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ARAŞTIRMA/RESEARCH

Are type B aortic dissections feasible to intervention under local anesthesia?

Tip B aort diseksiyonları lokal anestezik girişim ile tedavi edilebilir mi?

Uğur Göçen[1], Atakan Atalay[1]

[1]Cukurova University Medical Faculty Department of Cardiovascular Surgery, Adana,Turkey

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Abstract

Purpose: In Type B Arotic diseections, endovascular interventions are frequently performed under sedation or general anesthesia. To prevention of complications that can occur due to anesthesia and to observe cognitive activities, we share our experience with endovascular stent graft performed under inguinal local anesthesia in patients with Type B aortic dissection.

Material and Methods: Between March 2010 and March 2016, we performed endovascular stent graft repair with inguinal local anesthesia for 23 Type B aortic dissection patients in our clinic. Only patients with good cooperation, no neurological conditions and hemodynamically stable (Systolic 120-90 mmHg and Diastolic 70-50mmHg) were included in to study. A follow up CT angiography at postoperative months 3 and 6 were performed for patient assessment.

Results: Of 4 patients who had an implantation of thoracic endovascular stent due to emergency Type B aortic dissection, one had left heart failure, pulmonary edema, and visceral ischemia, one had persistent hypertension, back pain, and two others had renal malperfusion and anuria. In the remaining 19 elective cases, no signs or symptoms other than hypertension and back pain were present. Stent graft procedure could be accomplished successfully in the appropriate anatomical location in all patients. There was one in-patient mortality due to multi-organ failure in a patient who underwent emergency intervention. No neurological deficits occurred in any of the surviving patients.

Conclusions: Endovascular stent graft may be successfully accomplished through the femoral artery without general anesthesia and sedation in patients with Type B aortic dissections, even in the emergency setting.

Key words: Thoracic endovascular aortic repair, type b aortic dissection, local anesthesia

Öz

Amaç: Tip B Aort diseksiyonlarında endovasküler girişim sıklıkla genel anestezi veya sedasyon ile yapılmaktadır. Anestezi kaynaklı gelişebilecek komplikasyonlardan korunmak ve bilişsel faaliyetleri gözlemek için biz inguinal lokal anestezi uygulayarak endovasküler stent greft ile tedavi yaptığımız Tip B aort diseksiyonu hastalarında tecrübemizi paylaşmayı amaçladık.

Gereç ve Yöntem: Mart 2010 ile Şubat 2015, arasında kliniğimizde Tip B aort diseksiyonlu 23 hastada inguinal lokal anestezi ile femoral arter girişimi ile endovasküler stent greft tamiri uyguladık. Kooperasyonları iyi olan, nörolojik problemi olmayan ve hemodinamik olarak stabil (sistolik tansiyon 90-120 mmHg ve diastolik tansiyon 50-70 mmHg) hastalar çalışmaya dahil edildi. Hastalar postoperatif üçüncü ve altıncı aylarda kontrol amaçlı BT angiografi ile değerlendirildi.

Bulgular: Acil Tip B diseksiyonu nedeniyle torasik endovasküler stent implante edilen 4 hastadan birinde sol kalp yetersizliği, pulmoner ödem ve viseral iskemi, bir tanesinde inatçı hipertansiyon, sırt ağrısı ve radyolojik olarak gelişmekte olan rüptür bulguları ve diğer ikisinde renal malperfüzyon ve anüri mevcuttu. Diğer elektif 19 hastada sırt ağrısı ve hipertansiyon dışında bulgu yoktu. Tüm hastalarda torasik stent greft ile tamir işlemi başarılı bir biçimde uygulandı. Hastane mortalitesi acil uygulama yapılan 1 hastada multiorgan yetmezliği nedeniyle görüldü. Yaşayan hiçbir hastada nörolojik defisit görülmedi.

Sonuç: Endovasküler stent greft uygulanması Tip B aort diseksiyonlarında acil durumlarda bile genel anestezi ve sedasyon uygulanmadan lokal anestezi ile femoral arter girişimi kullanılarak başarılı bir şekilde uygulanabilir.

