



Original Contribution

Effect of hydroxyethyl starch 130/0.4 on ischemia-reperfusion determinants in minor lower extremity surgery with tourniquet application ☆, ☆☆, ★, ★★



Hüseyin Ulaş Pinar MD (Staff Anesthesiologist)^{a,*},
Aşina Pinar MD (Staff Anesthesiologist)^b,
Ömür Mavioglu MD (Associate Professor of Anesthesiology)^c,
Nilgün Yener (Associate Professor of Biochemistry)^d

^aDepartment of Anesthesiology, Baskent University Medicine Faculty, Ankara, Turkey

^bDepartment of Anesthesiology, Medicana Hospital, Konya, Turkey

^cDepartment of Anesthesiology, Dokuz Eylul University Medicine Faculty (retired), Izmir, Turkey

^dDepartment of Biochemistry, Dokuz Eylul University, Izmir, Turkey

Received 16 May 2013; revised 29 June 2014; accepted 3 July 2014

Keywords:

Tourniquet;
Ischemia-reperfusion injury;
Hydroxyethyl starch

Abstract

Study Objective: To investigate the effect of 6% hydroxyethyl starch (HES) (130/0.4) infusion on ischemia-reperfusion determinants in minor lower extremity operations with tourniquet application.

Design: Prospective, randomized, clinical trial.

Setting: University hospital operation room.

Patients: American Society of Anesthesiologists I and II 40 patients between 18 and 65 years of age who were scheduled to undergo knee arthroscopy and below-knee minor orthopedic surgery.

Interventions: Patients were randomized into 2 groups (normal saline [NS] group and HES group). Unilateral spinal anesthesia with 2-mL 0.5% hyperbaric bupivacaine after 10 mL/kg NS intravenous infusion to NS group and 10 mL/kg 6% HES intravenous infusions to HES group.

Main Outcome Measures: Blood samples were obtained from antecubital vein for malondialdehyde, xanthine oxidase, and hypoxanthine before tourniquet inflation and after 10 minutes of tourniquet deflation.

Results: There was no significant difference between groups with respect of hemodynamic data. There were no significant differences between 2 groups in terms of malondialdehyde values before tourniquet inflation and after tourniquet deflation. In the HES group, xanthine oxidase levels after tourniquet deflation were significantly lower than xanthine oxidase levels before tourniquet inflation ($P < .05$). In the HES group, hypoxanthine levels after tourniquet deflation were similar with the basal levels; however, they were significantly higher than levels obtained before tourniquet inflation in the SF group ($P < .05$).

☆ The work was undertaken at the Dokuz Eylul University Medicine Faculty Hospital, Izmir, Turkey.

☆☆ Assistance with the study: None declared.

★ Financial support: This work was supported by the Department of Anesthesiology, Dokuz Eylul University Hospital, Izmir, Turkey.

★★ Conflicts of interest: None declared.

* Corresponding author at: Dr Hüseyin Ulaş Pinar, Hocacihan mah. Saray cad. No:1 43200, Selçuklu/Konya, Turkey.

E-mail address: huseyinpinar2002@yahoo.com (H.U. Pinar).

Conclusion: HES infusion may be beneficial for reduction of tourniquet-associated ischemia-reperfusion injury; however, further large-scale studies are needed to fully elucidate its mechanism.
© 2014 Elsevier Inc. All rights reserved.

1. Introduction

Orthopedic surgical procedures require a blood-free working area usually provided by pneumatic tourniquet application [1]. Pneumatic tourniquet applications induce hemodynamic and metabolic alterations depending on the tourniquet phase (inflation/deflation), tourniquet time, extent of ischemic zone, anesthetic method, and cardiovascular status of the patient [2]. A tourniquet induces ischemia following inflation and allows reperfusion by restoring blood flow after deflation. As in the case of other ischemia-reperfusion models, this condition may cause local or systemic effects [3,4].

