Endovascular repair of dissecting abdominal aortic aneurism under spinal anesthesia in a patient with pulmonary embolus

Pulmoner embolisi olan bir hastada dissekan abdominal aort anevrizmasının spinal anestezi altında endovasküler onarımı

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Endovascular stent grafting procedures for aortic aneurysms use different anesthetic techniques including general anesthesia, epidural anesthesia, spinal anesthesia and local anesthesia. Although there is little information regarding which type of anesthesia is the safest, the use of local or regional anesthesia decreases morbidity and mortality compared to the use of general anesthesia, especially in patients with comorbidities. Here, we report a 70-year-old male patient with dissecting abdominal aortic aneurysm and pulmonary embolus who underwent an endovascular stent grafting procedure under spinal anesthesia with mild sedation. Also, the literature regarding the advantages and disadvantages of different anesthesia methods which may be preferred for endovascular stent grafting is reviewed.

Key words: Aortic aneurysm; endovascular stent grafting; pulmonary embolus; spinal anesthesia.

Aort anevrizmalarında uygulanan endovasküler stent greftleme işlemlerinde genel anestezi, epidural anestezi, spinal anestezi ve lokal anestezi gibi farklı anestezi teknikleri kullanılmaktadır. Hangi anestezi yönteminin en güvenli olduğu konusunda çok az bilgi olmasına karşın, özellikle eşlik eden hastalıkları bulunan hastalarda lokal veya rejyonel anestezi genel anesteziye kıyasla morbidite ve mortaliteyi azaltmaktadır. Burada, hafif sedasyonlu spinal anestezi altında endovasküler stent greftleme işlemi uygulanan dissekan abdominal aort anevrizmalı ve pulmoner embolili 70 yaşında bir erkek hasta sunuldu. Ayrıca endovasküler stent greftlemede tercih edilebilecek farklı anestezi yöntemlerinin avantaj ve dezavantajları ile ilgili literatür gözden geçirildi.

Anahtar sözcükler: Aort anevrizması; endovasküler stent greftleme; pulmoner emboli; spinal anestezi.

Endovascular stent grafting for aortic aneurysms is a commonly used technique which was first described in 1991.[1,2] Endovascular repair is preferred for patients with comorbidities such as hypertension, obstructive pulmonary disorders, or coronary heart disease. Furthermore, endovascular stent grafting is advantageous as it allows for the use of local or regional anesthesia in such patients with comorbidities, better maintenance of hemodynamic stability because of the shorter duration of aortic occlusions, shorter postoperative hospitalization periods, decreased morbidity and mortality and decreased overall costs.[3-5] Although different anesthetic techniques are used for abdominal aneurysm repairs, use of epidural

anesthesia compared to general anesthesia results in lower rates of postoperative cardiopulmonary complications, fewer postoperative intensive care admissions and shorter hospitalization periods, especially in patients with chronic obstructive pulmonary disorders.[6-8]

Here, we report a patient with dissecting abdominal aortic aneurysm and pulmonary embolus who underwent an endovascular stent grafting procedure under spinal anesthesia with mild sedation. Also, the literature regarding the advantages and disadvantages of different anesthesia methods which may be preferred for endovascular stent grafting is reviewed.

CASE REPORT

A 70-year-old male patient was referred to our hospital for dissecting abdominal aortic aneurysm and total occlusion of the left pulmonary artery with embolus. His past medical history was remarkable for hypertension, smoking, and alcohol consumption. The patient was admitted to the cardiovascular intensive care unit. His physical examination revealed tachypnea and tachycardia (105 beats/min) with a blood pressure of 128/40 mmHg and an arterial oxygen saturation of 83% in room air. Arterial blood gas analysis showed that the pH was 7.31, pCO_2 was 48.6 mmHg, pO_2 was 48 mmHg and HCO_3 was 28 mmol/L. Hemoglobin level was 13.9 g/dL on complete blood count. Blood urea nitrogen was 75 mg/dL and creatinine was 2.0 mg/dL on biochemistry. Chest X-ray showed an enlarged heart, pleural retractions and thickening in lateral parts of the upper segment of left lung, and aortic elongation and tortuosity. Electrocardiogram showed sinus tachycardia with findings of right heart strain. Thoracic computed tomography (CT) revealed filling defects within the left main pulmonary artery and bilateral lobar pulmonary arteries consistent with embolus and pulmonary parenchymal changes secondary to embolus. Abdominal CT and digital subtraction angiography showed marked dissected abdominal aortic aneurismal dilatation of 4.8 cm in greatest diameter, extending from the level of the renal arteries to iliac bifurcation (Figure 1a). We also detected a subacute hematoma in the para-aortic area.

Catheterizations of peripheral, radial artery, right internal jugular vein were performed under local anesthesia with lidocaine in the operating theatre. Spinal anesthesia was performed without complications using 3 mL of 0.5% heavy bupivacaine given with a 27G Quincke-type spinal needle inserted at the L3-4 interspace. Subsequently, we observed motor blockade up to the T_{12} level within 15 minutes. A total dose of 0.05 mg/kg-1 midazolam was used for mild intravenous sedation while the patient was oxygenated by 2 L/dk-1 using nasal oxygen cannula. A sedation score of one was maintained to allow immobilization of the patient with his cooperation whenever needed during angiographic screening (sedation was graded as 0- fully alert; 1- mildly drowsy; 2- moderately drowsy but easily rousable; 3- very drowsy but rousable; and 4- difficult to rouse or unrousable).[9] Heparinization with 1 mg/kg-1 heparin was done to keep the activated clotting time between 250 and 300 sec. Bilateral femoral arteries were explored and introducer sheaths were inserted into both femoral arteries. Angiograms were obtained via scaled pigtail catheters advanced through a hydrophilic guide-wire. Endovascular stent grafts were placed in appropriate positions determined by repeated angiograms (Figure 1b). Proximal and distal balloon

