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ORIGINAL ARTICLE

Treatment Of Iatrogenic And Traumatic Vascular Lesions With Stent-Grafts

İatrojenik Ve Travmatik Vasküler Lezyonların Stent-Greftlerle Tedavisi

[1]Fatih ÖNCÜ, [1]Burak Mert AKHAN, [1]Koray AKKAN, [1]Baran ÖNAL, [1]Erhan Turgut ILGIT, [2]Abdullah ÖZER

[1]Department of Radiology, Faculty of Medicine, Gazi University, Ankara, Türkiye
[2]Department of Cardiovascular Surgery, Faculty of Medicine, Gazi University, Ankara, Türkiye

Correspondence

Fatih ÖNCÜ
Emniyet Mah. Mevlana Bul. No: 29, 06510 Beşevler, Yenimahalle / Ankara

E-Mail: oncufatih@gmail.com

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ABSTRACT

Aim: Purpose of this study is to report our experience with stent-graft applications in iatrogenic and traumatic vascular injuries.
Methods: We report endovascular treatment of 65 patients (45 men, 20 women; age range 17 - 91 years-old, mean 60 ± 19 years), 65 iatrogenic and traumatic vascular lesions with stent-grafts. The localisations of the vascular lesions are as follows: 43 lower extremity, eight upper extremity, seven supra aortic, seven visceral. Early Doppler ultrasound imaging was performed before patient discharge.
Results: Immediate technical success was achieved in 59 lesions (91%). In the remaining six lesions pathology continued and these cases were treated with accompanying embolisation (four with glue embolisation, one with vascular plug, one with concomitant stent-graft). Complications such as deformation or migration were not observed in any case. Follow-up was available for 53 lesions (mean follow-up 13 months, range 4-19 months). During the follow-up period, 13 cases of in-stent restenosis were observed. Seven cases of incomplete restenosis and two stent-graft occlusions were treated with balloon angioplasty, while one stent-graft occlusion was managed with the placement of an additional stent-graft. Three cases of in-stent restenosis were left untreated due to the absence of significant clinical symptoms. The primary patency rate was 76%, the primary assisted patency rate was 88%, and the secondary patency rate was 94%.
Conclusions: Endovascular treatment of iatrogenic and traumatic vascular lesions with stent-grafts is a safe, effective and less invasive procedure.

Keywords: arteriovenous fistula, covered stent, dissection, endovascular treatment, extravasation, iatrogenic, pseudoaneurysm, stent-graft, trauma

ÖZ

Amaç: Bu çalışmanın amacı, iyatrojenik ve travmatik vasküler yaralanmaların stent-greft ile tedavisinde elde ettiğimiz deneyimleri paylaşmaktır.
Gereç ve Yöntemler: İyatrojenik ve travmatik vasküler yaralanması olan toplam 65 hastada (45 erkek, 20 kadın; yaş aralığı 17-91, ortalama yaş 60 ± 19) 65 lezyon stent-greft kullanılarak endovasküler yöntemle tedavi edildi. Vasküler lezyonların lokalizasyonları şu şekildedir: 43 alt ekstremite, sekiz üst ekstremite, yedi supra-aortik ve yedi visseral. Hastalar taburculuk öncesinde erken dönem Doppler ultrasonografi ile değerlendirildi.
Bulgular: 59 lezyonda (%91) teknik başarı sağlandı. Kalan altı lezyonda patolojinin devam etmesi nedeniyle bu olgular ek embolizasyon teknikleriyle tedavi edildi (dört olguda yapıştırıcı (glue) embolizasyonu, bir olguda vasküler tıkaç, bir olguda ek stent-greft yerleştirilmesi uygulandı). Hastaların hiçbirinde deformasyon veya migrasyon gibi komplikasyonlar görülmedi. Toplam 53 lezyonun takibi yapıldı (ortalama takip süresi 13 ay, takip aralığı 4-19 ay). Takip süreci boyunca 13 stent-greft içi restenoz vakası gözlendi. Yedi inkomplet restenoz ve iki stent-greft oklüzyonu balon anjiyoplasti ile tedavi edilirken, bir stent-greft oklüzyonu ek bir stent-greft yerleştirilerek yönetildi. Üç stent-greft içi restenoz vakası ise belirgin klinik semptom bulunmaması nedeniyle tedavi edilmedi. Primer açıklık oranı %76, primer yardımcı açıklık oranı %88 ve sekonder açıklık oranı %94 olarak belirlendi.
Sonuçlar: İyatrojenik ve travmatik vasküler yaralanmaların stent-greft ile endovasküler tedavisi güvenli, etkin ve minimal invaziv bir yöntemdir.

