similar (within 10%) to the non-haemophilic patient. • No extra (unplanned) doses of FVIII/FIX/bypassing agents needed AND • Blood component transfusions required are similar to non-haemophilic patient
Good	Intra-operative and/or post-operative blood loss slightly increased over expectation for the non-haemophilic patient (between 10 and 25% of expected), but the difference is judged by the involved surgeon/anaesthetist to be clinically insignificant. • No extra (unplanned) doses of FVIII/FIX/bypassing agents needed AND • Blood component transfusions required are similar to non-haemophilic patient
Fair	Intra-operative and/or post-operative blood loss increased over expectation (25–50%) for the non-haemophilic patient and additional treatment is needed. • Extra (unplanned) dose of FVIII/FIX/bypassing agents needed OR • Increased blood component (within 2-fold) of the anticipated transfusion requirement
Poor	Significant intra-operative and/or post-operative blood loss that is substantially increased over expectation (>50%) for the non-haemophilic patient, requires intervention, and is not explained by a surgical/medical issue other than haemophilia • Unexpected hypotension or unexpected transfer to IC due to bleeding OR • Substantially increased blood component (>2-fold) of the anticipated transfusion requirement

3. Results

Twenty-two patients were identified from the initial search and 21 of these charts were obtained (95%) with the final chart reported permanently lost. Ten patients (48%) were excluded from the study, as they did not meet the inclusion criteria leaving 11 patients for analysis. One patient with haemophilia had undergone a revision total hip replacement, and another patient had a hemiarthroplasty for treatment of avascular necrosis of the hip. Eight patients had a clotting disorder other than haemophilia: Factor X deficiency (1); Factor XI deficiency (3); von Willebrand's disease (2); platelet dysfunction (1), and unknown coagulopathy (1).

One patient had bilateral THR at a 2-year interval, which gave data for 12 THA in total. This patient's data was recorded for each event and he was identified as 6R and 6L for each episode. To avoid confusion no identifier of "patient 7" was applied. The results and demographics for each patient are recorded and presented in Table 3 and surgical details in Table 4. The mean age for the group was 56 years (range 28–76, SD ± 15.6). All patients were male. Haemophilia A was the diagnosis in 9 of the 11 cases (5 severe; 1 moderate; 3 mild). Two patients had haemophilia B (both severe). Six of the 11 cases were hepatitis C positive and one was HIV positive. No patient had factor inhibitors pre-operatively or any other medical co-morbidity which would affect coagulation.

Haematological management was standardised according to the NCHCD Haemostasis Guidelines.[15] A bolus infusion of recombinant factor was administered to bring the factor level up to 100% (1.0 IU/ml) – Advate® for Factor VIII deficiency or BeneFix® for Factor IX. This was given 60 min prior to surgery and factor levels tested 20 min after infusion. A continuous infusion continued peri-operatively for 5 days for patients with severe clinical type, with rate adjusted according to the daily factor level. Bolus dosage thereafter was administered as required by the attending haematologist. Perioperative factor levels were adequate in all cases. Two consultant surgeons were the primary operator in