Anahtar kelimeler: Torasik endovasküler aortik tamir, tip b aort diseksiyonu, lokal anestezi

Yazışma Adresi/Address for Correspondence: Dr. Ugur Göçen, Cukurova University Medical Faculty Department of Cardiovascular Surgery Adana-Turkey, E-mail: ugurgocen@hotmail.com
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INTRODUCTION

A Type B aortic dissection occurs when there is an intimal tear present beyond the left subclavian artery. However, this tear can also form in the aortic arch. The false channel propagates distally into the descending and abdominal aorta.

The first description of endovascular stent implantation in the thoracic aorta was reported by Volodos et al. in 1991[1]. The endovascular repair of thoracic aortic aneurysm and abdominal aortic aneurysm has become a promising alternative for open surgical graft replacement. TEVAR in decreasing overall morbidity and mortality compared with open thoracic aortic surgery has been convincingly demonstrated by clinical trials[2-4] and further validated by more recent multi-institutional reviews,[5] retrospective registries,[6-9] and meta-analyses[10,11]. Such clinical research has led to the applicability of TEVAR to a diverse group of aortic pathologies, including thoracic aortic aneurysms, complicated type B dissections, traumatic transections, penetrating aortic atherosclerotic ulcers, and intramural hematomas. However, TEVAR is associated with certain complications that are unique to the procedure. Given the obligate wire passage beyond the aortic arch into the ascending aorta as well as the frequent need to deploy the stent graft at or near the aortic arch branch vessels, embolic stroke remains a risk of thoracic aortic endovascular intervention.

Various anaesthetic techniques have been used for EVAR which include general anaesthesia (GA), regional (epidural and spinal anaesthesia) and local anaesthesia (LA) with or without monitored anaesthesia care[12,13] After 20 years, there is still no consensus about which type of anesthesia is most suitable for EVAR. Feasibility of local and regional anesthesia was proven in 1999[14]. According to the guidelines of the European Society for Vascular Surgery, the preferential use of local anesthesia for EVAR is feasible and appears to be well tolerated, restricting regional or general anesthesia only to those with predefined contraindications for local anesthesia[15]. The Society Endovascular procedures are commonly carried out under general anesthesia or sedation using a femoral arterial route. In the current study, our objective was to present our results in patients undergoing thoracic endovascular stent graft implantation due to Type B aortic dissection via an inguinal incision and femoral artery under local anesthesia. for Vascular Surgery practice guidelines suggest the use of epidural and local anesthetic along with conscious sedation for patients undergoing EVAR[16]. However, these guidelines are based on a low level of evidence and recommendation.

The aim of this report is to highlight our preliminary experience in twenty three patients with Stanford Type B Aortic Disection who underwent TEVAR using local anesthesia.

MATERIAL AND METHODS

This is a retrospective review of 23 patients with Stanford Type B Aortic disection who underwent an TEVAR procedure under LA during the period between March 2010 and February 2015. Demographic data, diagnoses, treatments administered, risk factors, and ASA (American Society of Anesthesiologist Scoring System) scores were recorded. Prior to the procedure, patients were provided detailed and clear information on the nature of the intervention and potential complications and written informed consent was obtained from all patients.

Before the procedure, all patients underwent a contrast-enhanced computed tomographic (CT) angiography with 3-mm cross-sections and 3-dimensional reconstructed images as well as a digital substraction angiography (DSA) (Multistar Plus, Siemens, Erlangen Germany) to assess the anatomic suitability of each patient for endovascular stent graft implantation, and to determine the type and dimensions of the type of the stent to be used. For contrast enhancement, ioprimide (Ultravist, 300 mg/ml, Berlin, Germany) was used. Using computed tomographic data the presence/absence of a dissection flap and its location (if present), aortic dimensions, presence/absence of calcifications and intra-luminal thrombi, and the length of aortic segment into which the endograft stent would be placed were determined. In cases with aneurysms, a device oversize factor ranging between 10 to 15% is applied to the selection of endograft stents at the proximal aortic site. The following three types of endovascular stent grafts were used for the procedures: Valiant Thoracic Stent Graft (Medtronic AVE, Santa Rosa, CA), Conformable Thoracic Endoprosthesis (TM,W.L.Gore & Associates, Flagstaff, AZ, USA), and E-vita 3G Thoracic Stent Graft (Jotec,

