ABSTRACT
Background: Thrombocytosis can occur following a wide variety of surgical procedures. The purpose of this study is to assess the platelet count in patients admitted to the surgical ward after major surgeries of two major surgical disciplines; ENT & Breast surgeries and define if post-surgery thrombocytosis is attributed to poor outcomes including the risk of DVT. Methods: Platelet count (PLTs), Hemoglobin (Hb), red blood cell count (RBC), fibrinogen and D-dimer were assessed on admission and at discharge after major surgeries. Thrombocytosis was considered to have occurred when platelet count was greater than or equal to 450 x 10^9/L. All patients with thrombocytosis had ultrasonography to assess for DVT occurrence. The patients were also divided into “young” and “old” groups according to an age cut-off of 75 years to study potential age-related differences. The study was done in King Hussein Medical Center, a well-known tertiary medical center in the Middle East region. The study was conducted over a six months period and data were retrieved from medical records. The study was approved by the hospital ethic committee and written approval consent were obtained. Results: Two hundred and twenty patients were included to be studied and 102 were enrolled for having post surgical thrombocytosis. Of the 102, 27(26.5%) were males and 75(73.5%) were females. The mean age of the study group was 72 ± 15. Of the females, 64 underwent bilateral mastectomy with axillary clearance and 11 underwent radical neck dissection. Of the males, 26 underwent radical neck dissection and 1 underwent total laryngectomy. The young age group included 35 patients and the old age group included 67 patients. Of the females, 64 underwent bilateral mastectomy with axillary clearance and 11 underwent radical neck dissection. Of the males, 26 underwent radical neck dissection and 1 underwent total laryngectomy. The young age group included 35 patients and the old age group included 67 patients.

No subject had a single episode of DVT. Platel...
Primary or clonal thrombocytosis is defined as an unregulated abnormality of platelet production due to a clonal expansion of progenitor cells of the bone marrow. Since platelets are considered as acute phase reactants; Secondary or reactive thrombocytosis can be traced to other causes such as infections, chronic inflammatory diseases, critical illnesses, iron deficiency, severe bleeding and malignancy. Thrombocytosis can be encountered in patients with severe injuries in intensive care units and can be attributed to higher rates of DVTs.[5]

The cause and clinical significance of such thrombocytosis in patients with injuries remains unclear, none the less, it has been generally recognized as a reactive phenomenon.[6]

Thrombocytosis is observed after surgery.[7] Due to the risk of DVTs, prophylactic administration of subcutaneous low molecular weight heparin is usually administered.

The aim of the present study was to ascertain platelet count change in patients who underwent major surgeries and whether those with elevated platelet counts were susceptible to thrombotic events and to poor outcomes.

METHODS
Patients admitted to the surgical ward of our hospital were identified. The study took place over a 6 months period, June/2015 till December/2015.

Patients who underwent major ENT and breast major surgeries were the subject of the study.

The surgical ward uses multidisciplinary staff and a multidisciplinary approach to treating patients aiming at preventing post surgical complications and caring for concomitant diseases. With approval from the ethics committee of our Hospital and after obtaining written informed consents, patients who had major ENT and Breast surgeries were enrolled in the study.

Patients who had infections, malignancy, renal and liver impairments, multiple trauma, rheumatoid arthritis, primary thrombocytosis or previously diagnosed blood disorders were excluded because of potential confounding effects on the results of the study.

Low molecular weight heparin was administrated to all patients in the month after the surgery to prevent thrombotic and/or pulmonary embolic events.

Data regarding the causes of major ENT and Breast surgeries, including the type of surgery and the length of stay were collected. Co morbidities were evaluated.

Blood parameters including platelet count, red blood cells (RBC), hemoglobin (Hb), ESR, fibrinogen level and D-dimer were assessed on admission and at discharge.

Blood samples were collected in K3 EDTA tubes and were analyzed 1 h after venipuncture. Platelet count was evaluated using an automated cell counter (Sysmex cell counter).

D-dimer was measured using Elisa technique. All the lab tests were performed at Princess Imran Center for Research and Laboratory Sciences, which provides state of the art Laboratory services and is the main Laboratory medicine Center at King Hussein Medical City.

Lower limb ultrasonography was done for all patients on admission and at discharge and no single patient had an episode of DVT.

