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EFFICACY OF EARLY LOW-MOLECULAR-WEIGHT HEPARIN PROPHYLAXIS IN ELDERLY PATIENTS AFTER DEGENERATIVE SPINAL SURGERY: A BRIEF RETROSPECTIVE REVIEW.

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ABSTRACT

Many orthopaedic surgical procedures are potentially affected by deep vein thrombosis (DVT) and Pulmonary Embolism (PE). DVT and PE are a clinical expression of the same pathological process called venous thromboembolism (VTE). Low-molecular-weight heparin (LMWH) is approved/ recognized to be a pharmacological solution to prevent VTE. The objective of the current study is twofold: (i) to assess the effect of a therapeutic protocol with LWMH started 24 hours after surgery on *systemic* bleeding and ii) to assess its effect on thrombosis and pulmonary embolism risk in patients undergoing early prophylaxis after spine surgery. A consecutive cohort of 110 patients undergoing spinal surgery was tested. Fifty six cases were spinal stenosis and 54 were degenerative thoracolumbar kypho-scoliosis. None of the patients withdrew from the study. 2 patients manifested PE signs and a prophylactic protocol therapy with LMWH which was started 24 hours after spine surgery resulted in a very low haemorrhage risk and low rate of PE and DVT.

1. Introduction

Deep vein thrombosis (DVT) and pulmonary embolism (PE) are described as potential complications following major orthopaedic procedures, especially after hip and knee replacement [1] [2]. The pathogenetic mechanism at the base of DVT and PE is venous thromboembolism (VTE). Many risk factors like age, smoking, obesity, major surgery, hospitalization, immobilization, neurological deficit, blood transfusion, malignancy, trauma, coagulopathies and contraceptive therapy are associated with an increased incidence of VTE [3] [4] [5]. DVT incidence after hip and knee replacement surgery is at 84% with no prophylaxis, while PE occurs in 9 to 30% of all cases with an unfavourable prognosis in 0,1 – 0,7 % [6]. Spinal surgery also poses a risk of thromboembolic complications even though at a lower frequency. Patients with degenerative spine diseases have many risk factors and without prophylaxis the incidence of developing DVT is 15% [7] and PE from 0 % to 13,1% [8], [9], [10]. Two main protocol therapies are available, one with low-dose unfractionated heparin (UH) and the other one with low-molecular weight heparin (LMWH).
LMWH is more manageable than UH due to the low-dose needed, risk of minor bleeding and greater efficacy in VTE prevention [11], [12], [13], but the literature gives an unclear definition of its role after major spine surgery [14], [15].

Despite its efficacy, only 31% of surveyed surgeons use LMWH [16], so there are few studies supporting the evidence that LMWH reduces PE and DVT incidence after hip and knee replacement surgery. Many spinal surgeons are reluctant to use LMWH because of the risk of epidural haematoma in the postoperative period. The aim of this study is to quantify the haemorrhage risk of LMWH when it is started 24 hours after spinal surgery. The second purpose is to evaluate the incidence of VTE and PE in patients undergoing degenerative spine surgery with early prophylaxis.

2. Material and methods

A retrospective review of 110 spinal surgery patients operated by a single surgeon during a period of 36 months was approved by the institutional review board. The mean age was 74 years (66-82) and the minimum follow up period was 12 months. Fifty-six patients underwent a lumbar procedure, 54 patients had thoracic or thoracolumbar fusion. Exclusion criteria were cancer, metastases and acute infectious processes. Fifty-six patients were recruited with a diagnosis of multilevel spinal stenosis, 54 patients had a degenerative thoracolumbar kypho-scoliosis. The mean duration of surgery was 210 minutes.

