



ORIGINAL RESEARCH

THE EFFECT OF ANAESTHETIC TECHNIQUE ON POSTOPERATIVE VENOUS THROMBOEMBOLISM IN ELDERLY PATIENTS UNDERGOING TOTAL HIP REPLACEMENT

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ABSTRACT

Objective: Because hip fractures are common in elderly patients, total hip replacement has been a major advancement in treatment. This procedure, however, is associated with significant postoperative complications such as venous thromboembolism. In this study we retrospectively analyzed the factors affecting the incidence of venous thromboembolism complication is related with postoperative morbidity and mortality and its relation with the type of anaesthesia used in elderly patients undergoing total hip replacement for traumatic hip fracture.

Materials and Methods: We retrospectively reviewed the data of patients aged over 65 years old who had undergone total hip replacement after traumatic hip fracture at our institution between 1997 and 2003. The data included patients' demographic characteristics, intraoperative and postoperative findings, venous thromboembolism incidence and its relation with the anesthetic technique.

Results: Venous thromboembolism was diagnosed in 10.8% of 291 patients. The incidence of venous thromboembolism was 10.5% after general anaesthesia and 9.2% after epidural anaesthesia ($p>0.05$).

Conclusions: We found no association between the incidence of venous thromboembolism and the type of anaesthesia, although there were some advantages eith epidural anaesthesia such as less blood loss and fewer blood transfusions. However, a significant correlation was found between venous thromboembolism and the patient's age and duration of the surgery.

Keywords: Anaesthetic technique; general, epidural; Complication: venous thromboembolism

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YAŞLI HASTALARDA ANESTEZİ YÖNTEMİNİN TOTAL KALÇA PROTEZİ SONRASI DERİN VEN TROMBOZUNA ETKİSİ

ÖZET

Amaç: Yaşlı hastalarda sık görülen travmatik kalça kırığının major tedavisi total kalça protezidir. Ancak bu girişim venöz tromboemboli gibi belirgin postoperatif komplikasyonlara neden olabilir. Bu çalışmada travmatik kalça kırığı nedeniyle total kalça protezi operasyonu geçiren yaşlı hastalarda postoperatif dönemde morbidite ve mortaliteyi arttıran bir komplikasyon olan venöz tromboemboli görülme sıklığının uygulanan anestezi yöntemiyle ilişkisi retrospektif olarak incelenmiştir.

Gereç ve Yöntem: Kliniğimizde 1997-2003 tarihleri arasında 65 yaş üzeri, travmatik kalça kırığı nedeniyle total kalça protezi operasyonu geçiren 65 yaş üstü hastaların kayıtları incelenmiştir. Hastaların demografik özellikleri, intraoperatif ve postoperatif bulguları, venöz tromboemboli görülme sıklığı ve anestezi yöntemi ile ilişkisi incelenmiştir.

Bulgular: 291 hastanın %10.8'inde postoperatif venöz tromboemboli tesbit edilmiştir. Genel anestezi sonrası tromboemboli sıklığı %10.5 iken, epidural anestezi sonrası %9.2 olarak belirlenmiştir ($p>0.05$).

Sonuçlar: Çalışmamızda venöz tromboemboli sıklığı ile cerrahi sırasında uygulanan anestezi yöntemi arasında bir ilişki belirlenemese de, epidural anestezinin daha az kan kaybı ve daha az kan transfüzyonuna neden olduğu saptanmıştır. Ayrıca venöz tromboemboli görülme sıklığının yaş ve cerrahi süre ile orantılı olarak arttığı belirlenmiştir.

Anahtar Kelimeler: Anestezi tekniği: genel, epidural; komplikasyon: venöz tromboemboli

INTRODUCTION

Hip fractures are common in elderly patients, who are at high risk of intraoperative complications¹. Most hip fractures are treated surgically, with either internal fixation or total replacement of the femoral head with arthroplasty. This total hip replacement (THR) has been a major advancement in the treatment of hip fracture, but is associated with significant perioperative complications such as venous thromboembolism (VT)². The incidence of VT is 40 % to 50 % in patients with hip fractures and, the incidence of pulmonary embolism has been estimated to be 3.5%^{3,4}. Studies show a reduced incidence of VT in patients with hip fractures with the use of spinal anaesthesia compared to general anaesthesia⁵⁻⁷. However, the data about the effects of epidural anaesthesia on the incidence of VT after surgery for a hip fracture is not sufficient. We retrospectively analyzed the factors affecting the incidence of VT and its relation with the type of anaesthesia used in elderly patients undergoing THR for traumatic hip fractures.