RESULTS
Two hundred and twenty patients were included to be studied and 102 were enrolled for having post-surgical thrombocytosis.

Of the 102, 27(26.5%) were males and 75(73.5%) were females.

The mean age of the study group was 72 ± 15.

Of the females, 64 underwent bilateral mastectomy with axillary clearance and 11 underwent radical neck dissection.

Of the males, 26 underwent radical neck dissection and 1 underwent total laryngectomy.

The young age group included 35 patients and the old age group included 67 patients.

40 patients (39.2% of the total) had a platelet count of 470-495 x 10^9/L and 62 patients (60.8% of the total) had a platelet count of more than 500 x 10^9/L, of which 15 (14.7% of the total) had very high platelet count above 600 x 10^9/L.

On admission, young people had significantly higher platelet counts than old subjects.

Of the 40 who had a platelet count of 470–495 x 10^9/L, 30 were females and 10 were males and of the 62 who had a platelet count of more than 500 x 10^9/L, 45 were females and 17 were males.

Of the 15 who had very high platelet count of more than 600 x 10^9/L, 11 were females and 4 were males.

On admission to the surgical ward, the mean values of ESR, fibrinogen and D-dimers were elevated.
Young patients had non-significantly higher values of ESR and fibrinogen than old people, on contrast; old patients had non-significantly higher mean value of D-dimers than young people.

Females had different values of ESR and fibrinogen than males.

Co morbidities were higher in old people than in young.

On discharge, the platelet count had significantly decreased and the counts were within the normal limits.

2 patients had thrombocytopenia which was attributed to the effect of low molecular weight heparin; HIT. The two patients required platelet transfusion.

Three patients had persistent thrombocytosis, yet lower limb sonography revealed no DVT.

At discharge, ESR, fibrinogen and D-dimers mean values were significantly decreased.

ESR decreased more, but not significantly so in young compared with old people and in females compared with males.

Fibrinogen decreased more, but not significantly so in young compared with old subjects and in males compared with females.

Clinical outcome was not affected by the platelet count. Clinical improvement and shorter hospital stay length were observed in young compared to old people to whom a lower Hb level correlated to a rather slower clinical improvement.

No patient with thrombocytosis and persistently elevated platelet count thereafter had lower limb DVT.

**DISCUSSION**

Thrombocytosis is an uncommon finding after major surgeries, it occurred in about half of the patients who were admitted to the surgical ward. Never the less, this did not affect the clinical outcome. Despite the risk of thromboembolism being a major issue in patients with thrombocytosis, no subject with elevated platelet developed lower limb DVT.

Of the most common causes of secondary or reactive thrombocytosis are tissue damage and tumors.\(^8\)

Thrombocytosis is also common after major surgeries.\(^9\)

The major function of the platelets is to prevent acute blood loss and to repair vascular walls after an injury. To achieve this, platelets secrete many mediators and cytokines that stimulate tissue regeneration. An elevation in of the platelet count may represent a component of that inflammatory mechanism of tissue regeneration. The observed increase in ESR, fibrinogen and D-dimer levels can also be considered as a part of the inflammatory response to repair the surgical wound.\(^10\)

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Thrombocytosis is also common after major surgeries.\(^7\)

This study was conducted in the surgical ward of King Hussein Medical City which is a well reputable medical center in the Middle East Region.

The risk of thromboembolic events remains the greatest issue in patients with elevated platelet counts, post surgery and subjects with thrombocytosis could be more likely to develop DVT occurrence after major surgeries.

Despite this concern, the patients included in this study did not experience any single episode of DVT and the data analysis revealed that other variables including age and other blood parameters mainly hemoglobin level were attributed to poorer outcomes. Older people had a longer hospital stay and significantly poorer outcomes.

**CONCLUSION**

Elevated platelet count was not uncommon phenomenon after major ENT and Breast surgeries and this occurred in more than half of the patients who were admitted to the surgical ward.

This condition did not affect the clinical outcome. Despite the risk of thromboembolism being a major issue in patients with elevated platelet count, no subject included in our study developed lower limb DVT.

Platelet count increase did not affect the outcome, rather, higher age and a lower hemoglobin level correlated with poorer clinical outcome.

**REFERENCES**


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