ORIGINAL RESEARCH

Thrombotic and Bleeding Complications Following Orthopaedic Surgery

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ABSTRACT
Background:Orthopaedic surgery is an operation conducted by a trained orthopaedic surgeon or orthopaedist expert to address musculoskeletal issues affecting the bones, chronic conditions, trauma, and ligaments from accidents, tendons, and joints. This study was conducted to assess thrombotic and bleeding complications following orthopaedic surgery.**Material and methods**: This study comprised of 100 subjects who underwent orthopaedic surgery. Major bleeding was defined as bleeding in a critical site, bleeding that resulted in either a 2 g/dl or greater decrease in haemoglobin during any 24-h period, or transfusion of two or more units of packed red blood cells. **Results**: In this study, 27 (27%) out of 100 patients showed ≥2 g/dl decrease in haemoglobin during 24-hour period following orthopaedic surgery. Out of 100 subjects, 49 were males and 51 were females. Deep vein thrombosis was seen in 9 subjects and pulmonary embolism was discovered in 4 subjects. Thrombotic complications were seen in overall 13 subjects. Bleeding complications were seen in 14 subjects including surgical site haemorrhage visible in 8 subjects and hematoma formation evident in 6 subjects.**Conclusion**: Thrombotic complications like pulmonary embolism and deep vein thrombosis were seen in a few subjects while bleeding complications like surgical site haemorrhage and hematoma formation was seen in other subjects following orthopaedic surgery.
Keywords:Haemoglobin, Bleeding, Thrombosis, Orthopaedic surgery.

INTRODUCTION

Orthopaedic surgery is an operation conducted by a trained orthopaedic surgeon or orthopaedist expert to address musculoskeletal issues affecting the bones, chronic conditions, trauma, and ligaments from accidents, tendons, and joints. Additionally, an orthopaedic surgery can address genetic disabilities, problems with the musculoskeletal system brought on by aging, and issues with the nervous system related to the spinal column.[1]

As a dynamic discipline, orthopaedic surgery has witnessed significant evolution over the years, marked by a continuum of approaches shaping the landscape of patient care. Historically, the field has been anchored in conventional surgical techniques, emphasizing precision and biomechanical principles. The advent of minimally invasive procedures in the late 20th century, as exemplified by the work of Mithany (2023), ushered in a new era, reducing surgical trauma and accelerating postoperative recovery.[2] In recent decades, technological innovations have become pivotal in defining the trajectory of orthopaedic surgery.

The integration of robotic-assisted surgery has transformed the precision and efficiency of joint replacements, as evidenced by studies such as Soomro et al. (2021). This underscores the historical progression of surgical techniques and sets the stage for a future where advanced technologies are integral to orthopaedic interventions. Regenerative medicine has emerged as another paradigm shift, representing a departure from conventional symptom management to holistic tissue repair.[3]

Venous thromboembolism (VTE), comprising pulmonary embolism (PE) and deep vein thrombosis (DVT), poses a significant risk during and after hospitalization, particularly for surgical patients. Among various patient groups, those undergoing major orthopaedic surgeries are considered to have a higher susceptibility to PE and DVT. Major lower-extremity orthopaedic procedures carry a higher risk of symptomatic VTE compared to most other

surgeries, with an estimated incidence of ~4%. The greatest risk period occurs within the first 7–14 days following surgery.[4] Major bleeding is also more prevalent in these surgeries compared to others, with rates estimated between 2% and 4%. For patients undergoing major lower-extremity orthopaedic surgery who have a low bleeding risk, it is recommended to use pharmacological thromboprophylaxis with or without mechanical devices. The choice of the initial agent depends on the specific surgery and patient comorbidities. First-line options include low-molecular-weight heparins (LMWHs), direct oral anticoagulants, and aspirin. Second-line options consist of unfractionated heparin (UFH), fondaparinux, and warfarin.[5,6]

This study was conducted to assess thrombotic and bleeding complications following orthopaedic surgery.

MATERIAL AND METHODS

This study comprised of 100 subjects who underwent orthopaedic surgery. The purpose of this study was to evaluate the thrombotic and bleeding complications among these subjects following the surgery. The subjects had been informed about the procedure and were asked to give consent. the subjects who were willing to give consent and those who underwent orthopaedic surgery had been included in the study while those who weren't willing to give consent had been excluded from the study. Major bleeding was defined as bleeding in a critical site, bleeding that resulted in either a 2 g/dl or greater decrease in haemoglobin during any 24-h period, or transfusion of two or more units of packed red blood cells. Statistical analysis was conducted using SPSS software.

RESULTS

Table 1: Number of patients fulfilling the criteria for major bleeding following surgery

≥2 g/dl decrease in haemoglobin during 24-hour period	Number of patients
Present	27
Absent	73
Total	100

27 (27%) out of 100 patients showed ≥2 g/dl decrease in haemoglobin during 24-hour period following orthopaedic surgery.

Table 2: Gender-wise distribution of subjects.

Gender	Number of subjects	Percentage
Males	49	49%
Females	51	51%
Total	100	100%

Out of 100 subjects, 49 were males and 51 were females.

