Is antithrombotic prophylaxis necessary or dangerous during elective spine surgery: analysis from a national registry

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INTRODUCTION:
Thrombotic complications, particularly venous thromboembolism (VTE) including deep vein thrombosis (DVT) and pulmonary embolism (PE), are a significant concern following surgery. Among patients with reduced mobility, VTE ranks as the third leading cause of hospital-associated mortality. To mitigate thrombotic risk, clinicians employ prophylactic strategies such as early mobilization, mechanical prophylaxis, and pharmacological thromboprophylaxis (PTP). However, the role of PTP in spinal surgery remains debated. Guidelines from the North American Spine Society (NASS) and the European Society of Anesthesiology and Intensive Care (ESAIC) highlight caution in routine PTP use due to potential hemorrhagic complications, particularly epidural hematomas, which though rare (<3%), can lead to severe outcomes.
Incidence of DVT and PE post-spinal surgery ranges from 1% to 15.5% and 0.1% to 2.4%, respectively, while epidural hematomas are reported in up to 3% of cases, with PTP being implicated in approximately one-third of these. Evidence on the balance of risks and benefits of PTP in spinal procedures is inconclusive due to the low incidence of both thrombotic and bleeding events. Large-scale data analysis is needed. This study utilizes Swespine, a national Swedish registry covering over 80% of spinal surgeries, to evaluate the effects of PTP on thrombotic and hemorrhagic complications in elective spinal surgery.
METHODS:
A retrospective cohort study design was used, employing de-identified data from Swespine. Patients aged 18 or older who underwent surgery for degenerative lumbar or cervical spine disease between January 2006 and May 2024 were included. Inclusion required complete data on antithrombotic prophylaxis and postoperative outcomes.
Patients independently completed preoperative and one-year postoperative questionnaires. Data included demographics, medical history, and complications such as PE, DVT, hematoma, surgical site infections (SSI), and reoperations. Surgeons indicated intraoperative PTP use on surgical forms. LMWH was the most commonly used agent.
To assess national PTP practices, a 2024 survey was conducted across all 43 Swedish hospitals performing spinal surgery. Respondents detailed their facility's use of PTP and criteria guiding its application.
Statistical analysis was conducted using GraphPad Prism. Mann-Whitney U and Fisher's exact tests assessed group differences. Logistic regression identified factors associated with thromboembolism and hematoma, adjusting for age, sex, BMI, smoking, and heart disease. Trends in PTP use and hematoma incidence from 2015–2024 were analyzed via linear regression.
RESULTS:
Swespine data included 44,163 lumbar and 7,541 cervical patients with complete datasets. PTP was used in 28.0% of lumbar and 23.7% of cervical cases.
In lumbar patients, PTP recipients were older, had higher BMI and smoking rates, and more comorbidities. Thrombosis (0.49%), PE (0.25%), hematoma (0.27%), and SSI (5.9%) rates were significantly higher in the PTP group. Reoperations occurred in 4.8% overall, with 0.27% due to hematoma.
In cervical patients, similar trends in demographics were noted. Hematoma incidence was significantly higher in PTP users (0.39% vs. 0.12%, p=0.02), but PE and DVT rates showed no significant difference.
Regression analysis revealed that PTP use, age, and BMI were associated with thromboembolism in lumbar cases, while age predicted hematoma. In cervical cases, age alone was significantly associated with both outcomes. Across the total cohort, PTP, age, BMI, and smoking predicted thromboembolism; PTP, age, and BMI predicted hematoma.
From 2015 to 2024, PTP use declined in lumbar surgeries ($r=-2.636$, $p<0.0001$), with no significant trend in cervical procedures. Hematoma incidence remained stable.
Survey data from 40 hospitals showed that 25% use routine PTP, while 75% use it selectively, guided by specific risk factors such as prior VTE, high BMI, or artificial heart valves.
DISCUSSION AND CONCLUSION:
This large-scale analysis reveals that PTP use in elective spinal surgery correlates with higher incidences of both thromboembolic events and postoperative hematoma. These associations persisted after adjusting for confounding factors. While PTP may be intended for high-risk individuals, its use did not clearly reduce thromboembolism rates in this subgroup and was linked to higher complication rates.
The findings align with prior research indicating inconsistent benefits of PTP in spinal surgery. Importantly, the relatively high utilization rate of PTP in this study permits more balanced comparisons than past investigations. The complication rates observed are consistent with previous estimates, supporting the reliability of Swespine data.

Significant variation in PTP use across hospitals, despite existing guidelines, underscores the need for updated, evidence-based protocols. Routine administration of PTP to all patients is not supported by this study's findings. Instead, a selective approach, guided by patient risk profiles, appears more appropriate.

Limitations include the retrospective design, lack of severity data for complications, and potential underreporting in patient-reported outcomes. The study did not differentiate between PTP agents or doses. Future prospective studies are needed to further assess PTP efficacy and safety, especially considering the need for large sample sizes to detect meaningful differences.

In conclusion, PTP use in elective lumbar and cervical spine surgery is associated with increased risk of thromboembolism and hematoma. Routine PTP administration is not justified for all patients. Selective prophylaxis based on individual risk factors is recommended.