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Vascular Graft Failure of Leg Arterial bypasses - a Review

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A major problem facing the vascular surgeon is graft failure. Patients are often more symptomatic after graft failure than they were before the bypass procedure [1]. Vein graft failure can be divided into three phases, depending on the timing of failure: early (<30 days), intermediate (30 days–2 years) and late (>2 years) [1, 2]. Acute graft failures (within 48 hrs.) are usually secondary to technical errors such as poor anastomosis, poor inflow or outflow or a retained unlysed valve cusps [1, 2]. Graft failure occurring between 2 days and 12 weeks after surgery is usually secondary to increased graft thromboreactivity [1, 3, 4]. All grafts or reconstructions involve thromboreactivity but it varies in intensity and duration and is governed by both host factors (coagulability and blood flow), and by graft factors (surface thrombogenicity and compliance) [3]. The thrombotic threshold velocity is required to maintain graft patency and thrombosis and closure of the graft occur for velocities below a given level for any graft material [3]. The cause of intermediate vein graft failure is intimal hyperplasia [1, 5]. Anastomotic intimal hyperplasia is commonly greater at the downstream or at the outflow anastomosis [6]. Late vein graft failure is generally caused by dyslipidemia and the progression of atherosclerosis, compromising either inflow or outflow

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vessels [1, 5].

Structural failures are rare in modern day fabric prostheses [7]. Dilatation of the graft results in bleeding though intercises of graft, breakdown of fiber resulting in holes and tears, mural thrombus deposition which finally leads to graft occlusion, and can form anastomotic aneurysms [3, 8]. Knitted fabrics have much more stretch because of their looped structure even though woven grafts with interlocking yarns have little or no inherent stretch [9]. Dilation is caused by the loops straightening in the line of greatest stress [3]. Patients with these grafts require life time follow-up [3]. Advanced degeneration requires replacement of the graft [3, 10].

A partial or complete separation of the prosthetic graft from the host artery can lead to an anastomotic false aneurysm [11]. False aneurysms are most commonly found at the common femoral artery [3, 11]. Atherosclerotic degenerative changes in the host artery wall are the cause of the tear [3, 12]. Other factors leading to the formation of false aneurysm are compliance mismatch between the host artery and the graft, incorrect suturing technique, infection and tension on the suture line [3]. Rupture, thrombosis, and embolism are some of the complications of false aneurysm [3, 12]. An anastomotic false aneurysm should be surgically repaired when diagnosed. In the elderly or high risk patients, small false aneurysms (2 cm) can be left untreated but require close monitoring and any sign of expansion mandates repair [3, 13].

One of the most serious complications of arterial reconstruction is graft infection [3, 14]. It is a failure of the bypass procedure, even though infection does not necessarily lead to graft thrombosis [3, 15]. To control the problem, the entire infected graft must usually be removed followed by revascularization by an extra-anatomical route [3, 14].

When replacing or bypassing an arterial segment with a vascular graft, the graft does not always behave like a normal artery [3]. In order to provide the most durable conduit, a number of properties of the graft must be controlled such as the diameter and the length in order to provide adequate flow to the distal arterial tree [3, 16]. The distensibility or compliance of the vessel plays an important role in the impedance to pulsatile flow [3, 18]. Compliant grafts are more likely to remain patent than stiff, non-compliant grafts [3, 17]. The inferior performance and decreased patency of small and medium sized grafts is due to mismatch in viscoelastic properties [3, 18].

A significant proportion of patients will appear well compensated after graft thrombosis [3]. Also, patients whose general health status has declined to the point where active ambulation is no longer realistic may benefit most from simple observation [3]. At the time of presentation, the majority of patients who were originally operated for severe ischemia will suffer from recurrent ischemia or claudication [3, 19]. For limb preservation and maintenance of independent function, these patients require revascularization [3, 20]. An

entirely new secondary bypass graft is needed for the majority of patients with failed bypass grafts and recurrent ischemia [3, 21]. In patients with graft failure, endovascular therapy resulted in reasonable patency and limb salvage with less complications and durable results at least for the first 15 months of their secondary procedures [22]. The first choice for revascularization whenever an intervention is needed after femoropopliteal graft failure should be endovascular therapy [22].

The rate of amputation after bypass surgery is influenced by the indication for operation, with a worse outcome for critical limb ischemia (CLI) than for intermittent claudication (IC) [23]. The ischemic consequences of femoropopliteal bypass graft occlusion are more severe with polytetrafluoroethylene (PTFE) than with saphenous vein resulting in a higher amputation rate [23, 24]. No effect was seen of oral anticoagulants and aspirin in terms of the amputation rate after bypass failure [23, 25]. Failed polytetrafluoroethylene (PTFE) grafts show a significant deterioration in pressure indices when compared with their preoperative values [26].

Fate of limb after failed femoropopliteal reconstruction has been studied [27]. The level of amputation or the need for amputation is not related to the age of the patient and there was a wide range from the time of thrombosis to amputation [27]. The amputations are rare if the reason for doing bypass is claudication [27, 28]. The need for amputation in thrombosed grafts is determined by their inflow and run off status, level of distal anastomosis and gangrene before the procedure [27]. Amputation is usually delayed or prevented due to vigorous attempts at revision of failed grafts [27].

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