

# Early experience with B mode ultrasound mapping of the long saphenous vein prior to femorodistal bypass

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## Summary

*B mode ultrasound was used to assess and map the long saphenous vein in 20 limbs prior to femorodistal bypass. The assessment was compared with operative findings.*

*Eighteen of 19 adequate veins and 8 of 9 anatomical abnormalities or major divisions were correctly identified.*

*B mode ultrasound allows accurate marking of the vein, facilitating dissection, alerts the surgeon to possible difficulties and is an ideal non-invasive technique for preoperative assessment of the long saphenous vein.*

## Introduction

Autologous saphenous vein is widely regarded as the best choice for femorodistal reconstruction (1). In a significant number of cases the long saphenous vein may be inadequate, although the use of the *in situ* technique may make it possible to use veins previously considered unsuitable for reversed vein grafting (1,2,3). The use of venography has demonstrated the value of preoperative assessment of the long saphenous vein (4,5). Up to 30% were found to be abnormal, influencing subsequent management.

B mode ultrasound has potential for non-invasive assessment of the long saphenous vein (6). It is possible to mark the course and indicate sites of abnormalities or branches, as well as establishing the presence of a suitable long saphenous vein.

This paper presents our early results using B mode scanning compared with operative findings.

## Methods

A consecutive series of patients admitted for femorodistal reconstruction were scanned the day before surgery. A 7.5 MHz real time B mode ultrasound scan (Sonicaid Vasoview duplex scanner) was used to scan the long

saphenous vein with the patient standing, resting against an examination couch and the examiner seated in front.

The saphenofemoral junction (SFJ) was identified (Fig. 1) and the long saphenous vein followed, first in a longitudinal and then in a transverse plane in order to identify any branches (Figs. 2, 3). The SFJ, course of the vein and any abnormalities or branches were marked on

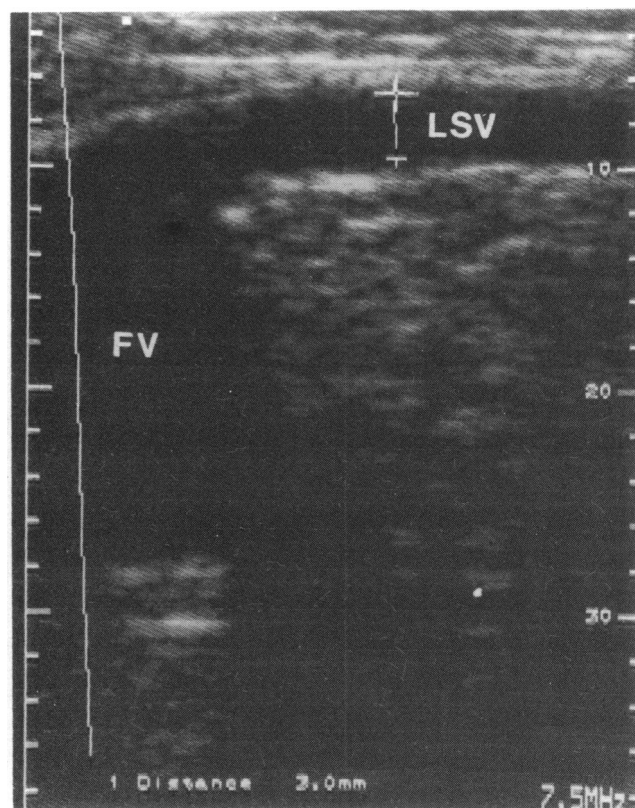


FIG. 1 B scan of the saphenofemoral junction (FV: femoral vein; LSV: long saphenous vein).

