BRIEF REPORT

Endovascular Stent-Graft Repair for the Occlusion of the Infrarenal Aorta

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ABSTRACT

Background
Total occlusion of the abdominal aorta is an infrequent condition mostly affecting middle-aged women with a history of smoking and dyslipemia. Angioplasty of the iliac arteries was the starting point of endovascular treatment of the aorta, progressing from balloon angioplasty to stent-grafts insertion.

Objective
To report the immediate results and medium-term follow-up outcomes in patients with occlusion of the abdominal aorta treated with endovascular stent-graft repair.

Material and Methods
From October 1998 to May 2005, 5 female patients with total occlusion of the abdominal aorta with severe symptoms of claudication of both lower limbs were treated at our Department. The procedures were performed under local anesthesia and sedation. Whooley or hydrophilic Glidewire guide wires were inserted through the femoral artery. After abdominal angiography was performed, guide wires were removed and the balloon was introduced through an Amplatz guide wire; dilatations were done before the stent-graft was placed. Patients with iliac lesions were also treated with stent-grafts. The ankle-brachial index was 0.71.
Mean hospital stay was 2 days. Patients were discharged with clopidogrel and aspirin as antiplatelet therapy, except for the first patient who received ticlopidine and aspirin. Clinical assessment and color echo-Doppler were performed at week 1, and at 1, 6 and 12 months of follow-up.

Results
All patients were women, with a history of smoking and dyslipemia. All the procedures were technically successful, and the ankle-brachial index improved to 0.98. One patient presented an inguinal hematoma at the puncture site, with favorable outcomes. During late follow-up, ultrasound showed 100% aortic patency, and one patient presented a stenosis of a segment of the iliac artery that had not been covered by the stent.

Conclusions
In this group of patients with total occlusion of the abdominal aorta, balloon angioplasty with stent-graft placement has demonstrated to be a safe and effective procedure, resulting in technical success and patency at medium-term follow-up in all patients.

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Key words > Abdominal Aorta - Arterial Occlusive Diseases - Stent

BACKGROUND

Aortoiliac occlusive disease is a localized and infrequent condition mostly affecting middle-aged women with a history of smoking and dyslipemia. (1)

Aortoiliac bypass graft or aortobifemoral bypass graft have been considered the surgical procedures of choice for more than twenty years. (2)

Clinical manifestations include bilateral progressive intermittent claudication and atheroembolism of the lower limbs. (3)

Angioplasty of the iliac arteries was the starting point of endovascular treatment of the aorta, progressing from balloon angioplasty to stent-grafts insertion. (4)

Conventional balloon angioplasty followed by stent placement is a procedure with acceptable angiographic

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and clinical outcomes; nevertheless, failures of the procedure are due to elastic recoil, intimal dissection with luminal obstruction or restenosis at long-term follow-up. (5)

The aim of this study was to report the immediate results and medium-term follow-up outcomes in patients with occlusion of the abdominal aorta treated with endovascular stent-graft repair.

MATERIAL AND METHODS

From October 1998 to May 2005, 5 female patients were referred to our Department for elective endovascular repair for the occlusions of the abdominal aorta. The basal characteristics of the patients are shown in Table 1.

All the patients complained of severe intermittent claudication; microemboli or distal ulcers were not present.

Technical Procedure

The procedures were performed under local anesthesia and sedation/analgesia with midazolam and fentanyl. The diameter of the abdominal aorta was assessed in all patients by contrast abdominal computed tomography scan and ultrasound.

A 7 Fr introducer sheath is placed into the less compromised femoral artery and a 0.035-inch Whooley guide wire (MallinKrodt Inc, Hazelwood, Mo) is inserted; in case this guide wire cannot pass the occlusion, a hydrophilic Glidewire ® (Meditech/Boston Scientific Corporation; Natick, Mass) guide wire is used.

Once the guide wire is placed proximal to the obstruction, a 6-Fr pigtail catheter is advanced to the abdominal aorta in order to perform and aortography with a Medrad® injection pump.

After the angiogram is finished, the guide wires are removed and the balloon is introduced through a 2.60 m-long 0.035-inch Amplatz guide wire; dilatations are performed until a satisfying angiographic image is achieved. The introducer sheath is exchanged for a 9 Fr sheath to advance the stent graft according to the diameter of the aorta.

Table 2 shows the different stent-grafts used.

Once the stent-graft has been placed, additional balloon dilations are done until a correct positioning of the stent-graft in the aorta is obtained and with a small aortic gradient.

Pre-treatment mean ankle-brachial index was 0.71. Patients were discharged with clopidogrel and aspirin as antiplatelet therapy, except for the first patient who received ticlopidine and aspirin. Mean hospital stay was 2 days (range, 1 to 3 days). No deaths occurred during hospitalization or follow-up, and all patients experienced a significant clinical improvement. Stent-graft was introduced through a 10 Fr sheath in the first case and via 9-Fr introducer sheaths in the rest of the cases. Patients were evaluated one week after the procedure, and subsequent clinical assessment and color echo-Doppler were performed at 1, 6 and 12 months of follow-up.

