

INFECTED ABDOMINAL AORTIC GRAFTS

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Aortic grafts were inserted in 1711 patients at Ottawa Civic Hospital (OCH) between 1976 and 1986. Aorto-iliac occlusive disease was the indication in 884 while in 827, the graft was inserted for abdominal aortic aneurysms. Graft infection occurred in 12 patients; six presenting with gastrointestinal bleeding due to aorto-enteric fistula (AEF) and the other six presenting with groin abscesses, mostly as a draining sinus. These were treated with graft excision and immediate extra-anatomic bypass. Seven patients died, giving a mortality rate of 58%. Three surviving patients required above-knee amputation. These results are comparable to the results of others in the literature; therefore, continuing assessment of all aspects of graft infection and the search for more effective methods of prevention and management are needed. *Ann Saudi Med 1994;14(4):304-306.*

The profound consequences of prosthetic graft infection are of major concern in vascular surgery. The incidence of graft infection is reported to be 0.2% to 2% for aortic grafts and up to 6% for femoro-popliteal graft.^{1,2} The mortality rate of aortic graft infection was reported in early reports to be up to 75%.³ The mortality rate is still reported in recent papers as ranging between 40% and 60%.⁴⁻⁶ Infected aortic grafts cause a high morbidity that includes limb loss of between 20% and 37%.⁶⁻¹¹ Recently, some reports have advocated in situ insertion after removal of the infected grafts,¹² while others stage the procedure by performing the extra-anatomic bypass first.^{9,10,13,14} We reviewed our experience in Ottawa Civic Hospital (OCH) to assess our infection, mortality and morbidity rates.

Material and Methods

This study is a review of 10 years' experience in Ottawa Civic Hospital between the years 1976 and 1986. Aortic grafts were inserted in 1711 patients. The indications are shown in Table 1. All patients received antibiotics one hour preoperatively, consisting of first generation cephalosporin. The antibiotics were continued until all the hemomonitoring lines and Foley catheters were removed. Preparation of the operation site was performed using a razor blade on the operating table. Plastic drapes were routinely used. Great care was taken in mobilizing the duodenum. The mural thrombus and debris were removed,

leaving the posterior wall intact, and the retroperitoneum was closed carefully. Wound lavage with bacitracin was performed in all these cases.

Results

Graft infection occurred in 12 patients, seven of whom died, giving a mortality rate of 58%. Graft sepsis presented with gastrointestinal bleeding due to aortoenteric fistula (AEF) in six patients. The bleeding was mild to moderate and intermittent in all patients. Melena occurred in all of these patients and was accompanied by hematemesis in only one patient. The other six patients presented with groin abscesses, usually as a draining sinus. One of the patients was explored for a groin mass, at which time the graft was found floating in pus.

Graft infection occurred in the first postoperative year in three patients. One patient presented with symptomatic abdominal aortic aneurysm and on dissecting his duodenum, he was found to have a small inadvertent enterotomy, which was repaired in two layers, and omentum was interposed between it and the graft. The retroperitoneum was then closed over the graft. This patient presented within three weeks with aortoduodenal fistula with general signs of sepsis and died due to sepsis after resection of his graft and construction of an extra-anatomical bypass. Four patients presented in the second and third years postoperatively, while three patients

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TABLE 1. Indications for inserting aortic grafts.

Indications	Patients	
	No.	%
Abdominal aortic aneurysms	827	48.3
Aorto-iliac occlusive disease	884	51.6
Total	1711	100

TABLE 2. Duration of period between aortic graft and infection.

Duration (years)	Patients	
	No.	%
1	3	25
2-3	4	33
4-6	3	25
7-8	2	17
Total	12	100

TABLE 3. Extent of involvement of prosthesis and outcome.

Site of Graft Placement	Extent of Involvement	No. of Patients	No. of Deaths
Aortic-iliac	Shaft	4	3
	One limb	0	0
Aorto-femoral	Shaft	5	3
	One limb	3	1
Total		12	7

presented between the fourth and sixth years. Only two patients acquired graft infection after the seventh year postoperatively (Table 2).

