

SIGNIFICANCE OF VENOUS GRAFT DIAMETER AND LENGTH FOR PERIPHERAL BY-PASS PATENCY

Mihail V. Cheshmedzhiev, Emil D. Jordanov, Miroslav D. Yordanov.

Department of Vascular Surgery, St. Marina University Hospital, Varna, Bulgaria.

ABSTRACT:

Objective: To analyze the one-year-patency of infrainguinal arterial reconstructions in relation to venous graft diameter and length .

Material and Methods: 56 patent and failed infrainguinal autovenous by-pass reconstructions were followed up for no less than a year. The diameter of the vein was measured at the site of distal anastomosis, and the length after the completion of reconstruction.

Results: Results are worse in venous grafts with diameter less than 3.5 mm and length over 40 cm, but the difference between failed and patent by-passes with diameter over 3.5 mm and bigger length is also significant. Shorter and with diameter over 3.5 mm by-passes have the higher percentage patency.

Conclusion: Shorter grafts with diameter above 3.5 mm do not guarantee longer patency if distal anastomosis is constructed above diseased run-off segment.

Key words: diameter, length, venous by-pass.

INTRODUCTION

Reconstruction surgery of the vessels of the lower extremities develops in relation to the high incidence of peripheral arterial disease (PAD). Risk factors as hypertension, hyperlipidemy, diabetes mellitus and smoking are seen more frequently.

One third of arterial occlusions occur in the aorto-iliac segment and two thirds in the arteries below inguinal ligament.

Despite improvement of revascularization techniques, 5 to 10% of by-passes fail up to 30 days after reconstruction⁽¹⁾. Walsh D.B. and al.⁽²⁾ discover that technical mistakes cause 25% of early thromboses. Patency of each reconstruction depends on combination of 3 different factors – surgical, haemodynamical and biological.

Surgical factor includes the surgical technique (continuous or interrupted sewing technique, graft material – vein, artery of synthetic material), geometry of anastomosis (form and size) and last but not least skill and experience of surgeon.

Haemodynamical factor includes anastomotic inflow,

run-off, characteristics of flow (turbulent flow with stagnation, separation and recirculation) and degree of stenosis. Haemodynamic success concerns the whole extremity and therefore distal sites of observation are used.

Size of graft and its quality are also major determinants of long term success of infrainguinal reconstructions. Exact measurement of internal venous diameter is difficult due to different wall thickness and conical narrowing⁽³⁾. Wengerter and al.⁽⁴⁾ demonstrate model of increasing patency in venous grafts ranging from 3.0 mm to 4.0 mm, and Idu and al.⁽⁵⁾ consider only venous graft diameter below 3.5 mm important for development of stenoses.

Operative technique, namely reversed against non-reversed configurations, received significant attention lately, but there is no solid evidence for extended patency of any of the techniques⁽⁶⁾.

MATERIALS AND METHODS

56 infrainguinal autovenous by-passes were followed – 24 patent (not less than 1 year) and 32 failed by-passes (12 with stenoses of distal anastomosis and 20 with thrombosis of grafts). Translocated VSM was used in 46 reconstructions, in situ venous graft in 2 and reversed vein in 4. Small saphenous vein was used in 4 by-passes. Diameter of vein was measured at the distal anastomosis and the length after the completion of the by-pass. Long were considered by-passes with length over 40 cm (LVGs) – 26 of all and below 40 cm were considered short (SVGs) – 30 of all. 22 have diameter less than 3.5 mm and 34 – over 3.5 mm.

In the postoperative period patients were followed by clinical examination, Ankle Brachial Index (ABI) measurement and duplex ultra sound every month up to 1 year after operation.

Criteria for high grade stenosis is accepted to be reduction of ABI and difference in velocities in two adjacent segments of inflow arteries, outflow arteries or the graft (V1/V2) over 2.5. These criteria were accepted as indication for control angiography.

RESULTS

Thrombosed venous grafts with diameter less than 3.5 mm are 46% and with diameter over 3.5 mm are 30 % (fig. 1a).

Venous grafts with stenoses of distal anastomosis and diameter less than 3.5 mm are 15%, with diameter over 3.5 mm are 23%. Patent by-passes are respectively 39% (more than a half anastomosed to tibial arteries with small diameter) and 47% (with diameter over 3.5 mm). Length of graft over 40 cm is related to thromboses in 48%, stenoses in 15% (total of 63%), while complications at length less than 40 cm are respectively 28% and 24% (total of 52%) – high percentage of failed reconstructions with smaller length.