Anahtar Kelimeler: Arteriyovenöz fistül, diseksiyon, ekstravazasyon, endovasküler tedavi, iyatrojenik, kaplı stent, psödoanevrizma, stent-greft, travma

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INTRODUCTION

Injuries to the arterial wall resulting from trauma, surgical, or endovascular interventions can give rise to a range of vascular complications, most notably pseudoaneurysms, arteriovenous fistulas, and active hemorrhage. Pseudoaneurysms occur when blood leaks through a defect in the arterial wall and becomes confined by the surrounding tissue, forming a pulsatile hematoma that remains in communication with the vessel lumen. Arteriovenous fistula (AVF) is an abnormal connection between an artery and an adjacent vein, leading to altered hemodynamics and potential complications such as heart failure or distal ischemia. Uncontrolled bleeding poses an immediate life-threatening risk, making prompt diagnosis and timely intervention essential.

Endovascular treatment may be preferable in selected patients. Stent-grafts, which combine a metallic stent and a synthetic graft material, are designed to repair vessel wall defects and prevent blood leakage and provide a reliable alternative by covering the injury site to restore vascular integrity.

In 1979 Nicolai Leontyevich Volodos, a cardiovascular surgeon working in Kharkov, Ukraine, Soviet Union, developed and used a device consisting of a stent with tubular casing (i.e., stent-graft) for the first time (1, 2). Since then stent-grafts have been widely used in the treatment of various vascular pathologies, including pseudoaneurysms, arteriovenous fistula (AVF), dissections, and extravasations.

Over the years, numerous studies have investigated the efficacy and safety of stent-grafts in the management of iatrogenic and traumatic arterial injuries, demonstrating high technical success rates, effective exclusion of vascular lesions, and satisfactory mid- to long-term patency with endovascular stent-graft placement. Moreover, stent-graft use has been associated with lower complication rates, reduced procedure-related morbidity, and shorter hospital stays particularly in high-risk or comorbid patient populations.

Despite these advantages, long-term durability, risk of endoleak, and the potential for in-stent restenosis or thrombosis remain subjects of ongoing research and debate. Current literature also highlights the importance of patient selection, appropriate device sizing, and careful follow-up to optimize outcomes (3-6).

In this retrospective study, we analyzed 65 patients who underwent endovascular treatment with stent-grafts for iatrogenic and traumatic arterial lesions, aiming to contribute further evidence regarding the effectiveness, safety, and clinical results of this minimally invasive approach in real-world practice.

MATERIALS and METHODS

Study Design and Patient Population

The study received ethical approval from the Institutional Ethics Committee. (decision number 77082166-604.01-1217481 and date 16.04.2025). 65 patients (45 men, 20 women; aged 17 - 91 years-old, mean 60 ± 19 years) with 55 iatrogenic and ten traumatic vascular lesions were treated in our center between by intra-arterial stent-graft placement January 2028 and January 2024. The site, type and etiology of the lesions are summarized in Table 1. The majority of lesions in this study were iatrogenic (n=55/65).