Blood flow to organs or tissues must be restored to prevent irreversible cell injury. However, reperfusion may lead to an even greater injury (reperfusion injury) to organs or tissues than that induced by ischemia. Zikria et al [5] reported that hydroxyethyl starch (HES) molecules reduced myocardial reperfusion injury in dogs. Zikria et al [6], in another study where they induced reperfusion injury in lower extremities of rats, observed that HES macromolecules reduced microvascular permeability increased by ischemia. Nielsen et al [7] showed that HES infusion reduced xanthine oxidase release in rabbits in which hepatoenteric ischemia was created. In 1 study in patients undergoing aortic aneurysm surgery, hetastarch molecules reduced systemic inflammatory response and endothelial cell dysfunction associated with ischemia-reperfusion injury [8]. HES solution was shown to be able to prevent ischemia-reperfusion injury in an ischemia reperfusion model induced by tourniquet application in rabbits [9]. The aim of this study was to examine the effects of 6% HES 130/0.4 infusion on the determinants of ischemia-reperfusion in patients undergoing unilateral minor lower extremity surgery using pneumatic tourniquet.

2. Materials and methods

After obtaining approval of Dokuz Eylul University Medicine Faculty local ethics committee for Drug Research, Izmir, Turkey (no. 06/18-46; Chairperson Prof M.E. Koyuncuoğlu, 14.08.2006) and patient consent, a total of 40 patients between 18 and 65 years of age, who were scheduled to undergo knee arthroscopy and below-knee minor orthopedic surgery and had a physical status of American Society of Anesthesiologists I and II, were enrolled. Subjects were randomized into 2 groups, each containing 20 patients, via sealed envelope method. The exclusion criteria were determined as presence of any of the

absolute or relative contraindications for spinal anesthesia, electrolyte imbalance, severe comorbidities, and antioxidant drug use.

A minimum of an 8-hour fasting period was required. Actual fasting times were questioned and recorded. Before the subjects were taken to the operating room, a 16-gauge intravenous (IV) line was placed in both antecubital veins, and IV infusion of NaCl 0.9% at a rate of 4 mL/kg per hour was begun. All subjects in the study were premedicated with IV midazolam 0.02 mg/kg. The fluid preloading was begun, and the initiation time of the application was recorded as follows: the normal saline (NS) group was administered NaCl 0.9% 10 mL/kg for 20 minutes, whereas the HES group was given HES 6% (Voluven 6%; Fresenius Kabi, Germany) for an equal period. Patients were placed in the lateral decubitus position with the extremity to be operated being under the body. Spinal anesthesia was performed with 2 mL of 0.5% hyperbaric bupivacaine injection via a 25-gauge spinal needle from L3-4 or L4-5 intervertebral space. The subjects were kept in this position for 10 minutes and then placed in supine position.

Before application of tourniquet, a 10-mL blood sample for basal malondialdehyde (MDA), hypoxanthine, and xanthine oxidase levels was drawn at the antecubital vein from which no infusion was administered. The pneumatic tourniquet was inflated using a pressure 2 times of the systolic blood pressure (inflation) after elevation of the extremity for 5 minutes. Tourniquet inflation pressures were recorded.

The surgical procedure was allowed to begin after the sensory block reaches T10. The level of sensory block at 15th minute was recorded as maximal level of block.

Arterial blood pressure values were expressed as systolic arterial pressure, diastolic arterial pressure, and mean arterial pressure and measured by the oscillometric method every 2 minutes in the first 20 minutes following spinal anesthesia and every 5 minutes thereafter until the end of the surgery. A 25% decrease of the mean arterial pressure or a systolic arterial pressure <90 mm Hg was considered hypotension, and 5 mg of IV ephedrine was administered as a bolus. Ephedrine at the same dose was readministered when hypotension persisted. Atropine 0.5 mg was administered if heart rate dropped <50 beats per minute. Administration times and total doses of ephedrine and atropine were recorded. The tourniquet was slowly deflated in 2 minutes after completion of the procedure. A second set of blood samples for MDA, hypoxanthine, and xanthine oxidase was drawn from the antecubital vein from which no infusion was given 10 minutes after the deflation of the tourniquet.

Download English Version:

<https://daneshyari.com/en/article/2762416>

Download Persian Version:

<https://daneshyari.com/article/2762416>

[Daneshyari.com](https://daneshyari.com)