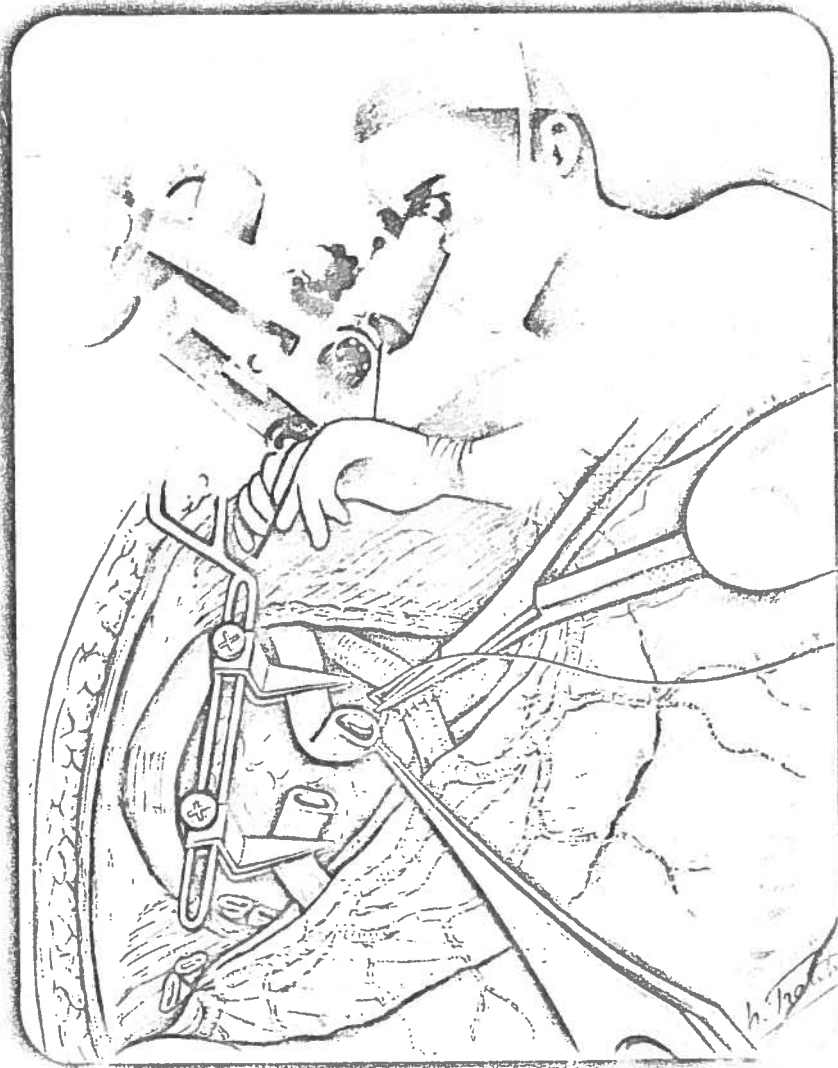


Papers from the German Speaking Group  
(Deutschsprachige Arbeitsgemeinschaft für Mikrochirurgie)

58

INTERNATIONAL JOURNAL OF

# MICROSURGERY



VOLUME 2 N° 4 DECEMBER 1981

ÉDITIONS VOLAI PARIS

## VEIN GRAFT IN HANDSURGERY

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**Summary** – Since 1975, 87 vein grafts were used for vascular repair in replantation cases and compound hand injuries as well as for free tissue transfer (4 cases). The operative technique is discussed and the benefits of this method in hand surgery are presented.

At the Plastic and Reconstructive Surgery Department of the 1st Surgical Clinic of Vienna, 39 patients underwent interposition of autologous vein grafts between 1975 and 1980 (2) ; 87 vein grafts were used. The reason of this relatively high frequency of vein grafts can be imputed to the severity of our replantation cases (1). In about 41% crush injuries with extensive damage to the severed vessels were present and in 9% there was also avulsion.

When attempts are made to reunite such vessels, thrombosis usually develops either intraoperatively or in the immediate postoperative period. A patent anastomosis can in such cases only be obtained by extensive bone shortening or interposition of autologous vein grafts. Bone shortening is limited by functional considerations and therefore the possibility of the interposition of vein grafts is very beneficial in primary management of these injuries. Vein grafting is also the

method of choice for secondary intervention, when it is necessary to restore the patency of thrombosed vessels. In free tissue grafting interposition of vein grafts gives additional length to the pedicle of the free flap or composite graft (3).

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TOTAL MATERIAL (1975-1979)						
TOTAL AMP.	PRIM. VG.	PATIENT	PARTS	V/A	V/V (+REV.)	AMP. PARTS
	SEC. VG.	17	18	20	28	6
		4	4	3	2	2
SUBTOT. AMP. FREE TISSUE TRANSPL.	PRIM. VG.	17	23	23	5	0
		4	4	7	4	0
		42	49	53	39	8
				87 VEINGRAFTS		

In the last six years 210 replantations were performed in our service, 39 cases necessitated vein grafts, 1 free toe to thumb transfer and 3 free tissue transfers also needed vein grafts to restore bloodflow in a satisfactory manner (Table). The material consisted of 18 total amputations in 17 patients. Here 20 vein grafts, vein to artery and 28 grafts, vein to vein were used. Six cases had to be reamputated because of severe damage to the amputated part. Secondary vein grafts to correct the primary anastomosis were done in 4 patients; there were 3 vein to artery and 2 vein to vein grafts necessary. Two cases could not be saved.