Table 1: Nature of Lesions and Lesion Sites

		Supraortic			Upper Extremity					Lower Extremity						Visceral		
i/t	**CCA**	**ICA**	**VA**	**SCA**	**A/B**	**R/U**	**CIA**	**EIA**	**CFA**	**SFA**	**DFA**	**PA**	**CA**	**CR**	**HA**	**SMA**	**SA**	**RA**
AVF			1/0	0/1	1/0		1/0		4/0	3/1	2/0	1/0						0/1
Pseudoaneurysm	1/0			1/0	1/1	0/1	3/0	1/0	6/0	10/1	3/1	1/0	0/1		1/0	2/0	1/0	
Dissection													1/0					
Extravasation	2/1	0/1	1/0	1/0	1/0				1/0	1/0		1/0		1/0	1/0			
		5/2			5/3					39/4						6/1		
							55/10											

i/t: iatrogenic / traumatic, **AVF:** arteriovenous fistula

CCA: common carotid artery, **ICA:** internal carotid artery, **VA:** vertebral artery, **SCA:** subclavian artery, **A/B:** axillary and brachial arteries, **R/U:** radial and ulnar arteries, **CIA:** common iliac artery, **EIA:** external iliac artery, **CFA:** common femoral artery, **SFA:** superficial femoral artery, **DFA:** deep femoral artery, **PA:** popliteal artery, **CA:** crural arteries, **CA:** celiac root, **HA:** hepatic artery, **SMA:** superior mesenteric artery, **SA:** splenic artery, **RA:** renal artery

Stent-Graft Choice and Procedure

Patients were referred to our department by the relevant clinic based on the urgency of their condition and their hemodynamic stability at the time of admission. All procedures began after achieving hemodynamic stability and correcting any coagulation abnormalities. Pre-procedural digital subtraction angiography (DSA) was performed for vessel sizing and planning. Procedures were carried out using a GE Innova 3100 Cath/Angio system, with continuous monitoring of vital signs. The choice of stent-graft depends on the characteristics of the lesion (Table 2).

Open-cell stent designs are more flexible due to fewer connections between the struts, making them suitable for tortuous vessels. In contrast, closed-cell stents provide greater radial support and stability, which can be advantageous in straight or high-pressure segments (7, 8). The stent-grafts in this study were made of nitinol and stainless steel. Nitinol offers flexibility and shape memory, making it suitable for tortuous or compressible vessels. Stainless steel provides strength and strong radial support, but is less flexible and lacks shape memory compared to nitinol (9, 10).

Self-expandable stent-grafts are flexible and resist kinking, suitable for peripheral and carotid arteries. Balloon-expandable stent-grafts provide higher strength and precise placement, making them ideal for vessels requiring accuracy, such as the renal arteries. (11-13). PTFE is a smooth, rigid material whose lack of pores limits flexibility, making it suitable for vessels that don't require high conformity. ePTFE, a modified form of PTFE with microporous structure, is more flexible and compliant. (14).

Endoskeleton stent-grafts have the stent inside the graft, giving a lower profile and easier delivery but less structural support. They are preferred in small, tortuous vessels where flexibility is needed. Exoskeleton stent-grafts have the stent outside the graft, providing greater strength and resistance to kinking, and are used in larger or high-pressure vessels like the iliac arteries. (15, 16).

Table 2: Material and Structural Properties of stent-grafts

	Stent Material	Graft Material	Structure	B.E	S.E
Fluency Plus (BD)	Nitinol	ePTFE (dual layer)	closed-cell/exoskeleton		+
Advanta V12 (Getinge)	SS	ePTFE	open-cell/exoskeleton	+	
LifeStream (BD)	SS	ePTFE	open-cell/exoskeleton	+	
Graftmaster (Abbott)	SS (dual layer)	PTFE	closed-cell/exoskeleton	+	
Viabahn (Gore)	Nitinol	ePTFE	open-cell/exoskeleton		+
Solaris (Scitech)	Nitinol	ePTFE	open-cell/exoskeleton		+

SS: stainless steel, **ePTFE:** Expanded Polytetrafluoroethylene, **PTFE:** Polytetrafluoroethylene, **B.E:** balloon expandable, **S.E**: self expandable

Lesion Sites

Extremity Lesions

All lesions were initially evaluated with Doppler ultrasonography and these lesions were treated by stent-graft placement after unsuccessful treatment attempts via manual compression under ultrasonographic guidance.

DSA revealed the exact source and size of the arteriovenous fistula (AVF) or pseudoaneurysm, and diameter of the artery. Length of stent-grafts were chosen with at least 1 cm of safety margin on each side. The stent-graft diameters were selected to be 1 mm larger than the diameter of the lesion's proximal segment.

