The Journal of Arthroplasty 28 (2013) 498–503

Contents lists available at SciVerse ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Hematoma Following Primary Total Hip Arthroplasty: A Grave Complication

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ARTICLE INFO

Article history:
Received 6 March 2012
Accepted 26 July 2012

Keywords:
total hip arthroplasty
hematoma
complications

ABSTRACT

Hematoma following primary total hip arthroplasty (THA) can require a return to the operating room. The purpose of this study was to uncover risk factors for hematoma and how it affects the outcome of THA. This case–control study identified 38 patients requiring reoperation due to hematoma following THA between 2000 and 2007. The 38 patients were matched with 117 patients without hematoma. The mean follow-up was 4.1 years (range, 2.1–9.6). Multivariate regression showed that blood loss, administration of fresh frozen plasma and Vitamin K, perioperative anticoagulation and hormonal therapy were independent predictors for hematoma formation. Chronic anticoagulation and autologous blood transfusion were independent risk factors for mortality. Hematoma itself was found to be an independent risk factor for adverse outcomes, increasing morbidity and mortality, despite adequate treatment.

Hematoma formation is a well-known complication following total hip arthroplasty (THA) [1–4]. While most hematomas are small and reabsorb on their own, some can become large enough to cause immediate consequences such as sciatic nerve palsy, excessive pain, swelling and persistent wound drainage [5]. On occasions return to the operating room for evacuation of hematoma may be needed [1,2]. Risk factors for hematoma formation following total knee arthroplasty were recently reported by Galat et al. [6]. This study found that bleeding disorders were associated with hematoma formation and reoperation for evacuation of hematoma. Furthermore, it was found that reoperation for hematoma was associated with a significantly increased risk of periprosthetic joint infection (PJI). Risk factors for hematoma formation following THA and the effects of this complication on the outcome of THA remain unknown.

It is known that administration of anticoagulation is one of the most important factors associated with bleeding and hematoma formation after any surgical procedure, including total joint arthroplasty (TJA) [3,7–9]. However, because of the risk for development of thromboembolic disease, namely deep venous thrombosis (DVT) and/or pulmonary embolus (PE), administration of some form of anticoagulation following TJA is warranted [10,11]. In recent years various anticoagulation guidelines for patients undergoing TJA have been issued [10,12]. The American College of Chest Physicians (ACCP) endorses chemoprophylaxis for all patients undergoing THA [10]. There has also been a flurry of publications suggesting that aggressive anticoagulation leads to increased hematoma formation, wound drainage, and PJI [3,13]. The question that arises is what other factors, if any, are associated with hematoma formation following THA and how does formation of hematoma influence the outcome of this procedure.

This study was undertaken to address the lack of knowledge regarding risk factors for hematoma formation after primary THA. We investigated how often this complication develops after primary THA and also sought to determine the factors that may put the patient at the risk of developing hematoma. The outcome of patients who developed hematoma and underwent reoperation was compared with control patients without hematoma formation.

Materials and Methods

After Institutional Review Board approval, using our computerized TJA database, we identified all patients who underwent primary THA between January 2000 and December 2007. At our institution, we have a prospective electronic database which records any complications that occur following joint arthroplasty during the hospitalization and during the postoperative period. Patients who were diagnosed with hematoma during their hospital admission were identified by discharge abstracts or by examining daily complications forms. These forms, which outline the nature of each in-hospital complication and the treatment rendered, are completed daily by orthopedic residents and uploaded into our database. The same form is then administered to each patient in every follow-up visit. In addition, we have a prospective database at our institution (based on billing records) for identifying any patients who may be evaluated in the emergency room or readmitted to the hospital. Patients who developed

The Conflict of Interest statement associated with this article can be found at http://dx.doi.org/10.1016/j.arth.2012.07.033.

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0883-5403/2803-0022$36.00/0 – see front matter © 2013 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.arth.2012.07.033

hematoma after hospital discharge were identified by examining electronic records of follow-up clinic visits and reoperation records. All patients who developed hematoma within 6 weeks of joint arthroplasty were identified. A total of 9,255 patients underwent primary THA during the period of study. We identified 38 (0.41%) patients who developed postoperative hematoma needing surgical intervention within the same hospital admission or within 6 weeks of THA. To determine the risk factors for hematoma formation, we then matched the hematoma patients, in a 3:1 ratio, based on date of surgery and surgeon to identify 117 control patients who underwent primary THA during the same time period. In some instances matching revealed numerous patients for a given day of surgery and the surgeon. In that circumstance we only selected three control patients for that particular day to allow for inclusion of control patients from various time points.

A detailed retrospective review of medical records (paper and electronic charts) of these patients was conducted to extract all pertinent information. Patient demographics, comorbidities, medications, detail of operative procedures and hospital stay information were then evaluated to identify risk factors for developing this complication and/or affecting the outcome. We collected medical histories for each patient, recording information on history of hypertension, diabetes, hyperlipidemia, smoking, coronary artery diseases, non-coronary artery cardiac disease, central nervous system disease, pulmonary disease, autoimmune diseases, hypothyroidism, bleeding disorder, gastrointestinal disease, genitourinary disease, and malignancy. Charlson comorbidity score was calculated based on patient comorbidities for all cases and controls and American Society of Anesthesiology (ASA) scores reported by the anesthesiologist at the time of surgery was recorded [14,15]. We also obtained data on preoperative medication use, including use of antithrombotic medications, chronic anticoagulation and other drug treatments. The patients in the cohort were categorized into two groups: urgent and elective THA. Patients undergoing urgent surgery were those needing surgery as a result of admission through the emergency room (e.g. hip fracture). The elective patients were those scheduled through office visit for surgical intervention. Details of the surgical procedure in terms of reason for surgery, unilateral versus simultaneous bilateral surgery, surgical approach, operative time, type of anesthesia, estimated blood loss (EBL) and calculated blood loss (CBL) and the amount of blood transfusion intra-operatively and postoperatively were also collected.