MATERIAL AND METHOD

We retrospectively analysed the charts of patients over 65 years who had undergone total hip replacement at our institution over a 6-year period (between 1997-2003) to determine the factors affecting the incidence of VT and the effects of general and epidural anaesthesia on thromboembolic complications. The recorded data included patients' characteristics (demographic data, comorbid diseases such as diabetes, hypertension, cardiovascular disease, ASA physical status, smoking status and use of medication), duration of surgery, intraoperative variables (anaesthetic technique, heart rate, mean arterial pressure, blood loss, transfusion requirement, complications), postoperative hemoglobin level, and the incidence of deep VT or pulmonary embolism within 30 days of surgery. Patients were excluded from the study if they had a history of thromboembolism or had undergone other surgical procedures. Thromboembolic disease was diagnosed if the patient had compatible



clinical findings confirmed by Doppler ultrasonography, venography (for VT), or scintigraphy (for pulmonary embolism).

Data are presented as mean values with the standard deviation (SD). Differences between groups were assessed with the unpaired Student's t-test, χ^2 analysis, or the Mann-Whitney-U test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 291 THR procedures were carried out during the 6-year period. General anaesthesia, defined as inhalational anaesthesia through an endotracheal tube, was administered to 114 patients (%39.1). Epidural anaesthesia was administered to 162 patients (%55.6). Fifteen patients who received combined spinal-epidural anaesthesia were excluded from the study. Preoperative data for patients receiving either type of anaesthesia were similar ($p>0.05$)

(Table I). The intraoperative mean arterial pressure, estimated blood loss, and number of blood transfusions were significantly lower in patients receiving epidural anaesthesia ($p<0.05$) (Table II). Postoperative hemoglobin levels and surgical duration were similar between the groups ($p>0.05$) (Table II). The incidence of deep VT was 10.5% ($n=12$) in patients receiving general anaesthesia, and 9.2% ($n=15$) in those receiving epidural anaesthesia. The incidence of pulmonary embolism was 0.9% ($n=1$) in patients receiving general anaesthesia (Table II). There was no correlation between the incidence of VT and the type of anaesthesia ($p>0.05$) (Table II). Table III compares patients' characteristics and intraoperative factors for those with and without VT. Statistical analysis revealed a correlation between the incidence of VT and the patients' age and duration of the surgery ($p<0.05$) (Table III).

Table I. Patients' data according to type of anaesthesia administered (mean \pm SD).

	General (n:114)	Epidural (n:162)
Sex (M/F) (n)	66 / 48	90 / 72
Age (yr)	70.2 \pm 4.6	71.8 \pm 5.5
Weight (kg)	67.5 \pm 10.9	69.6 \pm 13
Smokers (n)	16 (14 %)	20 (12 %)
ASA class I/II/III (n)	23 / 89 / 2	37 / 122 / 3

$p>0.05$

**Table II.** Intraoperative variables and the type of anaesthesia administered (mean± SD).

	General (n:114)	Epidural (n:162)
Intraoperative MAP (mmHg)	84.2 ± 7.7	69.1 ± 5.4*
Estimated blood loss (mL)	748.7 ± 138	479.6 ± 90.9*
Blood transfusion (unit/patient)	0.86 ± 0.69	0.22 ± 0.41*
Duration of surgery (min)	177.5 ± 16	178.8 ± 13
Postoperative Hb (g/dL)	10.8 ± 1.5	11 ± 1
Patients with VT (n)	12 (10.5 %)	15 (9.2 %)
Patients with PE (n)	1 (0.9 %)	0

MAP: mean arterial pressure; VT: venous thromboembolism; PE: pulmonary embolism

* $p < 0.05$ **Table III.** Patients' characteristics, duration of surgery and the incidence of venous thromboembolism according to the type of anaesthesia administered (mean± SD).

	General (n:114)		Epidural (n:162)	
	VT (n: 13)	No VT (n: 101)	VT (n: 15)	No VT (n: 147)
Sex (M/F)	4 / 9	62 / 39	6 / 9	84 / 63
Age (yr)	79.5 ± 1.4*	67.7 ± 1.7	79.0 ± 1.1*	67.0 ± 1.6
Weight (kg)	66 ± 2	67.2 ± 10	69 ± 12.8	69.4 ± 13
Smokers (n)	3 (23 %)	3 (2.9 %)	6 (40 %)	12 (8.2 %)
ASA class I/II/III (n)	5 / 7 / 1	18 / 82 / 1	6 / 8 / 1	31 / 114 / 2
Duration of surgery (min)	209 ± 4*	173 ± 12	208 ± 8*	176 ± 10