Two-thirds of the infected grafts were aorto-femoral in location and the other one-third were aorto-iliac. The extent of graft involvement is shown in Table 3. Organisms were cultured from the grafts in 11 patients, one or more species of gram-positive organisms having been cultured from four patients. Mixed gram-positive and gram-negative organisms were found in four patients and gram-negative organisms were cultured in three patients. No bacterium was cultured in one patient.

White blood cells were mildly elevated in seven patients and normal in five. Fever was present in seven patients and was within normal limits in the others.

Endoscopy to diagnose the cause of the gastrointestinal bleeding was performed in all of the six patients. No cause of the bleeding was found in four of these patients. Diagnosis of gastric erosions was established in one patient. In only one patient was the diagnosis determined after the endoscopist was alerted to the possibility. Computed tomography (CT) scan was done in two patients and showed the abscess around the graft in both patients. Arteriography was done in three patients and was not helpful in any of them.

Management and Outcome

Conservative management including intravenous antibiotics failed to eradicate graft infection in any patients. Resection of the graft was performed. Closure of the aortic stump was established with monofilament nonabsorbable material and this was reinforced with an omental patch in all patients. The duodenum was closed in two layers in the six cases of AEF and omentum was interposed between the

duodenum and the aortic stump. The abdomen was then closed. After redraping the patient and changing the instruments, an extra-anatomical bypass between the axillary artery and the femoral artery was done. If the area of the femoral artery was contaminated, the popliteal artery was used.

Seven patients died during the same hospitalization; five of these patients died due to sepsis. Two patients died of bleeding from the aortic stump. Two surviving patients required bilateral above-knee amputation. Another patient required above-knee amputation of his right leg. The extra-anatomical graft became infected in four patients including those who required amputation. Only one patient was still walking on both legs with no sign of infection after four years of follow-up.

Discussion

Infection of the graft occurred in five patients of the abdominal aortic aneurysm group and in seven patients of the aorto-iliac occlusive disease group. These numbers are too small to permit statistical analysis. The overall infection rate is 0.7%, which is an improvement over the same institution's previous experience of 2.7%.¹

Staphylococcus aureus, *Staphylococcus epidermidis*, *E. coli*, and *Klebsiella* were the most common organisms cultured. This compared with a previous report from the same institution, although *Staphylococcus epidermidis* was not cultured from the graft in the previous report.¹ The predominance of gram-positive organisms in our study is in agreement with others¹⁵ and this raises the possibility of skin-originating contamination. Therefore, the use of an antibiotic that would cover both gram-positive and gram-negative organisms is advisable prior to culture results.

Preoperative diagnostic studies including arteriography have a low yield in the majority of patients with aortic graft infection. CT scan confirmation of a paraprostatic enteric fistula has been found to be useful by others,¹⁶ as we found in two of our patients. We did not use scintigraphic detection of abscess with indium-111-labeled leucocytes as reported by some.¹⁷

Despite aggressive surgical treatment with graft resection and extra-anatomical bypass, seven patients died, giving a mortality rate of 58%. This is within the range of mortality rate reported in the literature.³⁻⁶ We did not attempt the use of povidone-iodine irrigation to control the infection as advocated by some in the literature.¹² Our amputation rate was also comparable to that reported in the literature.⁶⁻¹¹

Walker et al.¹⁸ have recommended *in situ* grafting for secondary aorto-enteric fistula. They had 22% hospital mortality rate and 16 out of the 18 surviving patients were alive after five years of follow-up, but it is worth noting that when the graft was inserted in the presence of

paraprosthetic graft infection, 60% of patients died. Their experience and those of others¹⁹ suggest that this procedure may be safe in selected cases.

The performance of the extra-anatomical bypass graft prior to graft removal is preferred by some.^{9,10,13,14} This has the advantage of giving the surgeon more time to perform the abdominal procedure without worrying about the ischemic time of the lower limbs. This sequence has the theoretical disadvantage of increasing the incidence of the extra-anatomical graft infection, but this is not supported by studies in the literature.^{9,10}

In conclusion, we feel that prevention is the most important measure to deal with this lethal complication. Once the diagnosis of an infected graft is made, early graft excision and prompt revascularization are required. *In situ* graft insertion has a satisfactory result in secondary aorto-enteric fistulae in the absence of paraprosthetic abscesses. We did not use local debridement and irrigation and we believe that their use should await more convincing evidence.

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