In a case of right superficial femoral artery (SFA) pseudoaneurysm and another case of left common femoral artery (CFA) pseudoaneurysm additional percutaneous embolisation with n-butyl-cyanoacrylate (nBCA) and ethiodized oil mixture was done (Figure 1).

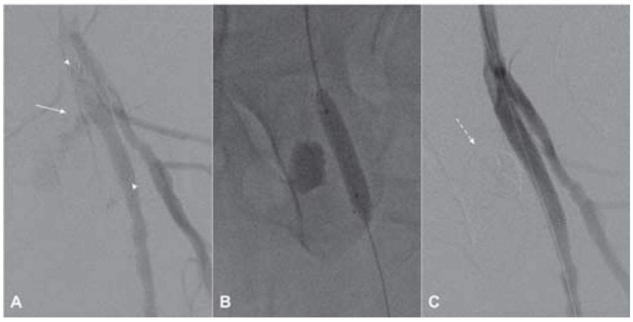

Figure 1. (A) Despite the placement of an 8.0 mm wide stent-graft (arrowheads) to exclude an iatrogenic pseudoaneurysm in the SFA, residual filling of the pseudoaneurysm was noted (white arrow). (B) In order to prevent glue leak to arterial site a 7.0 x 30 mm balloon dilatation catheter was inflated at the level of pseudoaneurysm neck and nBCA + Lipiodol mixture was injected percutaneously. (C) On control angiogram the glue cast can be seen with no residual filling (dashed arrow).

A case of extravasation at the femoral puncture site following coronary angiography, a 7 x 38 mm stent-graft (Advanta V12, Getinge AB, Sweden) was placed to left superficial femoral artery.

One deep femoral artery (DFA) and one anterior tibial artery (ATA) lesions were developed after stab wounds. The DFA lesion was treated with 6 x 40 mm (Fluency Plus, BARD, USA) and ATA lesion was treated with 4,5 x 19 mm (GRAFTMASTER, Abbott Vascular, USA) stent-grafts. For both lesions, 7F guiding sheaths were placed antegradely and the lesion site was reached by 0.014 hydrophilic guidewire and 0.014 microcatheter. A right CFA pseudoaneurysm developed due to arterial damage while central venous catheter placement. Remaining lesions were developed during endovascular procedures.

During a percutaneous transluminal angioplasty of left popliteal artery, extravasation was seen. A 4 x 19 mm stent-graft (GRAFTMASTER, Abbott Vascular, USA) was placed to the popliteal artery. After balloon dilatation with a balloon dilatation catheter extravasation was no longer present and stenosis was treated.

In a patient, a pseudoaneurysm developed on right subclavian artery due to central venous catheter placement without ultrasonographic guidance. Access to the lesion site was obtained via 0.035 hydrophilic guidewire. 7 x 37 stent-grafting (LifeStream, BD, USA) and 9 x 50 balloon dilatation was performed. On follow-up angiography filling of the pseudoaneurysm persisted and cessated with placement of another stent-graft (9 x 60 Fluency Plus, BARD, USA). After injection from right proximal subclavian artery pseudoaneurysm was completely excluded. On DSA from arcus aorta, retrograde flow from right vertebral artery was present. A guidewire was passed between native vessel wall and subclavian stent-graft. Then, right vertebral artery was embolised by a 7 mm plug (Amplatzer, Abbott Vascular, USA) (Figure 2).