Figure 1. (a) Digital subtraction angiography showing dissected abdominal aortic aneurismal dilatation which extended from the level of the renal arteries to the iliac bifurcation. **(b)** View of abdominal aorta with endovascular stent grafts placed.

catheter angioplasty was performed for fixation after stent-grafting. After confirmation of normal blood flow restoration and endoleak control in the aneurysm sac by control angiography, introducer and sheath systems were pulled out. During the procedure which lasted for about 120 minutes, the patient was hemodynamically stable and his blood pressure and heart rate stayed within 15% of basal levels. His arterial oxygen saturation was 97-99% with 2 L.dk-1 nasal oxygen. Estimated blood loss due to the procedure was 200 mL and the patient was given 300 mL crystalloid in addition to volume expansion.

The patient was re-admitted in the intensive care unit after the operation. Recovery from motor and sensory block was seen one hour later. He was discharged from the hospital on the fifth day following an uneventful postoperative course.

DISCUSSION

Endovascular stent grafting has gained considerable popularity following its first description.[1-4] However, no consensus exists in the literature regarding the type of anesthesia that should be used during this minimally invasive procedure. The lack of consensus is compounded by the availability of several anesthetic techniques such as general, epidural, spinal anesthesia, continuous spinal infusion anesthesia, combined general-epidural anesthesia, combined spinal-epidural anesthesia and local anesthesia with sedation.[10-12]

Local anesthesia with sedation is a safe and simple technique which may be used for endovascular stent grafting.[13] However, this technique requires a thin body habitus, no history of previous surgery in the inguinal region and no need for additional procedures. Nevertheless, it may be preferred in eligible patients with lower rates of systemic complications as it allows early discharge from hospital.[4] Despite its preferred use, patients' anxiety and inadequate cooperation limits its use. Moreover, overstretching the arterial system by the delivery sheath may induce discomfort.[4] We did not prefer to use local anesthesia because of relatively long duration of procedure. Furthermore, the possibility of adhesions and scar formations because of a previous varicocele operation could result in a longer operation time. Additionally, we could not use sedative agents because the patient had pulmonary dysfunction and hypercarbia resulting from a pulmonary embolus and acute right ventricular failure. Accordingly, inadequate sedation and analgesia might necessitate use of general anesthesia with associated risks of cardiopulmonary complications, longer admission in the intensive care unit and longer hospitalization period.

Epidural anesthesia is an alternative technique. The advantages of epidural anesthesia include an attenuated stress response to surgery, improved myocardial oxygen balance, decreased pulmonary complications, increased renal cortical blood flow and effective postoperative analgesia.[14] In a retrospective study, Cao et al.[15] reported that lower transfusion rates, shorter lengths of stay in intensive care units and shorter overall hospitalization periods may be associated with epidural anesthesia. However, because of difficulties in controlling the level of neural block during epidural anesthesia, intubation and controlled ventilation may be required when mid or high thoracic blocks occur.[15] Furthermore, epidural catheters must be maintained as long as postoperative anticoagulation continues. This may increase the risk of postoperative complications related to epidural catheterization.[16] Moreover, pulmonary functions could be affected by an increased block level. Also, the need for maintenance of anticoagulation therapy in the postoperative period could exacerbate the already impaired bleeding parameters. Therefore, epidural anesthesia was not used in our patient.

General anesthesia is also used for endovascular stent grafting. This technique is preferred especially for lengthy procedures during which restricted patient movement and controlled respiration are required.[6] However, because of its negative effects on myocardial and pulmonary functions, the use of general anesthesia is restricted in patients who have additional comorbidities.[14] General anesthesia was not used in our patient as it could result in cardiopulmonary complications which would require longer admission in the intensive care unit and longer hospital stay.

Spinal anesthesia is the preferred technique of choice for patients with cardiopulmonary problems for whom use of sedatives is restricted, general anesthesia necessitating endotracheal intubation is avoided, but muscle relaxation is necessary. Use of spinal anesthesia is associated with lower doses of systemic medications and lower incidences of adverse hemodynamic effects.[17] According to two recently published studies with a high number of patients, most endovascular stent grafting procedures were successfully performed under regional anesthesia with mild blood loss, infrequent need for conversion to general anesthesia, short hospitalization period and low mortality rates.[18,19] However, limited duration of action of spinal anesthesia is the major disadvantage, especially for the surgical interventions in which the length of the procedure is unpredictable. Because of the limited duration of action of spinal anesthesia, increased level of anxiety has been reported in about

33% of patients who underwent spinal anesthesia.[6] For lengthy procedures, continuous spinal anesthesia and epidural anesthesia are other options; but these procedures may be associated with increased complication rates in patients with coagulation disorders or when postoperative anticoagulation maintenance is required.[20,21] To minimize the risk of possible complications, we preferred to use a relatively fine (27G) Quincke-type spinal needle and mild sedation.

In conclusion, spinal anesthesia with mild intravenous sedation is a safe option in endovascular stent grafting for aortic aneurysms. Nevertheless, the short duration of action of available spinal anesthetics limits the use of this technique. Furthermore, patient characteristics should be carefully considered when choosing an anesthetic technique. Spinal anesthesia with mild sedation may be preferable in patients with pulmonary embolus.

Declaration of conflicting interests

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