Table 3: Thrombotic and bleeding complications after orthopaedic surgery

Thrombotic complications	Number of subjects	Bleeding complications	Number of subjects
Deep vein thrombosis	09	Surgical site haemorrhage	08
Pulmonary embolism	04	Hematoma formation	06
Total	13	Total	14

Deep vein thrombosis was seen in 9 subjects and pulmonary embolism was discovered in 4 subjects. Thrombotic complications were seen in overall 13 subjects. Bleeding complications were seen in 14 subjects including surgical site haemorrhage visible in 8 subjects and hematoma formation evident in 6 subjects.

DISCUSSION

Deep vein thrombosis (DVT), a subset of venous thromboembolism (VTE), is a major preventable cause of morbidity and mortality worldwide. The incidence of VTE is estimated to be 1 per 1,000 people annually[7,8], with DVT accounting for approximately two-thirds of these events.[9] Pulmonary embolism (PE), a dreaded complication of DVT, occurs in up to one-third of cases and is the primary contributor to mortality.[10] Much of the morbidity of DVT results from the development of post-thrombotic syndrome, which occurs in up to 50% of patients within 2 years of DVT and encompasses a number of symptoms including leg pain, swelling, and in severe cases, venous ulcers.[11,12] Anticoagulation is the mainstay of therapy for DVT, with the goal of preventing progression to PE and recurrence of thrombosis. The 30-day mortality rate exceeds 3% in patients with DVT who are not anticoagulated, and this mortality risk increases 10-fold in patients who develop PE.[13]

Venous thromboembolism (VTE) and PE is the third most common cause of cardiovascular death after myocardial infarction (MI) and cerebrovascular accidents (CVA).[14] Many PEs are likely undiagnosed and calculating the true incidence remains challenging. However, PE remains a significant cause of preventable in-hospital mortality. Hence; the study was conducted to assess thrombotic and bleeding complications following orthopaedic surgery.

In this study, 27 (27%) out of 100 patients showed ≥2 g/dl decrease in haemoglobin during 24-hour period following orthopaedic surgery. Out of 100 subjects, 49 were males and 51 were females. Deep vein

thrombosis was seen in 9 subjects and pulmonary embolism was discovered in 4 subjects. Thrombotic complications were seen in overall 13 subjects. Bleeding complications were seen in 14 subjects including surgical site haemorrhage visible in 8 subjects and hematoma formation evident in 6 subjects.Oberweis BS et al (2013)[15] investigated the incidence and risk factors for thrombotic (myocardial necrosis and infarction) and bleeding events in patients undergoing orthopedic surgery. In-hospital outcomes included myocardial necrosis (elevated troponin), major bleeding, coded myocardial infarction, and coded hemorrhage as defined by International Classification of Diseases, Ninth Revision, coding. Of the 3,082 subjects, mean age was 60.8 ± 13.3 years, and 59% were female. Myocardial necrosis, coded myocardial infarction, major bleeding, and coded hemorrhage occurred in 179 (5.8%), 20 (0.7%), 165 (5.4%), and 26 (0.8%) subjects, respectively. Increasing age (P < .001), coronary artery disease (P < .001), cancer (P = .004), and chronic kidney disease (P = .01) were independent predictors of myocardial necrosis, whereas procedure type (P < .001), cancer (P < .001), female sex (P < .001), coronary artery disease (P < .001), and chronic obstructive pulmonary disease (P = .01) were independent predictors of major bleeding. There is a delicate balance between thrombotic and bleeding events in the perioperative period after orthopaedic surgery.

An observational cohort study by Kleiboer B et al (2022)[16] evaluated the rate of bleeding during the postoperative period after total hip (THA) or knee arthroplasty (TKA). This included patients withhemophilia(PWH) of any severity ≥18 years of age who were undergoing THA or TKA. Clinical decisions were made at the discretion of the treating physician according to local standards of care. Clinical data were prospectively recorded. Major bleeding was defined as bleeding in a critical site, bleeding that resulted in either a 2 g/dl or greater decrease in hemoglobin during any 24-h period, or transfusion of two or more units of packed red blood cells. One hundred thirty-one procedures (98 TKA and 33 THA) were performed, 39 (29.8%) of which were complicated by major bleeding, including 46% of THA and 25% of TKA. The risk of major bleeding was increased in THA compared to TKA (OR 2.50, p = .05), and by the presence of an inhibitor (OR 4.29, p = .04), increased BMI (OR 4.49 and 6.09 for overweight and obese, respectively, compared to normal BMI, each p < .01), and non-use of an antifibrinolytic medication (OR 3.00, p = .03). Neither continuous clotting factor infusion (versus bolus infusion) nor pharmacologic thromboprophylaxis were associated with bleeding risk. The bleeding risk remains substantial after THA and TKA in PWH, despite factor replacement. Use of antifibrinolytic medications is associated with decreased risk.

CONCLUSION

Thrombotic complications like pulmonary embolism and deep vein thrombosis were seen in a few subjects while bleeding complications like surgical site haemorrhage and hematoma formation was seen in other subjects following orthopaedic surgery.

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