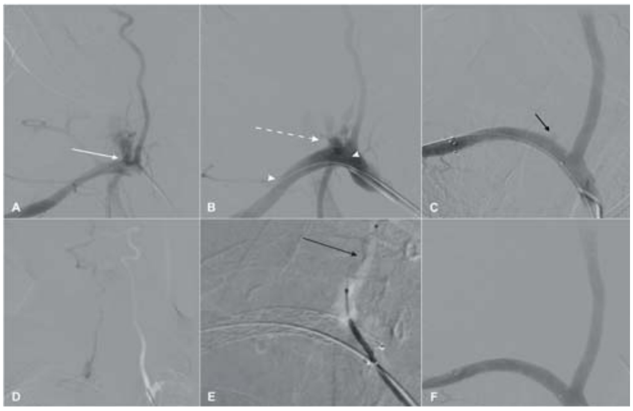

Figure 2. (A) Subclavian artery pseudoaneurysm near vertebral artery ostium (white arrow). (B) Protecting flow of vertebral artery a stent-graft (arrowheads) was placed and after dilatation with ballon catheter pseudoaneurysm was still filling(dashed arrow). (C) Another stent-graft covering right vertebral artery was placed and significant decrease of the filling of pseudoaneurysm was observed on injection from brachiocephalic trunk (D) Contralateral vertebral artery injection demonstrated retrograde flow from the vertebral artery. (E) After trans-seal catheterization of the right vertebral artery, an Amplatzer plug (black arrow) was deployed. (F) Final angiography demonstrating the dissappearence of pseudoaneurysm.

Another right subclavian artery pseudoaneurysm was presented after a bullet wound. This patient was treated by a 8 x 26 mm stent-graft.

We also have a left axillary, right ulnar artery and left main carotid artery pseudoaneurysms, developed after stab wounds. All these patients were treated by stent-grafting. A left brachial artery pseudoaneurysm occurred following diagnostic angiography was treated by a 9 x 30 mm stent-graft (Fluency, BARD, USA).

Supraaortic Lesions

A patient presented with symptoms of shortness of breath and palpitations. The patient's medical history revealed a previous central venous catheterization. Imaging studies demonstrated an AVF originating from the vertebral artery, likely as a complication of the catheterization procedure. The patient underwent a procedure in which a Solaris 8.0 x 60 mm stent-graft was deployed in the V1 segment of the right vertebral artery, followed by dilation with a 6.0 x 40 mm balloon catheter. Post-procedural imaging confirmed closure of the fistula. The patient's symptoms resolved in the early postoperative period (Figure 3).

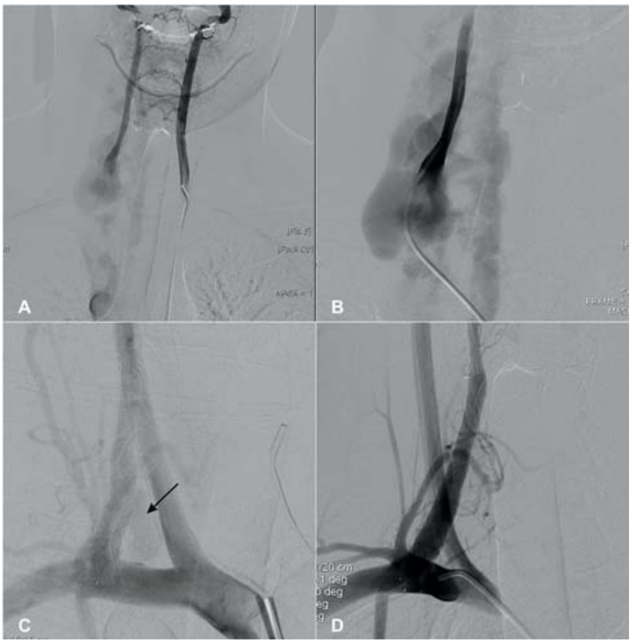

Figure 3. (A, B) Injection from both left and right vertebral arteries are showng high flow arteriovenous fistula. (B) A stent-graft was deployed in the right vertebral artery, after which a small residual filling (black arrow) was observed. Due to the significant decrease in fistula opacification, the patient was scheduled for follow-up. (D) One-year follow-up angiography demonstrated no residual fistula.

Three patients presented to the emergency department with carotid blow-out syndrome. In two lesions treatment with 9 x 40 mm stent-grafts (Fluency Plus, BARD, USA) was performed. One of these cases was readmitted a week later with decreased hemoglobin values on follow-up. Active extravasation from distal end of stent-graft was seen. An additional 8 x 40 mm stent-graft was deployed distall and external carotid artery was embolized with a 6 x 11 mm plug (Amplatzer, Abbott Vascular, USA) to prevent retrograde potential retrograde flow to the lesion site. Another lesion, located at the petrosal segment of the internal carotid artery, was treated with a smaller 4,8 x 19 mm stent-graft (GRAFTMASTER, Abbott Vascular, USA) (Figure 4).