Hechingen, Germany). The graft diameter and length varied between 26-38 mm and 100/230 mm (mean 143), respectively. After assessments, patients with adequate cooperation and orientation and no neurological conditions were considered eligible. Therefore, those with neurological or psychiatric conditions and active bleeding due to acute rupture, or those with severe peripheral arterial disease precluding endovascular intervention were excluded.

The procedures were performed by a cardiovascular surgeon at the angiography laboratory under appropriate sterilization conditions and an anesthesiology specialist was also available. Prior to the procedure, all patients were given prophylactic antibiotics (cefazolin sodium 2 g, i.v.). Continuous blood pressure and cardiac monitoring were performed via the right radial artery and electrocardiography. After inguinal local anesthesia with 10 cc of prilocaine hydrochloride 2% and 10 cc of bupivacaine hydrochloride 0.5, an inguinal incision was made for surgical exploration of the main femoral artery. During the procedure 50 units/kg of IV heparin was also administered. After placement of the stent, follow up angiographic images were obtained, after which, the site of arteriotomy was repaired using 6/0 prolene sutures.

Through the procedure patients cooperation and cognitive functions were followed by anesthesiologist. After procedure patients were transferred to the intensive care unit for hemodynamic monitoring. A contrast enhanced CT was performed at the day of discharge as well as 1 and 6 months after discharge to assess graft migration and endoleak. Additional arteriography or tomography was performed if required. Also, renal function and blood pressure were closely monitored after the procedure. Early outcomes including mortality rate, duration of intensive care and hospital stay and complications such as endoleak, neurologic deficits, upper extremity ischemia, graft migration, kink and lower extremity ischemia were recorded.

RESULTS

Table 1 summarizes the demographic data for the 23 study participants, of whom, 19 were male and 4 were female, with a mean age of 57.83 years for thoracal Stanford Type B dissections and 52 ± 6.4 years for thoracoabdominal Stanford Type B dissections. There were 14 patients with thoracal aortic lesions while 9 with thoracoabdominal aortic lesions. Table 2 depicts the distribution of the anatomical site of the lesions. Fifteen patients had an ASA score of IV, while 6 and 2 patients had an ASA score of III and II, respectively. Endovascular stent graft implantation was performed in elective settings in 22 patients and in emergency settings in 1 cases. Only one (1) patient required post operative ICU.

There was no one postoperative mortality in this study. Figure 1 shows a thoracal Type B dissection, while Figure 2 shows the post-treatment image from the same lesion. Figure 3 and 4 show the pre- and post-procedural images of a thoracoabdominal Type B dissection, respectively. Graft implantation could be successfully accomplished in all patients with no patients requiring transition to open surgery. Also, thoracic stent implantation was performed through the femoral artery with inguinal local anesthesia only in all patients. Three different types of endovascular stent grafts were used, as shown in Table 3. The average duration of fluoroscopy was 28 ± 3.2 minutes. Two patients undergoing endovascular repair required an average of 156 ± 12.4 ml (range: 160-480 ml) of blood transfusions. The mean duration of intensive care and hospital stay in the patient group were 1.2 ± 0.4 and 3.1 ± 1.4 days, respectively.

The total mortality rate was 4.34% (n=1). There were no deaths among patients who underwent elective procedures, while the only patient who died had required an emergency intervention and the cause of death was multi-organ failure. An early impairment in renal functions was detected in 4 patients with thoracoabdominal aortic dissection due to the use of contrast material during the procedure, and although a complete recovery in renal functions could be achieved in three with hydration, the remaining patient died due to the causes stated above. Cerebrospinal fluid drainage was not performed in any patients and no patients had neurological complications such as paresis, paralysis, or stroke. Similarly, no upper extremity ischemia occurred in patients with thoracal aortic aneurysms and no cases of lower extremity ischemia was observed among those with abdominal aortic aneurysms. Patients were discharged with anti-aggregating agents with unremarkable 1 month follow up findings. A repeat CT angiography was carried out to check the stent localization as well as the presence of migration or leak.