In subtotal amputations primary vein grafts were used on 23 occasions in 17 patients. Here 23 vein to artery and only 5 vein to vein interpositions were performed. None of these cases had to be reamputated. In the toe to thumb transfer 3 long vein grafts for restoring the arterial bloodflow were used and in 2 fibula transfers and 1 dorsalis pedis flap. Vein grafts up to a length of 10 cm were sutured between arteries and veins to lengthen the pedicle and allow anastomosis without tension (Fig. 1).

In primary management vein grafts had an average length of 23 mm, the shortest was 5 mm and the longest 40 mm, for arterial repair, and on average 31 mm, i.e. 10 to 60 mm for venous repair. In secondary surgery considerably longer vein grafts were required, i.e. 18 to 100 mm (average 45 mm) for arterial repair, and 20 to 80 mm for venous defects.

### Method

Our operative technique consists of clearly defining the damage to the vessels, resecting all damaged parts

so that only healthy tissues are present for anastomosing. After the defect and the length of the gap (Fig. 2) is clear we measure the gap between the vessel stumps. For bridging venous defects the interpositional vein graft should have approximately the same diameter as the vessels to be repaired. In arterial defects the vein graft diameter should be two thirds that of the arterial diameter because of the higher intravascular pressure. The grafts are taken under normal bloodflow conditions.

Suitable veins are available on the volar aspect of the wrist and the dorsum of the foot. The diameter of these veins is mostly adequate for the finger arteries and veins. Lateral branches should be ligated. Bipolar coagulation can be used

only for venous repair. Unlike BÜCHLER (4) we strip the vein of the adjacent fatty and connective tissue. The adventitia is left in place. Once the vein has been stripped it will be clamped distally and irrigated with Ringers solution containing 10% Heparin to remove the blood. Then the proximal and distal end are tagged anteriorly with sutures of different colour to prevent twisting and to indicate the original bloodflow through the graft.

In experimental studies from PIZA and GOTTLOB (6) an endothelium-preserving microsurgical technique was developed as follows: Veins are taken avoiding any damage caused by instruments, sponges or touching by fingers of the surgeon. Haemostasis during the anas-

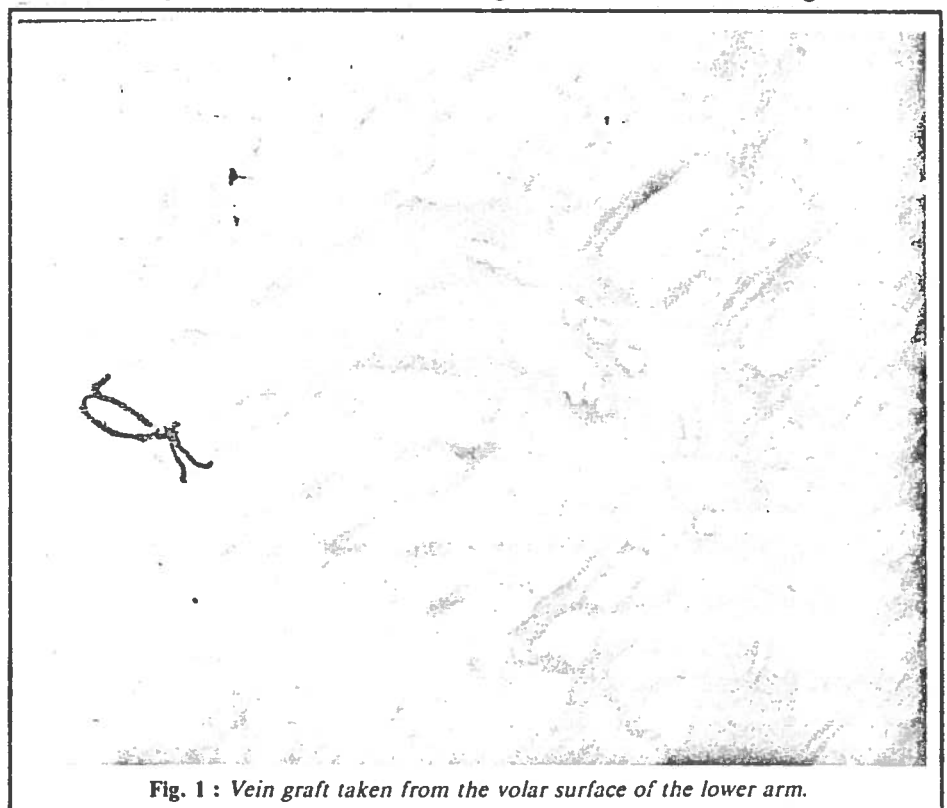


Fig. 1 : Vein graft taken from the volar surface of the lower arm.

tomosing procedure is achieved by slight compression from the adjacent tissues of the vessel. The anastomosis is performed with 11-0 interrupted sutures. The specimen examined by O'NEILL silver-staining method showed complete endothelialisation already up the 3rd day.