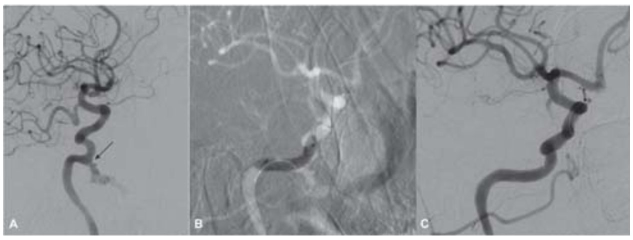

Figure 4. (A) Extravasation on petrosal segment of internal carotid artery (arrow). (B) Placement of a balloon expandable coronary stent-graft. (C) The final angiography showed that the vessel remained patent, while the pseudoaneurysm did not fill.

Five iatrogenic arterial injuries due to misplaced central venous catheters were managed with stent-graft placement. Our routine procedure for central venous catheter and port device placements include fluoroscopic guidance and control. All of these five cases were the result of procedures without fluoroscopic guidance. Two were placed to common carotid artery, one was placed passing through vertebral artery, one was placed to subclavian artery and one was placed to axillary artery.

For these lesions the process was always the same. Vascular access was obtained using 7F long sheaths. Lesion site was crossed and an appropriate stent-graft was sent. The stent-graft was deployed up to the level of the misplaced catheter entry site. After that the catheter was withdrawn and the remaining portion of the stent-graft was rapidly deployed. 8 x 37 mm (LifeStream, BD, USA), 5 x 19 mm (GRAFTMASTER, Abbott Vascular, USA), 12 x 40 mm, 12 x 60 mm and 13,5 x 60 mm (Fluency Plus, BARD, USA) stent-grafts were placed to axillary artery, vertebral artery, subclavian artery and two common carotid arteries, respectively. Follow-up digital subtraction angiography (DSA) demonstrated complete exclusion of the lesion with no residual extravasation.

Visceral Arteries

A patient had severe celiac root stenosis. While catheterisation of the stenotic site an extravasation was developed. A 4,5 x 19 mm stent-graft (GRAFTMASTER, Abbott Vascular, USA) was placed at the lesion site. Dilatation was performed with a 6,0 x 20 mm balloon dilatation catheter resulting in successful resolution of both stenosis and extravasation.

A proximal superior mesentericartery (SMA) pseudoaneurysm developed during Whipple operation. With the aid of 0.035" guidewire lesion site was reached through right CFA and 6 x 20 mm stent-graft was placed (LifeStream, BD, USA).

A patient was presented with a splenic artery pseudoaneurysm and extravasation after endoscopic cystojejunostomy. For this patient we used a 7F long sheath, 0.035" stiff guidewire and 8 x 39 mm stent-graft (Figure 5).

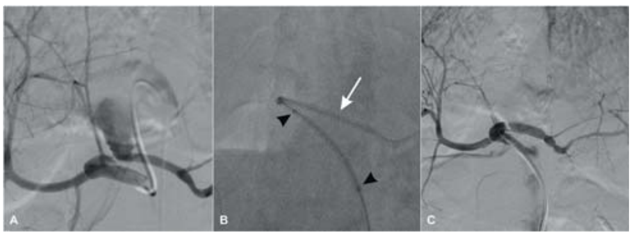

Figure 5. (A) Angiography showing active extravasation developing during endoscopic cystojejunostomy. (B, C) A 7F long introducer was placed distal to the lesion in the splenic artery (white arrow), and a balloon-expandable stent-graft was delivered through it (black arrowheads).