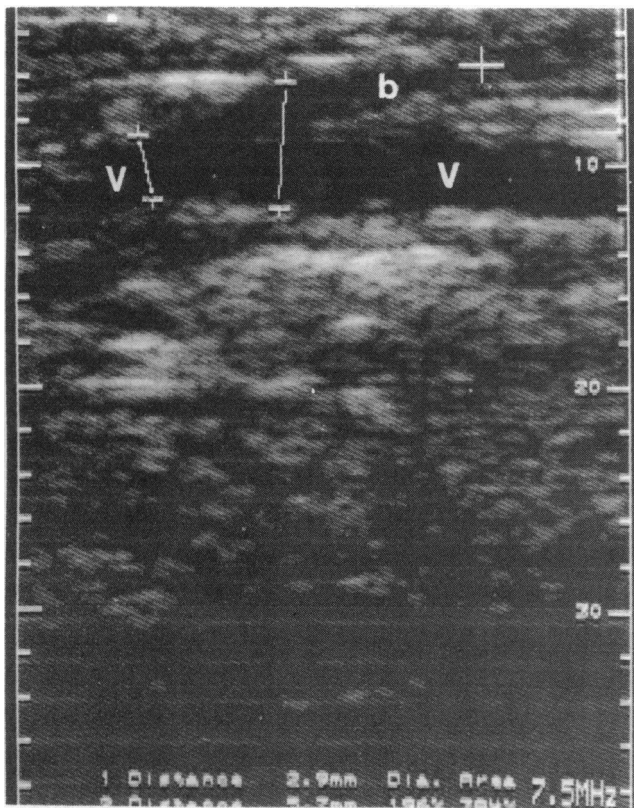


FIG. 2 Longitudinal B scan of saphenous vein demonstrating side branching (V: main vein; B: branch).

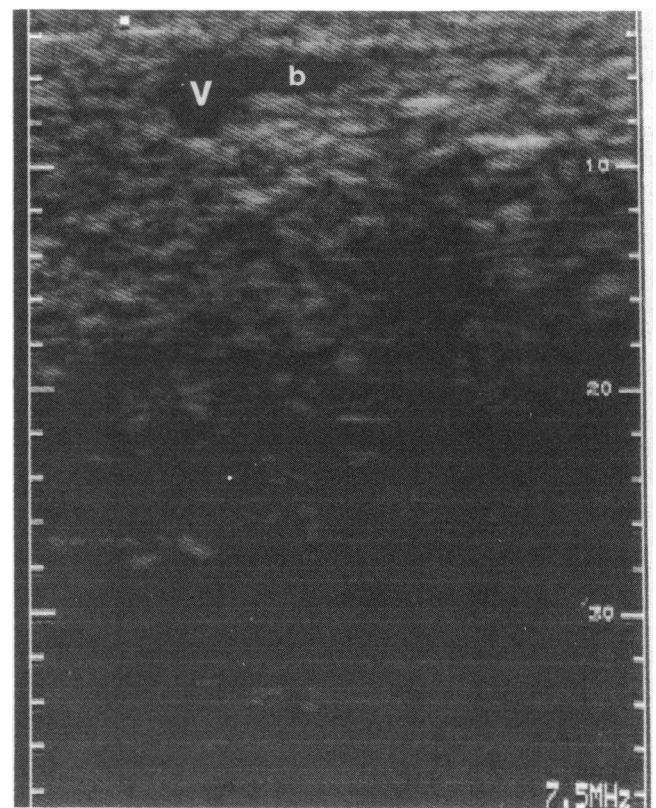


FIG. 3 Transverse B scan demonstrating side branch (V: main vein; b: side branch).

the skin surface. The adequacy of the vein for reconstruction was determined by measuring the internal luminal diameter (<2 mm considered unsuitable). At operation the vein was completely exposed for *in situ* grafting and the intra-operative findings compared with the preoperative assessment.

### Results

Twenty limbs were studied in 19 patients (15 male; average age 72 years, range 45–85 years). Following ultrasound examination 18 veins were considered suitable in length and diameter for use in reconstructive surgery. One vein could not be traced just distal to the SFJ and the diameter of the second was too small. At operation 19 suitable veins were found. In the first case exposure of the SFJ confirmed the absence of a useful vein as described preoperatively, but in the second it was evident that a superficial vein had been incorrectly marked and a deeper, more posterior, long saphenous vein was present. Of the 18 veins considered adequate, B scanning demonstrated 2 anatomical abnormalities and

one vein with varicosities. Major divisions (branches reducing the lumen >1 mm) were found in 5 veins.