VT: venous thromboembolism

* $p < 0.05$



DISCUSSION

This study showed no association between the rate of venous thromboembolism and the type of anaesthesia used in elderly patients undergoing total hip replacement for traumatic hip fractures. However, the use of epidural anaesthesia offered considerable advantages over general anaesthesia by decreasing blood loss and transfusion requirement. The lower blood loss is probably associated with a lower mean arterial pressure and the patient's age. Lower mean arterial pressure is the result of a decrease in central venous pressure, heart rate, stroke volume, and cardiac output caused by sympathetic blockade with epidural anaesthesia. Hypotension is attributable to the reduction in blood loss and the augmentation of lower extremity blood flow. On the other hand, the higher incidence of intraoperative hypotension in elderly patients may also result from decreased autonomic homeostasis and a reduced capacity to tolerate or compensate an imposed pathology or surgical stress. In addition, epidural anaesthesia greatly increases the volume of blood in the larger vessels of the legs while diminishing local blood flow in the small vessels of the surgical area, thereby diminishing operative blood loss⁸. However, our study was retrospective, and blood loss and transfusion variables were not defined as an outcome; therefore, we did not standardize criteria for the transfusion of blood products. The decision to transfuse blood was made intraoperatively by the anaesthesiologist. Despite the lack of criteria for transfusion, however, the postoperative hemoglobin levels were similar between the two groups of patients.

The duration of surgery affects the incidence of postoperative thromboembolism. Regardless of the type of anaesthesia, patients who suffered VT had a significantly longer surgical time than those who did not, a finding confirmed by most other studies as well⁸⁻¹¹. Sharrock and colleagues noted that the VT rate was 15% after THR and the observed VT rate was 9.5% for patients

whose surgery lasted less than 70 min, and increased to 20% for longer cases⁹. Prolonged surgery may influence the VT rates in several ways. First, one would expect longer surgery to be associated with longer periods of femoral venous stasis and perhaps greater endothelial trauma¹⁰. Prolonged surgery is also likely to cause additional bleeding, which could lead to hypovolemia, hypothermia, vasoconstriction, subsequent venous stasis, and further deoxygenation of venous blood⁹. The combination of venous stasis and low venous oxygen tension is a potent stimulus for the formation of thrombus on the endothelial surfaces of veins^{12,13}.

Many clinical factors, such as increased age, sex, obesity, smoking, and the patient's ASA physical status, have been shown to predict rates of perioperative mortality and morbidity¹⁴⁻¹⁶. The patients in our study did not differ significantly according to sex, weight, ASA physical status, or smoking habits, but there was a correlation between VT and the patient's age. The surgical repair of hip fractures is carried out primarily in elderly patients, who are at greater risk of perioperative morbidity and mortality than their younger counterparts because of the high incidence of coexisting disease. In addition, older patients have a high risk of thromboembolic complications after surgery¹⁷. The poor medical condition of many of these patients is evident in the reported distribution of perioperative ASA physical status scores: approximately 50% of patients are designated ASA class III, while another 10% are classified as ASA IV^{6,18}. Only 1.8% of our patients were classified as ASA III, and we found no correlation between the incidence of VT and ASA physical status.

Previous studies have not reliably established whether the type of anaesthesia influences mortality and morbidity rates in patients undergoing nonvascular surgery. The largest clinical trial included 6,206 patients, but only 141 of those were randomized to epidural anaesthesia, and the authors did not identify any relationship between VT and the type of



anaesthesia used¹⁹. Few studies found any differences in mortality or morbidity rates, but most included only a small sample size^{8,20,21}. One small study of 30 patients found a lower incidence of VT with epidural anaesthesia⁸. Another study included only 20 patients². Our study of 162 patients is the largest analysis so far. However, the findings may be limited because it is a retrospective study.

VT after THR surgery is associated with postoperative immobilization and venous stasis²². The earlier ambulation that takes place in patients who were administered epidural analgesia reduces the risk of VT by improving deep venous blood flow²¹. Mechanical devices also reduce VT rates after THR. In our hospital, patients began to walk as soon as possible after surgery. Furthermore, all patients received elastic stockings, did ankle-setting exercises, and had the leg held in abduction with slings.

This study suggests that the duration of surgery and increasing age may account for the significant differences in the rates of postoperative venous thromboembolism in elderly patients undergoing total hip replacement for traumatic hip fractures. The type of anaesthesia used did not appear to have any associated risk of VT, although epidural anaesthesia does seem to offer the advantages of lower blood loss and transfusion requirement over general anaesthesia for this population. A prospective study may be required to define the effects of epidural anaesthesia on the incidence of VT in elderly patients undergoing THR for traumatic hip fracture.

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