Interventional strategies for haemodialysis fistulae and grafts: interventional radiology or surgery?

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Past

In 1966, Brescia, Cimino and colleagues described the surgical creation of an arteriovenous fistula. Access surgery developed remarkably over the next decade introducing various types and sites of anastomoses and learning how to manage several complications. Graft materials were introduced during the 1970s including ePTFE (expanded polytetrafluoroethylene). During the following 25 years, access surgery failed to achieve really new technical developments. An increasing use of mainly ePTFE grafts (arteriovenous graft(s)) was observed with a well-known high complication rate although the Brescia–Cimino fistula is considered ‘the best available form of vascular access’. Modifications and minor innovative procedures only came up in the field of management of complications. The main complications of arteriovenous fistula(e) and arteriovenous graft(s) are identical: stenosis, thrombosis, (pseudo-)aneurysm, and infection (mainly in grafts). Special problems arise in cases with high flow rates and peripheral ischaemia/steal syndrome. A great variety of surgical techniques have been described and are successfully practised.

In the early 1980s, percutaneous balloon angioplasty was introduced by interventional radiologists for the treatment of stenoses followed by a series of other non-invasive approaches including thrombolysis, mechanical/pharmacomechanical thrombectomy, endo-vascular stents, and atherectomy techniques.

A remarkable geographical difference developed during this time: Europe continued to prefer native arteriovenous fistulae with a high complication rate of 20–30%, whereas in the United States in 70–80% of patients graft material is used. Available data show that native arteriovenous fistulae are less likely to result in complications. The high complication rates of arteriovenous grafts encouraged many radiologists to adopt these new approaches.

Present situation

Surgery

Arteriovenous fistulae. A great variety of surgical techniques and tricks are available to manage arteriovenous fistula(e) complications like stenosis, thrombosis, and aneurysms dependant on the experience and skill and on the patience and imagination of the surgeon involved. In the forearm and in the lower upper arm, this is easily performed and mostly done under local anaesthesia. Selective correction of stenosis will prevent thrombosis. Once established, thrombectomy will be followed by correction of the underlying anatomical lesion. Peripheral, post-anastomotic stenoses may be replaced by a short graft segment, or preferably a new anastomosis just a few centimetres proximally. The result is a remodelling of the inner surface and the lumen of the vein, providing long-term function of the arteriovenous fistula. The great variety of local conditions, common in arteriovenous fistulae, makes it difficult to compare published results. Revisions in the high upper arm and along the central veins are difficult to achieve, often requiring major surgery in these highly comorbid patients. Here, interventional procedures are the better option.

Arteriovenous grafts. Although elective revision would be welcomed in cases of elevated venous pressure, thrombosis is the leading complication, mainly due to intimal hyperplasia at the graft–vein anastomosis. Thrombectomy is followed by a patch plasty (not recommended), a bypass-like jump graft, or replacement of the stenotic segment by new graft material. The better the remodelling of the lumen, the longer will be the next complication-free interval.

Interventional radiology

Arteriovenous fistulae. Indications for correction of stenosis by percutaneous balloon angioplasty have changed with increasing experience. Excellent primary results suffer from a high recurrence rate. Therefore, easily accessible lesions should be treated surgically. In more centrally located stenoses, interventional procedures are the preferred option. To overcome elastic
recoil or for treatment of repeated stenoses endovascular stents were introduced. Re-stenosis within a stent will be treated by balloon angioplasty. So functional vascular access can be prolonged in many patients with comorbidity, avoiding the risks of major surgery and atrial catheters.

The interventional approach of a thrombosed arteriovenous fistula requires great experience and skill. The particular challenge of adequate procedures was described recently [1]. Declotting is the first step, followed by correction of the anatomical lesion, most often a stenosis. Several techniques have been described: thrombolysis, mechanical thrombectomy, and (pulse-spray) pharmacomechanical thrombolysis using various devices. Excellent results were obtained by a few dedicated and highly experienced groups.

**Arteriovenous grafts.** Because of the predominant use of arteriovenous grafts in the US, numerous reports and techniques have been published on the dilatation of stenoses, mainly at the graft–vein anastomosis site, and the treatment of clotted grafts. Interventional radiologists have established these procedures. Recently interventional nephrologists have become more and more active in this field.

There is no doubt that interventional procedures in arteriovenous graft complications have a high initial technical success but with an increased risk of restenosis and thrombosis. In face of rising costs and its socioeconomic implications the DOQI guidelines for vascular access recommend arteriovenous fistula(e).

**Comment**

Analysing the reports published in this field over the years may cause confusion. Both surgery and interventional radiology claim to provide the better, if not the best results. Is there a solution?

The opinion of a nephrologist experienced in surgery and interventional procedures is that both are right. Admirable results are presented by a few dedicated, innovative radiologists as well as by some more experienced surgeons. The main problem is to submit groups of patients to an adequate, objective comparison. This can be achieved in the relative uniform setting of arteriovenous grafts, but seems almost impossible in the greatly variable conditions of arteriovenous fistulae. Furthermore, it is not an easy task to compare the level of experience, education, and dedication of surgeons and interventional radiologists involved. In addition, a clear, commonly accepted definition of statistical methods for comparison of results is lacking. So, polemics and some degree of aggression have been repeatedly observed. Nothing worse than that!

**Future**

Co-operation is needed. There is no place for pseudo-competition. Surgery and interventional radiology should do their best. An attitude of sovereignty based on comprehensive experience should concede that both surgery and interventional procedures can have advantages for the special problem of the individual patient. The goal is the best management for each patient. To provide a high level of quality, local or regional centres should be established regardless of their discipline. The optimal solution would be a close co-operation of dedicated surgeons and interventionalists, avoiding any competition. Multidisciplinary centres with accumulated experience are needed. An essential contribution to lower the rate of complications and costs would be a shift from arteriovenous grafts to arteriovenous fistulae.

**References**


**Editor’s note**

Please see also Original Article by Turmel-Rodrigues *et al.*, pp. 2029–2036.