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The safety of low molecular-weight heparin after blunt liver and spleen injuries

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Abstract

BACKGROUND: Anticoagulation is routinely administered to all trauma patients owing to the high incidence of venous thromboembolism (VTE). However, the timing of administration of anticoagulation is not clearly defined when patients have blunt spleen or liver injuries because of the perceived risk of hemorrhage with early administration.

METHODS: A retrospective chart review was performed of all blunt trauma patients who sustained blunt liver and/or spleen injuries during the 5-year period from 2007 to 2011. Data were collected for all patients managed with nonoperative therapy for these injuries while also receiving routine prophylactic anticoagulation with low molecular-weight heparin. Patients were categorized based on the initiation of enoxaparin therapy after injury: early (<48 hours), intermediate (48 to 72 hours), and late (>72 hours). Primary and secondary outcomes were designated as need for operative or radiologic intervention secondary to spleen or liver hemorrhage, number of transfusions, and incidence of VTE.

RESULTS: Three hundred and twenty-eight patients were included. There were no enoxaparin-related hemorrhagic complications or hemorrhage necessitating operative intervention. Patients in the early, intermediate, and late groups received an average of .9, .93, and 1.55 units of blood, respectively. There was 1 pulmonary embolism in the early group, and there were 6 VTE complications in the late group (3 deep venous thromboses and 3 pulmonary embolisms).

CONCLUSIONS: There are currently no standards for the initiation of prophylactic anticoagulation in trauma patients with blunt liver and spleen injuries. Early administration may be safe and reduce the incidence of thrombotic complications in patients with blunt spleen and liver injuries. Prospective studies in this area are warranted.

All authors participated in the analysis and interpretation of data.

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Patients sustaining multisystem trauma are at increased risk of venous thromboembolism (VTE) because of the presence of an acute inflammatory response and altered mobility. The reported incidence of VTE in trauma patients has increased in recent years, with incidence exceeding 50%.[1,2] An aging trauma population and improved overall survival of severely injured patients are the 2 factors that have been implicated in the increased incidence of VTE.[3] Although deep venous thrombosis (DVT) itself is not life threatening, its association with pulmonary embolism (PE) carries a high mortality with rates reported as high as 50%.[4–8]

Administration of low molecular-weight heparin (LMWH) prophylaxis has been shown to be effective in preventing VTE and is routinely administered to this patient population.[1,6,9–14] Although not completely clear, it is assumed that VTE chemoprophylaxis should be initiated early to optimally prevent VTE. However, the timing of VTE chemoprophylaxis in solid organ injury is controversial because of the perceived risk that early initiation may exacerbate or renew hemorrhage. We hypothesized that early administration of LMWH would not lead to failure of nonoperative management (NOM) in patients after blunt abdominal solid organ injury. The purpose of this study was to define the safety of early prophylactic anticoagulation in this population.

Methods

After institutional review board approval, a retrospective review of all blunt liver and spleen injuries was performed at 2 academic level 1 trauma centers, the University of South Alabama and the University of Mississippi Medical Center. Data were collected for all blunt trauma patients admitted during years 2007 through 2011 who underwent NOM of liver and/or splenic injuries. All patients received routine prophylactic anticoagulation with LMWH (enoxaparin). Collected data included date and time of admission, date and time of initial LMWH administration, patient age, gender, mechanism of injury, Injury Severity Score (ISS), and American Association for the Surgery of Trauma grade of solid organ injury. Failure of NOM was defined as the need for operative or radiographic intervention due to hemorrhage of the involved organ. Patients with both spleen and liver injury who underwent splenectomy or angioembolization before the initiation of anticoagulation were excluded from the study. All injuries sustained were used to calculate total ISS to reflect true severity of patient injury. Extremity duplex ultrasonography and computed tomographic angiography were obtained to confirm any clinical suspicion of DVT and PE, respectively.

A standardized order set and attending discretion were used to determine dose and timing of LMWH, respectively. Dosing of LMWH consisted of 2 standard regimens of subcutaneous enoxaparin: 30 mg twice daily or 40 mg daily. All patients received lower extremity compression devices on admission barring any contraindications. After data collection, patients were stratified into groups on the basis of the timing of initiation of LMWH after injury: early (<48 hours), intermediate (48 to 72 hours), and late (>72 hours). The primary outcome was designated as the need for operative or radiologic intervention secondary to liver or splenic hemorrhage. Secondary outcomes included the number of blood transfusions, incidence of VTE, and other hemorrhagic complications. Data were analyzed using GraphPad Prism, version 5 (GraphPad Software Inc., La Jolla, CA). Analysis of variance was used to compare continuous variables, and the Bonferroni test was used for multiple comparisons. A P value less than .05 was considered significant.

Results

Three hundred fifty-five patients with blunt spleen or liver injuries were identified from the study period, 172 from the University of South Alabama and 183 from the University of Mississippi. Three hundred twenty-eight of these patients had complete information concerning LMWH administration. One hundred three patients (31%) received LMWH early, 54 (17%) in the intermediate group, and 171 patients (52%) were in the late administration group (Tables 1 and 2). All patients had an initial attempt at NOM, with 13 (3.7%) failing NOM before starting enoxaparin. All failures of NOM occurred before the administration of LMWH. There were no instances of LMWH-related bleeding complications or hemorrhage necessitating operative intervention in any group. After the initiation of LMWH, patients in the early, intermediate, and late LMWH groups were transfused an average of .90, .93, and 1.55 units of packed red blood cells, respectively (Table 3).

As compared with both early and intermediate LMWH administration groups, patients receiving LMWH after 72 hours had a significantly higher ISS (Table 3). There was 1 patient (1%) in the early LMWH administration group who developed a PE and no VTE complications in the intermediate group. Therefore, 1 patient (.6%) developed a VTE who was administered LMWH within 72 hours of admission. Five patients (2.8%) in the late LMWH administration suffered 6 VTE complications. In the late

Table 1 Study characteristics: timing of LMWH in blunt liver injuries

Timing of LMWH	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Less than 48 hours	26	24	7	0	0
48 To 72 hours	12	11	8	5	0
Greater than 72 hours	44	45	24	10	0

LMHW = low molecular-weight heparin.