Another post-whipple lesion was a hepatic artery pseudoaneurysm with extravasation. We accessed this lesion by a 7F guiding sheath from right CFA and 0.035" hydrophilic guidewire. A 7 x 40 (Fluency Plus, BARD, USA). Stent-graft was placed and post-dilatation was performed by a 7 x 40 mm balloon dilatation catheter (Ultraverse, BARD, USA). Even though pseudoaneurysm and extravasation were no longer present, a newly developed dissection was seen proximal to the stent-graft. This lesion was crossed by 0.014" guidewire (Choice, Boston Scientific, USA) and 4,5 x 20 stent was placed. Follow-up DSA showed patency of the stented segment and no extravasation.

A patient presented with hemobilia after biliary stent placement with endoscopic retrograde cholangiopancreatography (ERCP). In angiogram, a hepatic artery pseudoaneurysm was seen next to the proximal end of the biliary stent. After a 6F long sheath was placed to hepatic artery, a 4,5 x 19 mm stent-graft (GRAFTMASTER, Abbott Vascular, USA) was placed to lesion site over a 0.014" microguidewire. After balloon dilation the pseudoaneurysm was not filling.

A hepatic artery pseudoaneurysm was developed in a patient after cholecystectomy. After angiographic imaging, a 5F long sheath was placed to common hepatic artery. Measurement for stent-grafting was done by 6 x 40 mm balloon catheter (Boston Scientific, USA). Then, 0.035" guidewire was exchanged with a 0.014" microguidewire. According to measurement, a 4 x 19 mm stent-graft (GRAFTMASTER, Abbott Vascular, USA) was placed. In order to ensure stability, additional balloon dilatation with a 5 x 20 mm balloon dilatation catheter was done.

An arteriovenous fistula between the right renal artery and the inferior vena cava occurred after a stab wound. Right renal artery was accessed by 0.035" guidewire and 6 x 40 balloon catheter was inflated in order to test if occlusion is curative. After that a 7 x 37 stent-graft was placed and post dilatation was done by 8 x 40 mm balloon dilatation catheter (Figure 6).

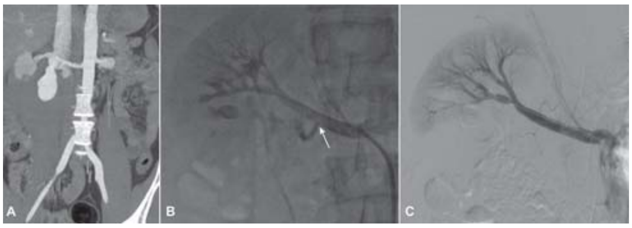

Figure 6. (A) CT angiogram shows a post-traumatic pseudoaneurysm and an arteriovenous fistula following a stab wound. (B) Flouroscopic image showing exact location of fistula (white arrow). (C) No active extravasation or early venous filling was seen on the final angiogram.

RESULTS

34 of 65 patients (52%) had a CT angiography before the procedure. All femoral pseudoaneurysms were diagnosed with. All femoral pseudoaneurysms were diagnosed by Doppler ultrasonography and evaluated with Doppler ultrasound prior to the procedure. The remaining patients were diagnosed angiographically, as vascular injury occurred during the endovascular intervention.

All patients were evaluated with DSA immediately after procedures. Technical success was defined as lesion exclusion with preserved vessel patency demonstrated on angiography. Immediate technical success was achieved in 59 of 65 lesions (91%). The remaining lesions were successfully treated with additional interventions (four with glue embolisation, one with vascular plug, one with concomitant stent-graft). Stent-grafts were evaluated with Doppler ultrasound one week after the procedure. All treated segments were patent in early follow-up.

Follow-up was available for 53 lesions (mean follow-up 13 months, range 4-19 months). In two patients, in-stent stenosis was detected during the follow-up period (six and eight months). Two patients who were treated for SMA pseudoaneurysms that developed after Whipple surgery died during the follow-up period, one due to sepsis and the other due to multiple organ failure. Additionally, two patients with central venous catheter-related injuries died from fungal sepsis. Eight patients were lost to follow-up.