The mean duration of follow up was 17.1 ± 5.4 months. There were a total of 3 patients (13.07%) with endoleak, one patient with type I (4.34%), and two patients (8.69%) with type II. Patient with type I endoleak was managed using balloon angioplasty and a second aortic extension method. No interventions were required for patients with Type II endoleak. No graft migration occurred during the follow up. Table 4 summarizes the complications occurring within the first 6 month period following the intervention.

Table 1. Demographic characteristics of patients undergoing TEVAR

	Stanford Type B Aortic Dissection (Thoracal) (n=14)	Stanford Type B Aortic Dissection (Thoracoabdominal) (n=9)
Male/Female	11/3	8/1
Mean age (years)	57±8.3	52±6.4
Diabetes (n)	4	6
Hypertension (n)	8	7
COPD (n)	2	1
Creatinine mg/dl (n)	1	6
Coronary artery disease (n)	3	0
CABG history (n)	2	0

COPD: Chronic obstructive pulmonary disease; CABG: Coronary artery bypass graft

Table 2. Lesion distribution

Lesion	n (number)	(%)
Stanford Type B Aortic Dissection (Thoracal)	14	60.87%
Stanford Type B Aortic Dissection (Thoracoabdominal)	9	39.13%
Total	23	100%

Table 3. Type of endovascular stent grafts utilized

Stent Graft	N (number)	%
Valiant Thoracic Stent Graft-Medtronic	10	43.47%
Thoracic Endoprosthesis-Gore	N (7)	30.43%
E-vita 3G Thoracic Stent Graft-Jotec	N (6)	26.08%

Table 4. Complication rate in the first 6 months

	Thoracal Type B Dissection	Thoracoabdominal Type B Dissection
Mortality (n)	0	1
Need for blood replacement (n)	0	2
Type 1 leak (n)	1	0
Type 2 leak (n)	0	2
Migration (n)	0	0
Impaired renal functions (n)	0	4
Upper extremity ischemia (n)	0	0
Lower extremity ischemia (n)	0	0
Neurological complications (n)	0	0

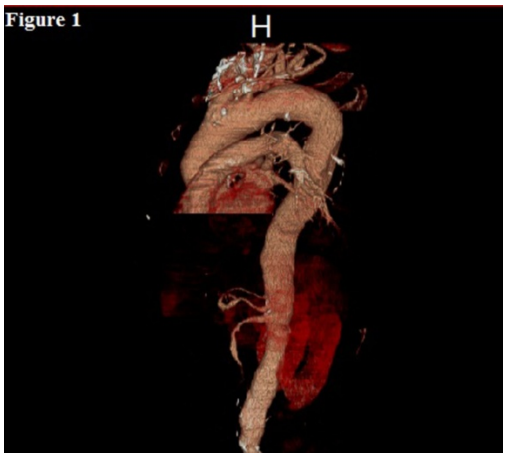

Figure 1. Preoperative thoracic type B dissection image

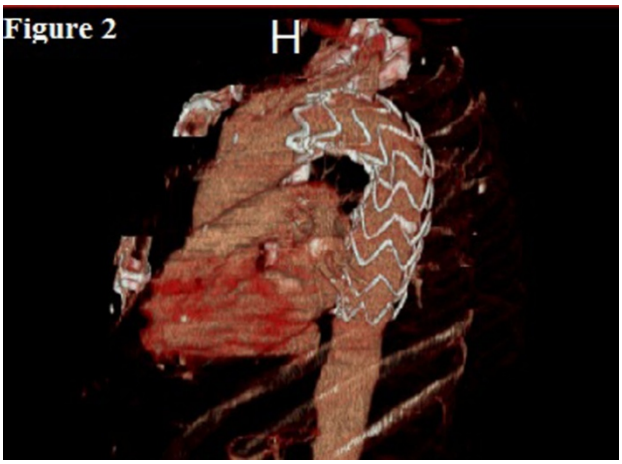

Figure 2. Postoperative thoracic endovascular repair of thoracic type B dissection image

