Enoxaparin Dosing in Pediatric Hemodialysis Patients

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Objectives:

Low-molecular-weight (LMWH) heparins have been suggested as an anticoagulant in extracorporeal circuit during hemodialysis (HD) with evidence of several advantages over unfractionated heparin. However, experience with LMWH use in pediatric HD patients is limited.

We observed serious urinary and gastrointestinal bleeding during the third HD session in a three-year old girl treated daily HD because of severe fluid retention. She was using a single initial bolus of enoxaparin sodium at a dose of 1mg/kg as an anticoagulant. Her anti-Xa activity was found to be as high as 1.79 ml (normal range 0-0.1 ml) at the time of the bleeding.

After having a serious bleeding complication of enoxaparin in this case, we aimed to evaluate dose-dependent efficacy and safety of enoxaparin, and to assess plasma anti-Xa activity in patients receiving enoxaparin for their routine HD.

Methods:

- Nine children and adolescents on maintenance HD were enrolled into the study. Patients' characteristics are shown in Table 1.

- All of the patients were receiving HD thrice weekly for four hours. The vascular access of the patients was either an arterio-venous fistula or a venous catheter.

- Enoxaparin sodium was administered as a single bolus dose, 1mg/kg, 0.75 mg/kg, and 0.60 mg/kg in the consecutive sessions, at the beginning of the dialysis.

- Anticoagulant effect was clinically monitored by visual inspection of HD line hourly and inspection of the dialyzer at the end of the session, and also laboratory monitored measuring anti-Xa levels at the end of each session.

Results:

Table 1: Characteristics of the patients

Number of patients	9
Gender, *male/female*	4/5
Age, *years*	14.8 ± 5.4
BSA, m^2	0.99 ± 0.15
Time on HD, *months*	65.4 ± 80.5
Kt/V, *single pool*	1.87 ± 0.38

- All HD sessions resulted in no fibrin/clot formation in the HD lines or in the dialyzers.

- There was no bleeding complication during or after the HD sessions.

- The mean anti-Xa levels were 1.05±0.34, 0.81±0.27 and 0.50±0.23 ml at the end of the sessions followed by the decreasing doses of enoxaparin (1 mg/kg, 0.75 mg/kg, and 0.60 mg/kg, respectively).

- The mean anti-Xa levels after the dose of 1 mg/kg were significantly higher than the doses of 0.75 mg/kg and 0.60 mg/kg (p= 0.028 and p= 0.043, respectively). However, there was no significant difference in anti-Xa levels between the doses of 0.75 mg/kg and 0.60 mg/kg.

- There was no association between the levels of anti-Xa and age, sex, body surface area (BSA) or single pool kt/V.

Conclusions:

- Enoxaparin sodium seems to be efficient and safe as an anticoagulant at a single initial dose of 0.60 mg/kg for thrice weekly HD. On the other hand, the dose of enoxaparin sodium should be adjusted in frequent dialysis sessions because of its potential risk of accumulation and causing bleeding complication in the setting of renal impairment.

- Therefore, we recommend monitoring plasma anti-Xa activity in pediatric HD patients, especially in daily dialysis.

References:

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