As part of our joint arthroplasty database, patients were followed clinically and radiologically at 6 weeks, 6 months and every 2 years thereafter. Therefore, office charts were queried for any further complications or reoperations and to assess the outcome. Effort to complete the latest follow-up was attempted for all patients in our cohort; those who were not able to return for physical examination were contacted by phone. No patients were lost to follow-up.

To determine the risk factors for hematoma, baseline and intraoperative variables were tested between cases and controls using the *t*-test for continuous variables and Fischer's exact test for categorical variables. Means and standard deviations were reported for the continuous variables while frequency distributions were reported for the categorical variables. All p values reported are two-sided and p values of $<.05$ were considered significant. Adjusted analysis was performed using selection stepwise logistic regression analysis to determine variables that were significant independent predictors of hematoma. To evaluate the effect of hematoma on the outcome of primary THA, unadjusted analysis using univariate statistics for continuous and categorical variables was performed. Four outcomes were considered: Harris Hip Score (HHS), Satisfaction Score (SS), complication rate and mortality rate. Then a hypothesis driven multivariate analysis of the data set was performed with the hypothesis that hematoma is an independent risk factor for the four outcomes.

Results

Cohort Description

The average age of study patients was 66 years (range, 27 to 89 years), and the average age of control patients was 62 years (range, 34 to 86 years) ($p=0.12$). There were 24 women and 14 men in the study population while there were 69 female and 48 male patients in the control population ($p=0.62$). The average body mass index was 31 kg/m^2 (range: 21 to 55 kg/m^2) in the study group and 29 kg/m^2 (range: 16 to 60 kg/m^2) in the control group ($p=0.20$). The average Charlson comorbidity score was 2.6 (range: 0 to 5) in the study population and 2.0 (range: 0 to 5) in the control population ($p=0.06$). Six different joint surgeons performed the primary hip arthroplasty. All cases were performed using the direct lateral approach to the hip, posterior and direct anterior approaches were not used.

Evacuation of hematoma was conducted in all study patients. In all cases, the prior incision and approach was used to evacuate the hematoma. The operating surgeon determined the need to re-open the deep fascia based on intraoperative assessment of hematoma communication with the joint space and/or dehiscence of deep fascia closure. A large majority (31 of 38) of the hematoma evacuation procedures were conducted by the same surgeon that performed the original joint replacement. In seven cases, a colleague of the original joint replacement surgeon performed the irrigation and debridement procedure. Twenty nine patients received general anesthesia and 9 received spinal anesthesia; the average surgery lasted for 60.5 minutes; the average intraoperative EBL was 160 mL. The average preoperative white blood cell count, erythrocyte sedimentation rate and C-reactive protein were $9.6\times10^3/mm^3$, 49.3 mm/hour, and 5.7 mg/dL, respectively. All patients received post-operative anticoagulation. Thirty-two of the thirty-eight hematoma patients received the standard post-operative chemoprophylaxis regimen at our institution with coumadin. Six of the thirty-eight hematoma patients required therapeutic anticoagulation post-operatively for their various medical comorbidities such as mitral valve replacement. Two patients out of these six were anti-coagulated with low molecular weight heparin and four received a combination of heparin and coumadin. Eighteen patients were found to be culture positive based on intraoperative fluid/tissue samples, 17 were culture-negative and in 3 patients no culture samples were sent. Half of the culture positive patients had positive results from superficial cultures only, with an intact deep fascial closure encountered during reoperation. The other half, nine patients had deep-space hematoma involvement and culture positive results from the hip joint. In all cases of culture positive results, the infectious disease service was consulted and all patients were given antibiotic therapy for 6 weeks with either intravenous or oral agents based on culture sensitivity results. At latest follow-up, none of the culture positive patients required implant removal for their infection; all patients retained their original hardware. Of the culture positive results, coagulase-negative *Staphylococcus* was the most common isolated organism (7), one of which was methicillin-resistant. Other bacteria isolated included *Enterococcus* (5), *Proteus* (3), *E. coli* (2), *Enterobacteria* (2), *Klebsiella* (2), *Streptococcus* (2), and *Pseudomonas* (1). Four patients were infected by multiple organisms. The majority of patients with hematoma presented with drainage (35/38) as a presenting symptom. Other presenting symptoms were redness, pain, fever and swelling. Hematoma was found at an average of 11 days after the primary surgery (range, 0 to 44 days). The average hospital length of stay after primary THA was 6.7 days for the hematoma cohort. Fourteen patients were discharged from the hospital after primary THA (5 to home and 9 to rehabilitation) while 24 remained in the hospital from the initial admission until after the hematoma was treated. Twenty-four hematoma patients experienced a complication during/after hematoma treatment. Twenty-one of those complications were infectious