Figure 3. Preoperative thoraco-abdominal type B dissection image

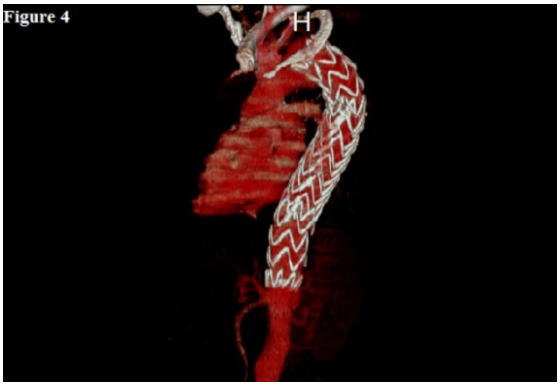

Figure 4. Postoperative thoraco-abdominal endovascular repair of thoraco-abdominal type B dissection image.

DISCUSSION

Aortic dissection is one of the most catastrophic events affecting aorta. The treatment strategy usually involves medical approach for dissections not involving the ascending aorta and when uncomplicated. Approximately 20% of the patients with uncomplicated Stanford type B dissections display aneurysmal dilatation in spite of the strict antihypertensive medication. This raises the concern about aortic rupture or redissections in these patients. The mortality rates for Stanford type B dissections can be more than 50% when complicated by preoperative end-organ ischemia[17-19]. TEVAR for the treatment of patients with aortic dissection is emerging as an alternative to conventional operations[19]. The purpose of stent-graft placement is to seal the intimal tear to decompress the false lumen and decrease the risk of rupture[20].

This retrospective review showed TEVAR with LA has showed a very encouraging outcome in terms of safety, short length of post-operative stay, short ICU admission, reduced postoperative monitoring and postoperative morbidity in our local setting. Henretta et al[21] reported no operative death or cardiopulmonary adverse events in 47 patients who underwent EVAR with LA. Our patients mean duration of intensive care and hospital were 1.2 ± 0.4 and 3.1 ± 1.4 days and we thought this was very satisfactory for the Type B aortic dissection patients.

Ruppert et al[22] in an analysis of the large EUROSTAR database of 5557 cases in 167 centers

found that 310 patients(6%) were done under LA with subsequent significant reduction in ICU and hospital stay with reduced systemic complications. The use of local anaesthesia avoids mechanical ventilation and allows spontaneous ventilation therefore reducing the patient's exposure to factors that increase the risk of post operative respiratory failure and reduces the risk of pulmonary morbidity.

Bettex et al23 in his study noted lower fluid requirements and vasopressor support resulting in lower need for ICU post operative care. In our study only one required post operative ICU care due to transient hypotension and bradycardia shortly after completion of the procedure. This was the patient that had poor cardiac function and history of congestive cardiac failure. Concerning the pain control, majority of patients required only oral non-steroidal anti-inflammatory medication. This is possibly due to the effect of preemptive analgesia excerted by the infiltration of local anaesthetic agent[24].

The limitation of this initial report is that there were only a small number of patients in the study cohort and we will require a larger cohort to compare the efficacy and outcome of this technique with other larger studies in our center. Endovascular treatment of type B aortic dissection with local anesthesia, reduce intensive care unit stay and hospital stay. Except this, during local anesthasia procedure patient can present cognitive and neurological changes.

Although this procedure can be accomplished under local anesthesia, it is essential that adequate information be provided to the patient preoperatively and a good level of cooperation exists between the patient and the surgeon. We believe that endovascular repair of Type B dissections under local anesthesia may allow early detection and timely management of neurological or cognitive impairment. However, it is also essential that the procedure be performed in clinical settings where an anesthesiologist is also available.

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