Clinical assessment included a questionnaire to ascertain symptoms of intermittent claudication and examination of peripheral arterial pulses and blood pressure measurement to obtain the ankle-brachial index (ABI). During follow-up, the procedure was considered successful if patients were free of symptoms or if the improvement of symptoms achieved with the procedure persisted.

RESULTS

Basal characteristics of patients are shown in Table 1. Mean age was 56 ± 9.8 years, and pre-treatment mean ankle-brachial index was 0.71. Stent-graft was successfully placed in all patients; residual stenosis assessed by angiography was not greater than 30% and gradients were below 10 mmHg.

All 5 patients underwent clinical follow-up. The aorta showed a 100% patency at late follow-up. One patient presented progression of the atherosclerotic lesion with a stenosis of a segment of the iliac artery that was repaired with placement of a stent-graft. During follow-up (6-12 months, mean, 30 ± 25.3 months), the ankle-brachial index improved to 0.98.

Table 1. Patients' basal characteristics and at follow-up

Patient	Age	Sex	CVRF	Follow-up	Symptoms
1	49	F	CS	62 months	Asymptomatic
2	69	F	CS-DLP	51 months	Iliac artery stenosis
3	64	F	CS-DLP	23 months	Asymptomatic
4	51	F	CS-DLP	8 months	Asymptomatic
5	47	F	CS-DLP	6 months	Asymptomatic

F: Female. FRCV: Cardiovascular risk factors. TBQ: Current smoking. DLP: Dyslipemia.

Table 2. Characteristics of the procedure

Patient	Type of *stent* -graft	Number	Diameter	Ilíaco artery *stent*
1	Palmaz	1	10	
2	Wallstent	1	14	1
3	Wallstent	1	12	
4	Wallstent	1	12	
5	Wallstent /Invastent	2	14/10	1

DISCUSSION

Leriche syndrome (the classical triad of symptoms consisting of buttock claudication, absent femoral pulses and erectile dysfunction) is the clinical manifestation of focal stenosis or occlusion of the infrarenal abdominal aorta. (6)

Since the beginning of the sixties, patients were referred to surgery once the diagnosis of occlusive disease of the aorta was made. (7)

Aortobifemoral bypass graft is considered the gold standard treatment of this condition (8), with favorable outcomes during hospitalization and at long-term follow-up, with graft patency at 30 years. (9)

Nevertheless, angioplasty of the iliac arteries was the starting point of endovascular treatment of the aorta, especially in patients with high-risk at surgery. (10-12)

Balloon angioplasty was followed by placement of Palmaz stents in the iliac arteries. (13) Dietrich et al (14) described a series of 24 patients with stent-graft placement in the abdominal aorta; technical success was 100% and no deaths were related with the procedure. Therasse et al. (15) compared 53 patients successfully treated with balloon angioplasty with 24 patients who had a Palmaz stent implanted due to failure of balloon angioplasty or to high probability of microemboli due to plaque ulcerations. During a 3-year follow-up, clinical patency was 85% in the balloon group and 69% in the stent-graft group. The authors considered that this difference in patency was related to the presence of more complex lesions in the group of patients treated with placement of stent-grafts. Multivariate analysis showed that the variables associated with high risk of restenosis were current smoking habits ($p = 0.04$) and a smaller aortic diameter ($p = 0,001$). When univariate analysis was performed, the placement of a stent-graft in an abdominal aorta with a small diameter (10.3 versus 12.7 mm) seemed to be a predictive factor. Nevertheless, both procedures had similar outcomes in aortas with comparable diameters. The STAR registry compared conventional angioplasty with Palmaz stent placement. Patients were followed-up during 9 months, but the population was too small to establish any difference. (16)

The development of the technique and the materials used might have influenced the outcomes. Feugier et al, (17) reported long-term outcomes at 31 months of 86 patients with aortoiliac disease irrespective of severe obstructions or total occlusions. Stents were implanted in 88% of cases. Patency was 94% at one year, 89% at 3 years and 77% at 5 years. Another series of 15 patients (18) reported the outcomes of stent-graft repair with angiographic follow-up in all patients; patency at 36 months was 85%.

CONCLUSION

In this series of patients with total occlusion of the abdominal aorta, balloon angioplasty with stent-graft placement has demonstrated to be a safe and effective procedure, resulting in technical success and patency in all patients during follow-up.

Fig. 1. Conventional angiography Occlusion of the infrarenal abdominal aorta. Severe obstruction in a segment of the left common iliac artery. Right femoral access to perform angiography.