During the follow-up period, in-stent restenosis was observed in 13 patients. Two cases of subclavian artery in-stent restenosis were treated with balloon angioplasty at one year of follow-up. Among the remaining treated non-occlusive in-stent restenoses, three were located in the common femoral artery and two in the superficial femoral artery. A complete occlusion within a stent-graft placed in the common iliac artery was managed with the implantation of an additional stent-graft (9×80 mm, Solaris (Scitech Medical, Brazil)). Two cases of stent-graft occlusion in the superficial femoral artery were successfully treated with balloon angioplasty. In-stent restenoses in two deep femoral arteries and one splenic artery were managed conservatively due to lack of clinical symptoms. The remaining stent-grafts remained patent throughout the follow-up period. The overall primary, primary-assisted, and secondary patency rates were 76%, 88%, and 94%, respectively.

DISCUSSION

Several studies have investigated the use of stent-grafts in the treatment of iatrogenic and traumatic arterial injuries (3-6). Endovascular therapy offers a minimally invasive treatment option for these lesions.

Various embolization techniques are available for endovascular management of vascular injuries. However, these methods are often unsuitable for pathologies such as dissection and AVF, and they carry risks including organ ischemia, infarction, and abscess formation (17, 18). Stent-grafts restore vascular integrity while preserving distal perfusion. Moreover, embolic agents may be inadequate in the management of large pseudoaneurysms or high-flow arteriovenous fistulas.

Data on primary patency rates in infra-aortic arterial pathologies other than steno-occlusive disease remain limited. Saxon et al. (19) reported a primary patency rate of 73% at one year in stent-grafts placed in the iliac artery and its distal segments, while Lammer et al. (20) found a rate of 70.9%. In our study, the primary patency rate of lower extremity stent-grafts was observed to be 76% (n = 33/43), which is consistent with the findings reported in the literature. The effectiveness of stent-graft use in injuries at these locations has been reported in the literature (21-23). Furthermore, in cases such as arterial perforation or even rupture during endovascular procedures like iliac stenting, endovascular treatment is the fastest option due to limited time (24).

Literature data regarding stent-grafts placed in upper extremity arteries such as the subclavian and axillary arteries are inconsistent (25-27). In our study, the primary patency rate for this localization was found to be 75% (n = 6/8).

For visceral artery lesions vascular repair is often achieved through a large tissue incision resulting in prolonged hospitalization with associated morbidity. The use of stent-grafts has several advantages over open surgery, including reduced blood and tissue loss, shorter hospital stay, and the avoidance of general anesthesia. Furthermore, in patients who are not suitable for surgery due to comorbidities, endovascular treatment is a life-saving alternative (28, 29).

On the other hand, stent-grafting has its own complications and disadvantages. Stent-grafts are preferred when maintaining vessel patency is essential. Stenosis or total occlusion of stent-grafts is a reported problem (30, 31). The lifelong need for antiplatelet therapy and the metallic burden of the device are also noteworthy concerns (32). In younger patients and non-emergent settings, surgical repair should remain a viable alternative.

The use of large diameter introducer sheaths for stent-graft procedures may increase risk of puncture site local complications such as pseudoaneurysm or hematoma formation (33). Also, several of the stent-grafts used in our study were low-profile devices, compatible with small-caliber sheaths. (34).

In the literature most studies describe endovascular treatment of a certain site like carotid artery (35, 36), subclavian and axillary artery (37, 38), brachial artery (39), iliac artery (21, 22, 40), femoral artery (23), popliteal artery (41), hepatic artery (42). Our study provides a comprehensive overview of the endovascular treatment of iatrogenic and traumatic arterial injuries across multiple vascular territories.

In conclusion, our study supports endovascular stent-grafting as a first-line treatment option for arteriovenous fistulas, pseudoaneurysms, active bleeding sites, and arterial wall dissections. It appears to be a reliable, safe, and minimally invasive alternative for managing these vascular lesions.

CONCLUSION

In conclusion, our study supports endovascular stent-grafting as a first-line treatment option for arteriovenous fistulas, pseudoaneurysms, active bleeding sites, and arterial wall dissections. It appears to be a reliable, safe, and minimally invasive alternative for managing these vascular lesions.

Conflict of Interest

The authors have no conflicts of interest to declare. All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report.

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