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Protocol therapy started on the first postoperative day and consisted of a daily administration of 40mg of enoxaparin at 8 pm. Anticoagulation therapy was resumed, if present, on 15th postoperative day. All patients were mobilized on the 3rd day after surgery and lower extremity ultrasonography was executed with any presentation of DVT's signs; whereas computer tomography (CT) with contrast was adopted in patients with dyspnoea, chest pain, desaturation, tachypnoea or tachycardia in order to exclude PE. Complete neurological examination was provided routinely to individuate any new or worsened neurological deficit and completed with CT. Data collected were analysed with SPSS Statistic (version 20, IBM Corp., Armonk, NY). Incidence rates of spontaneous bleeding, acute DVT and PE were calculated. Logistic regression analysis was conducted to identify risk factors of VTE among 5 independent variables (age, sex, obesity defined as body mass index > 30kg/m^2, smoking, time of surgery), statistical significance was defined as $p < 0.05$.

3. Results

The waist-hip ratio was on average 0.84 for women and 0.94 for men (table 1).

All patients remained enrolled until the end of the study, none presented any bleeding complication during anticoagulant prophylaxis, there were no epidural or superficial haematoma or persistent wound bleeding. Symptomatic PE was observed in 2 cases following thoracolumbar procedures 3 days post-surgery. In one of them, surgery exceeded the average time. Diagnosis was confirmed by CT with contrast after clinical symptoms. One case presented thromboembolic complications with acute DVT 1 week post-op which was detected by lower extremity ultrasonography. In both cases, an immediate anticoagulation therapy was begun (heparin drip or therapeutic enoxaparin bridge to warfarin). Logistic regression analysis demonstrated only one statistically significant predictor of acute VTE (duration of surgery, $p < 0.05$). During the 12 month follow-up, no cardiovascular events were observed and an improvement in patient quality of life was noted.

Patient groups, n	56	54
Age, range	66 - 77	68 -82
Sex distribution	Male	Female
BMI, average	28.2	28.9
Smoking habits, n (%)	17 (30.3%)	11 (20.3%)
Duration of surgery, min	210 min	210 min

Table 1. Average of the scanned values.

4. Discussion

Scientific literature reports a great variability in incidence of acute VTE for spinal surgery. This is because spinal surgery varies according to the extent of the intervention, but also according to the location of the intervention, whether it is on the cervical, thoracic or lumbar spine [17]. Ferree reported a 5% DVT incidence [18] using ultrasonography in a study cohort of 60 patients operated for laminectomy using compressive stockings for prophylaxis. All the thrombi were localized distal to the knee, characterizing a minor risk of PE [19], [20].

In a randomized study about the efficacy of different compression devices in patients treated with coumarin anticoagulation, Rosiko et al. [8] described a very low DVT rate (0.3%) and no PE. In contrast, Rosner et al. [9] used a a retrospective design to study a cohort of high-risk patients as a control group looking at the routine use of IVCF as a form of thromboembolic prophylaxis and found a much higher rate of PE (13.1%). Only one study, by Dearborn et al. [21], looked prospectively at the incidence of both asymptomatic DVT and asymptomatic PE during spinal surgery. Pharmacological prophylaxis is widely used in the setting of spinal cord injury, but there is no consensus on its role after degenerative spine surgery [13], [14], [15], [16]. Although there is good evidence that LMWH reduces the incidence of PE and DVT in hip and knee surgery [22] no study has investigated this matter for spinal surgery. The use of PRP does not appear to have negative correlations with deep vein thrombosis [23]. Many spinal surgeons are unwilling to use LMWH due to the possibility of epidural haematoma formation in the post-operative period. Only one study so far has shown the relative safety of this approach, reporting a very low (0.7%) incidence of postoperative haematomas [24]. This low incidence is also confirmed in our study.

5. Conclusions

Prophylactic protocol therapy with LMWH demonstrated a very low risk of bleeding and low rate of PE and DVT when started 24 hours after spine surgery. The study suggests therefore that all patients undergoing major spinal surgery should be supported by pharmacological prophylaxis with LMWH, particularly where VTE risk factors are present. Clinical observation of patients during therapy is reasonable for DVT and PE, however, in patients with delayed mobilization lower legs should be evaluated by ultrasonography.

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