Fig. 2. Digital subtraction angiography. Final result after the implant of Wallstent and Invastent stent-grafts in the aorta. An 8-mm Wallstent stent-graft is implanted through the left femoral artery.

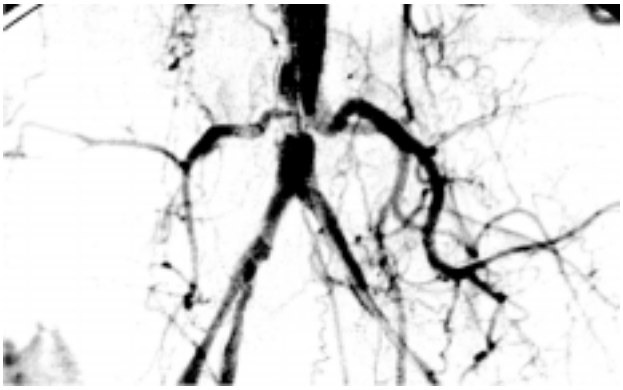

Fig. 3. Conventional angiography Occlusion of the abdominal aorta. Image obtained after advancing the occlusion with a hydrophilic guide wire; exchange to an Amplatz guide wire; a pigtail catheter is advanced to the abdominal aorta in order to perform an aortography, which shows occlusion of a short segment with a great development of the lumbar arteries.

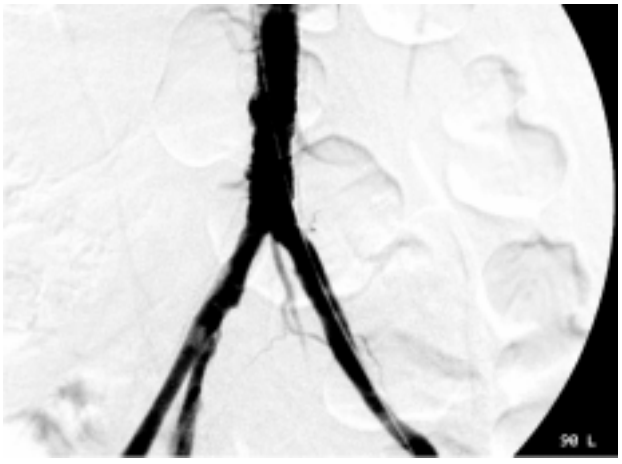

Fig. 4. Digital subtraction angiography. Final result after the implant of a self-expanding stent-graft.

RESUMEN

Introducción
La oclusión total de la aorta abdominal es de presentación poco frecuente y afecta más a menudo a mujeres de edad mediana con antecedentes de tabaquismo y dislipidemia. El punto de partida de la terapéutica endovascular en la aorta fue la angioplastia en las arterias ilíacas y fue progresando desde el balón hasta la colocación de *stents*.

Objetivo
Comunicar nuestros resultados inmediatos y el seguimiento a mediano plazo de pacientes con oclusión de la aorta abdominal tratadas con *stents* por vía endovascular.

Material y métodos
Desde octubre de 1998 a mayo de 2005 en nuestro servicio se trataron 5 pacientes de sexo femenino por oclusión total de la aorta abdominal, con síntomas de claudicación grave de ambos miembros inferiores. Los procedimientos se realizaron con anestesia local y sedación. Por vía femoral, se intenta recanalizar con las cuerdas de Whooley o hidrófila Glidewire. Posteriormente se realiza un angiograma abdominal e intercambio por cuerda Amplatz con la cual se avanza el balón para realizar las dilataciones antes de implantar el *stent*. Las pacientes con lesiones ilíacas también se trataron con *stent*. El índice tobillo-brazo era de 0,71.
El promedio de hospitalización fue de 2 días. Al alta se indicaron clopidogrel y aspirina como medicación antiplaquetaria, excepto la primera paciente (ticlopidina y aspirina). El seguimiento fue clínico y por ecografía Doppler color a la semana, al mes, a los 6 meses y a los 12 meses.

Resultados
Las pacientes eran de sexo femenino, con antecedentes de tabaquismo y dislipidemia. Todos los procedimientos fueron técnicamente exitosos, con mejoría del índice tobillo-brazo a 0,98. Una paciente presentó un hematoma inguinal en el sitio de punción, con buena evolución posterior. En el seguimiento alejado clínico y por ultrasonido se observó una permeabilidad de la aorta del 100%, con estenosis en una paciente tratada a nivel de la arteria ilíaca en el segmento no cubierto por el *stent*.

Conclusiones
En este grupo de pacientes con oclusión total de la aorta abdominal, la angioplastia con balón e implantación de *stent* ha demostrado que es una técnica segura y efectiva, con éxito técnico y permeabilidad en el seguimiento a mediano plazo en todas las pacientes.

Palabras clave > Aorta abdominal - Arteriopatías oclusivas - *Stent*

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