

**Title** : COMPARATIVE EFFECTS OF EPIDURAL AND GENERAL ANESTHESIA ON FIBRINOLYSIS FUNCTION, LOWER LIMB RHEOLOGY AND THROMBOEMBOLISM AFTER TOTAL HIP REPLACEMENT

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The frequency of deep venous thrombosis, especially in the thigh veins, is greater after major orthopedic surgery involving the lower extremities than following other surgical procedures. After total hip replacement frequency figures varying from 20 to 80 % have been reported, depending upon the technique used for diagnosing the thrombosis and the nature of the prophylactic measures<sup>1</sup>.

In an investigation on deep venous thrombosis and pulmonary embolism - where neither dextran nor anti-thrombotic drug prophylaxis were employed - patients undergoing total hip replacement were randomly allotted to one of two groups receiving either epidural or general anesthesia. The epidural group (n = 15) was given 0.5 % bupivacaine with epinephrine (5 µg/ml), which was prolonged into the postoperative period (24 hours) for pain relief. The general anesthesia group (n = 15) was operated on under artificial ventilation with N<sub>2</sub>O/O<sub>2</sub>, via an endotracheal tube and intravenously administered fentanyl and pancuronium bromide. In this group of patients a narcotic analgesic (ketobemidone) was given intramuscularly on demand for pain relief postoperatively. The frequency of deep venous thrombosis involving the femoral veins, as observed at phlebography, was significantly lower in patients receiving continuous epidural block (3 of 15) than in those given general anesthesia with postoperative parenteral analgesics (11 of 15). Further, the frequency of pulmonary embolism, as determined by pulmonary perfusion lung scanning, was lower in the former group of patients (2 of 15) than in the latter (7 of 15).

In a parallel study a prophylactic effect of local anesthetics themselves against thrombosis could not be found. Thus, patients subjected to total hip replacement under general anesthesia and given during a 14-day period a local anesthetic of the amide type (tocainide) had a similar high frequency of deep venous thrombosis and pulmonary embolism.

Additional investigations concerning rheological and fibrinolytic functions in patients subjected to total hip replacement explained the thromboembolic differences associated with the two anesthetic techniques.

Thus, venous occlusion plethysmography revealed that arterial inflow, venous emptying rate and venous capacity were all significantly higher in patients receiving epidural block than in those operated on under general anesthesia and given ketobemidone postoperatively. The rheological improvement in the epidural group was most pronounced immediately at the end of surgery and later (3 h) postoperatively. This hyperkinetic lower limb circulation - occurring at a time period when the stimulus to clotting is maximal - provides an unfavorable milieu for both the formation and the propagation of thrombi.

In the study on fibrinolysis function, it was found that the resting level of plasminogen activators in the blood and the capacity of the endothelial cells of the veins to release plasminogen activators - as measured by the method of Walker et al. (1976)<sup>2</sup> - were significantly greater in patients receiving continuous epidural block. Further, the fibrinolysis inhibition activity in serum - as determined by a modified clot-lysis method adapted from Paraskevas et al. (1962)<sup>3</sup> - was significantly lower in this latter group. These findings concerning fibrinolytic function should be beneficial, implying both an inhibitory effect on thrombus growth and more effective lysis of thrombi formed during surgery and in the postoperative period in patients receiving continuous epidural block.

We conclude that in patients undergoing total hip replacement continuous epidural block offers advantages over general anesthesia with postoperative parenteral analgesics from a thromboembolic point of view.

The above reported investigations were approved by the Ethical Committee of the Faculty of Medicine, University of Uppsala. The patients were fully informed of the investigation and gave their consent.

#### References.

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