Surgery confirmed all the abnormal findings and divisions. In one case a further major division was found, that had been missed by ultrasound (Table I). Minor branches (<1 mm diameter) were less easily identified and in those cases where all such branches were marked, the mean number of branches detected preoperatively was 4 (range 2–6), compared with a mean of 6 (range 4–8) when the vein was completely exposed.

### Discussion

Veith *et al.* have shown that preoperative assessment of the long saphenous vein by venography demonstrates anatomical abnormalities, absent and unsuitable veins in up to 30% of cases (4). Not all the veins may be adequately visualised (5). In addition the procedure is invasive and carries a risk of damaging the vein (7).

Real time B mode ultrasound is non-invasive and we have found it easy to perform. As with venography some veins may not be adequately visualised. Assessment of the adequacy of the luminal diameter is more difficult because, although it can be measured from the B scan, it is recognised that arterialisiation significantly alters the vein diameter (4,6). The arbitrarily chosen minimum suitable diameter was 2 mm, and more experience is required to determine whether smaller diameters will be acceptable.

Where anatomical abnormalities are detected this influences the operative procedure as dissection can be continued with the knowledge that there is suitable vein distally. In the presence of major divisions, undermining

TABLE I Results of real time B mode ultrasound assessment compared with operative findings (20 limbs)

	Preoperative	Intraoperative
Suitable veins	18	19
Anatomically abnormal	2	2
Varicose	1	1
Major divisions	5	6

of the skin edges can be avoided as the direction of the most suitable branch is indicated by the surface markings.

It was hoped that all the branches of the long saphenous vein could be identified preoperatively, obviating the need for complete exposure of the vein. Although this has been suggested by Leopold *et al.* (6) in a comparison of B mode ultrasound with venography, in those cases where this was attempted in this study subsequent dissection demonstrated that a number of small, but clinically significant, branches had been missed. Exposure of the vein by limited skin incisions could have led to the development of AV fistulae which appears to be a significant problem if this technique is used (8), and we therefore still prefer to fully expose the vein to ensure ligation of all branches.

Real time B mode ultrasound is an ideal method for non-invasively assessing the long saphenous vein preoperatively and has now become a routine procedure in those patients selected for femorodistal reconstruction.

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## Notes on books

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**A Colour Atlas of Reducing Operations for Lymphoedema of the Lower Limb** by Norman Browse. 79 pages, illustrated. Wolfe Medical Publications, London. £17.

Two hundred and eight high-quality colour photographs with accompanying text comprise this book originating from a centre known throughout the world for its contributions to surgery of the lymphatic system. Many of the photographs show grotesque deformity and the before and after pictures are impressive. Even so, the author stresses that surgical reduction is indicated in less than 10% of patients with lymphoedema and surgery should be eschewed whenever possible.

**Advances in Surgery: Volume 20** edited by J A Mannick, J L Cameron, G L Jordan, L D MacLean, G T Shires, R K Tompkins and C E Welch. 352 pages, illustrated. Year Book Medical Publishers, Chicago. £46. The latest volume in a well-known series. The subjects reviewed include penetrating abdominal trauma, total parenteral nutrition, the cancer patient, acute pancreatitis, lasers in general surgery, small bowel Crohn's disease and modern management of biliary tract stone disease.

**Diabetes and the Heart** edited by K G Taylor. 143 pages, illustrated. Castle House Publications Limited, Tunbridge Wells. £25.

Although usually managed by physicians, all surgeons operate from time to time on patients with diabetes mellitus and it behoves us to have some knowledge of the disease. This book covers all aspects of the interaction between diabetes and heart disease as well as examining the pathogenesis, nature and management of diabetic heart disease.

**Handbook of the Spinal Cord: Volumes 4 and 5** edited by Robert A Davidoff. 823 pages, illustrated. Marcel Dekker, New York. \$179.50.

Volume 4 on Congenital Disorders and Trauma and Volume 5 on Infections and Cancer are combined into a single book to complete this five volume set covering every aspect of the spinal cord in health and disease. Neurosurgeons and orthopaedic surgeons will be the principal readers of this publication.