For arterial reconstruction the vein grafts are oriented with valves facing in the direction of the flow. The vein graft must be shorter by about 10% than the distance between the two vessel stumps, to avoid kinking. If there are different calibers then an end-to-side anastomosis or splitting of the graft are possible. In severe compound injuries of the hand more than one digital artery may be severed. These multiple defects may be bridged by a single vein graft with the distal arterial stump anastomosed end-to-side to the graft or the lateral venous branches sutured end-to-end to the digital artery stump (Fig. 3-4).

Postoperative treatment consists of low-molecular Dextran infusion: 500 cc in 2 portions per day for 5-7 days and Persantine. There is still discussion whether low dose of Heparin should be given for vein-to-artery repair and Dicoumarol for vein-to-vein repair.

## Results

The patency rate was 80% with a failure rate in venoarterial anastomosis of 26% (7 of 27 cases) and in veno-veno anastomosis of 14% (3 of 22 cases). In primary management 26% showed a thrombosis (5 of 19 cases) in veno-arterial anastomosis and 20% in veno-venous anastomosis (3 of 15 cases). In secondary procedures 25% (2 of 8 cases) of the veno-arterial anastomoses were obstructed and none of the veno-venous anastomoses.

## Discussion

Small autologous vein grafts offer the microvascular surgery many benefits and are since the technique improved a standard method for the repair of extensive crush injuries to the finger and hand avulsions or free tissue transfer if a gap between the vessel stump needs to be bridged.

In spite of the fact that the grafting



Fig. 2 : Y-shaped vein graft in a replantation

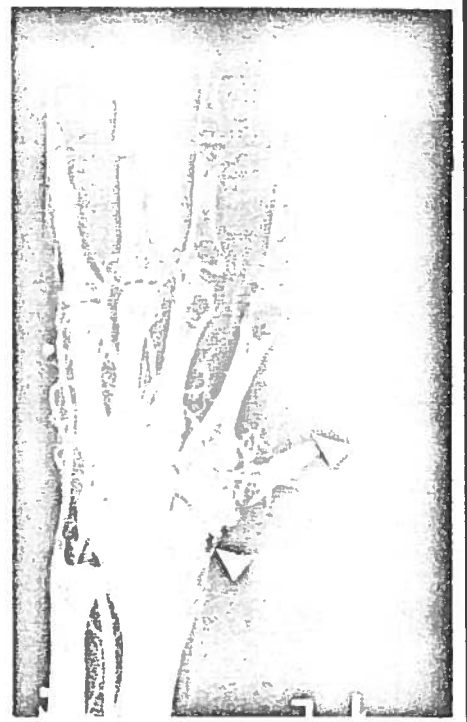


Fig. 3 : 20 year-old male patient : second toe-case. The graft is shown between the two to-thumb transfer 10 cm vein graft for arterial repair.

technique is more delicate in all cases in which a gap between the stumps of the vessels is present vein grafts should be used, especially in replantation surgery the functional results could be improved by less necessary shortening of important structures of the injured hand and fingers.

Also in free tissue transfers, such as toe to thumb transfer in our own case and the free fibula and dorsalis pedis flap transposition long vein graft made success possible (JACOBSON 1965, DONAHGY 1967, BUNCKE 1971 and O'BRIEN 1975).



Fig. 4a-4b : 20 year-old male patient. Second toe-to-thumb transfer. 2 years later.



## References

1) ALPERS B.S., BUNCKE H.J., BROWN-STEIN M. : Replacement of damaged arteries and veins with vein grafts when replanting crushed, amputated fingers. *PLast. Reconstr. Surg.* 1978, 61 : 17.

2) BERGER A., MILLESI H. : Functional

results and nerve concepts in replantation surgery (a five years report of the Viennese Replantation Team). *New Zeal. J. Surg.* 1980.

3) BIEMER E. : Vein grafts in microvascular surgery. *Br. J. Plast. Surg.* 1977, 30 : 197.

4) BÜCHLER V. : Diskussionsbeitrag zur 1. Arbeitstagung der Deutschsprachigen Arbeitsgemeinschaft für Mikrochirurgie der peripheren Nerven und Gefäße. Wien, 1978.

5) PIZA H. : Analysis of complications in digital vein grafts. *Chir. Plast. (Berl.)* 1979, 5 : 23-32.

6) PIZA-KATZER H., GOTTLOB R., GESTRING G. : Veno-venöse Transplantation kleiner Gefäße, technische Erwägungen mit besonderer Berücksichtigung einer endotelerhaltenden Operationsmethode. *Acta Chir. Austr. (Kongressband in press).*

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