

NON-THROMBOTIC COMPLICATIONS OF PTFE GRAFTS FOR HAEMODIALYSIS

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Summary

In a consecutive series of 76 PTFE grafts (37 Impra and 39 Gore-Tex), 30 non-thrombotic complications were observed. Twenty-one (70%) of these grafts could be salvaged either by conservative means (2) or by an aggressive surgical approach (19). The median survival time of the salvaged grafts was 12 months. Only nine grafts (30%) were lost as a result of the complications. Lesions caused by puncture techniques seemed more frequent in Impra grafts than in Gore-Tex grafts. Apart from this observation it is concluded that an aggressive surgical approach to non-thrombotic complications in PTFE grafts is worthwhile.

Introduction

Thrombosis is the most frequent complication in dialysis grafts. Relatively little attention is paid to the incidence of non-thrombotic complications and experience in the treatment of such complications has been seldom reported. This paper reviews our experience of non-thrombotic complications in a series of 76 Polytetrafluoroethylene (PTFE) grafts with special regard to treatment.

Material and methods

In a five year period from January 1977 to January 1982, 76 PTFE grafts were implanted for haemodialysis purposes. In the first three years Impra grafts were used and from January 1980 only Gore-Tex grafts (39). All 37 Impra grafts were placed in the lower arm, 19 were straight grafts between the radial artery distally and a cubital vein and 18 were loop grafts between the brachial artery and a cubital vein. Of the 39 Gore-Tex grafts 35 were placed in the lower arm, 14 were straight and 21 had a loop configuration. Two straight grafts were placed in the upper arm between the brachial artery at elbow level and the basilic vein near the axilla. Two looped grafts were placed in the thigh between the superficial femoral artery and the femoral vein. All arterial anastomoses were end graft to side artery and all venous anastomoses were end-to-end.

Results

In the 76 PTFE grafts non-thrombotic complications were observed in 30 grafts (39%) (Table I).

TABLE I. Complications in 76 PTFE grafts in relation to graft type and graft configuration

		Impra graft		Gore-Tex graft	
		loop	straight	loop	straight
Bleeding	N = 6*	3	3	0	0
Pseudo-aneurysm	N = 10	1	5	3	1
Infection	N = 7	2	1	3	1
Haemodynamic changes	N = 4	1	0	2	1
Skin erosions	N = 3	2	1	0	0
Total	N = 30	9	10	8	3

* Number of grafts concerned

Bleeding

Bleeding requiring surgical intervention was observed in six (Impra) grafts. Bleeding seemed due to puncture lesions, mostly multiple puncture holes close to one another in the graft wall. In two cases longitudinal tears in the graft wall were present. Only two grafts could be salvaged by suturing the puncture defect in the wall. The other four were lost due to massive bleeding requiring ligation of the graft.

Pseudo-aneurysm

One or multiple pseudo-aneurysms were observed in 10 (six Impra, four Gore-Tex) grafts. Pseudo-aneurysm formation is due to defects in the wall of the grafts caused by punctures. Surgical intervention was undertaken because of imminent rupture or infection.

Two grafts were replaced by a new graft because multiple aneurysms were present along the length of the graft. In the remaining eight grafts the affected part of the graft was bypassed by a new graft segment in a parallel subcutaneous tunnel. By doing this the original graft segment with the pseudo-aneurysm(s) is isolated and can be excised. When infection was present the wound was left open for secondary healing.

Infection

Infection was seen in seven grafts. Infection was mostly related to secondary operations or failure to observe the rules of asepsis. Three grafts were lost due to

massive bleeding from infected arterial anastomoses. In all three cases ligation of the brachial artery at elbow level was required to control the bleeding and all three grafts were removed. In the remaining four grafts infection could be managed by opening the skin over the affected graft segment even in the area of one or both of the anastomoses. Wound debridement is an essential part of the treatment. The wound is left open and cleaned frequently. Secondary healing was waited upon. In three cases a skin defect over the graft occurred near the original infected site. In two cases this was closed by means of a bipedical flap and in one case by a bypass graft of the uncovered graft. This latter graft segment was resected after the completion of the bypass.

Haemodynamic changes

Haemodynamic changes occurred due to four grafts. In two cases oedema of the limb was observed, in one a loop graft in the lower arm and in the other a loop graft in the thigh. Both cases were treated conservatively by elastic stockings. In two patients with two grafts, one straight graft in the upper arm and one loop graft in the thigh, ischaemia of the limb distal to the arterial anastomosis was observed. The arterial anastomosis was 'banded' and the ischaemia resolved. Banding was done under plethysmographic control so that after narrowing the arterial anastomosis the peripheral flow as measured by plethysmography was doubled. None of these grafts were lost.

Skin erosions

This type of complication occurred in three grafts. The erosions were all caused by a too superficial subcutaneous positioning of the grafts. All erosions were small defects. Although these defects are without consequence, they were treated surgically because patients are often disturbed by them. All defects were closed by means of a bipedical flap. The non-viable edges of the erosion were excised. A relaxation incision was made and the skin between this relaxation incision and the erosion was undermined and this latter defect was closed. The defect caused by the relaxation incision is left open for secondary healing. In all three cases this surgical intervention was successful.

Overall results

Two types of complications, bleeding and pseudo-aneurysms are due to improper puncture techniques. In our series this type of complication is more frequent (12/37 grafts) in Impra grafts than in Gore-Tex grafts (4/39).

Thirty complications occurred in 30 grafts. Nine of these grafts had to be excised. Thus only nine (12%) of the original 76 grafts were lost. The other 21 grafts with complications could be saved either by surgery (19) or by conservative means (2). The median survival time of these saved grafts was 12 months.

Discussion

The most frequent complication in access surgery is thrombosis. In the literature this complication, its causes and treatment are discussed extensively. Of the non-thrombotic complications often only the incidence is reported [1–3], the cause and treatment seldom discussed.

Although our experience is limited several observations can be made. As is shown in Table I no relationship could be found between the incidence of complications and graft configuration. In our series the incidence of bleeding and pseudo-aneurysm formation is higher in Impra grafts than Gore-Tex grafts. These observations have been confirmed by other authors [4–6]. A possible explanation may be that the Gore-Tex graft is reinforced by an extra circular teflon layer around the graft proper. Our impression, however, is that most of these complications are caused by faulty puncture techniques. All too often the grafts are repeatedly punctured at the same site or the puncture is performed roughly or with poor aseptic technique. Proper puncture techniques with frequent changing of the puncture site should prevent these complications [7].

Infection in or around PTFE grafts does not exclude reconstruction and salvage. The capacity of the PTFE graft to resist infection is well known [1,5,7].

Surgically related infections are often more extensive and therefore more dangerous. As shown in our experience these grafts often have to be removed. However when the infected site is opened and wound debridement is performed the infection can frequently be controlled. In some cases these wounds heal secondarily and in other cases reconstructive surgery with bypass of the affected segment is needed, implicating repeated operations. Banding of the arterial anastomosis of haemodialysis grafts for ischaemia of the limb or a steal syndrome was first mentioned by Van der Werf in 1977 [8]. The required degree of narrowing however, is very difficult to determine. To solve this problem we performed the narrowing under plethysmographic control. It was arbitrarily decided that the amplitude of the plethysmographic registration on either the finger or toe had to be doubled after the narrowing sutures were placed. Empirically this worked quite well.

As shown from our experience surgical treatment of the non-thrombotic complications is worthwhile. Not only were 21 of 30 grafts with complications salvaged, but the median survival time of these grafts appeared to be 12 months.

References

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