Results are worse in venous grafts with diameter less than 3.5 mm and length over 40 cm (fig. 1b) but the difference between failed and patent by-passes with diameter over 3.5 mm and bigger length is also significant – 28%. Shorter and with diameter over 3.5 mm by-passes have the higher percentage patency.

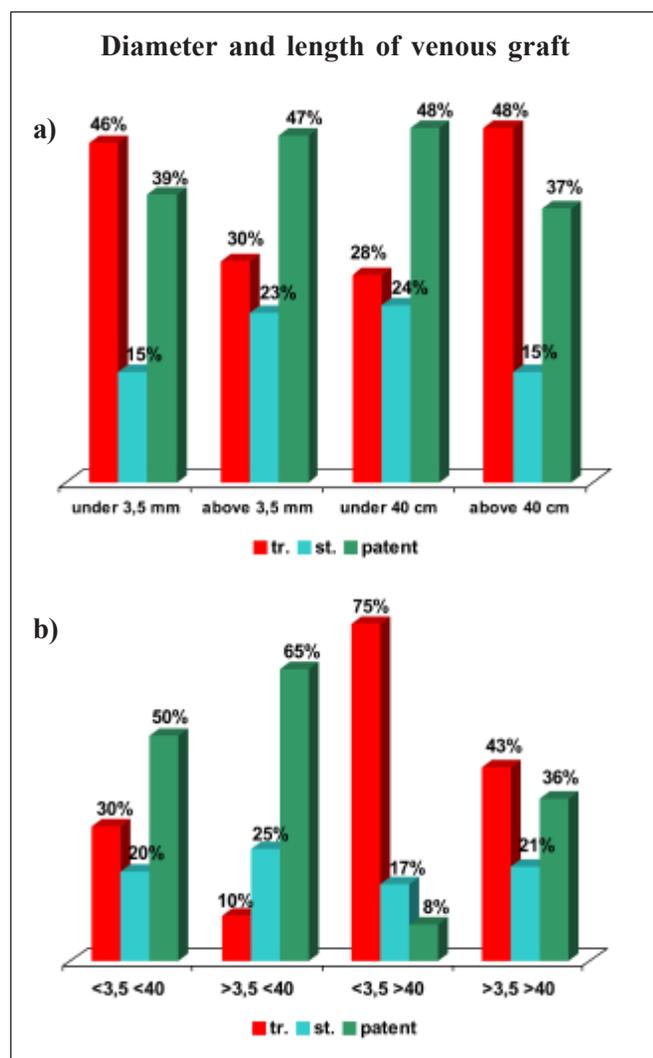


Fig. 1 a & b. Comparison of failed and patent reconstructions with autovenous graft in terms of a) diameter and length of vein and b) their combination.

DISCUSSION

Tangelder M. and al. emphasized in their study (7) the significance of 3 main factors for the thrombosis of infrainguinal reconstructions: length of by-pass, arterial run-off and material and diameter of the graft. Smaller length suggests more preserved venous segment with optimal distal diameter.

In our study this dependency was not fully confirmed – high percent failed reconstructions with diameter over 3.5 mm – 53% of venous grafts with stenoses and thromboses against 61% of by-passes with diameter under 3.5 mm.

Necessity of longer grafts is due to multi segmental spread of the disease (8), including partial involvement of run-off arteries, that is why failed by-passes, independently on their greater diameter (over 3.5 mm), but for bigger length prevail over patent ones by 28%.

Some studies have shown that poor run-off affects negatively the patency of infrainguinal reconstructions (9-11). Patency of infrainguinal by-pass and subsequent limb salvage depend crucially on the quality of the distal arterial segment.

Haemodynamic assessment of recipient arteries below the level of distal anastomosis is necessary(12). Used assays include measurement of mean blood flow, wave shape, velocity of flow, resistance and impedance.

CONCLUSION

Venous graft failing is due to technical mistake during harvesting of vein and anastomoses construction, lack of congruence of vein and artery diameters, poor run-off segment with low out-flow and subsequent thrombosis or stenosis. Quality of the run-off arterial segment is of crucial significance either in target artery selection, or in postoperative period in order of spread and advance of the disease. Use of short venous grafts is limited in wide spread of the occlusive disease and good quality of longer venous segment is uncertain.

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Address for correspondence:

Dr. Mihail Cheshmedzhiev,
Department of Vascular Surgery
St. Marina University Hospital, Varna, Bulgaria
E-mail: mi6046@gmail.com;