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REPLANTATION OR AMPUTATION

A basic discussion after three years of replantation work

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SUMMARY — We describe here our 4-year experience with the University of Vienna Replantation team. Appropriate preparation of the amputated parts, precise timing, a 24-hour service and a clear indication with intensive postoperative physiotherapy are the basic requirements for good functional results.
Our survival rate is 86% with 78% of good functional results (integrated parts). Replantation plays a main part in acute hand injuries.

Since June 1974, a replantation team has been working in Vienna in cooperation with the 2nd Surgical Clinic. From June 1974 to June 1978, 227 cases were treated. Seven microsurgeons are available in Vienna, one of them being on call every day (1, 2, 3, 5). The treated cases, mostly workers' accidents, were admitted out of a population of about 3.5 million people. These 4 years of experience in selecting indications for replantation — with regard to immediate and later function — call for some important remarks.
During the last four years, 148 patients with a total of 227 amputated parts were admitted to the Viennese Replantation Team. (5, 1, 2, 3). There were 51 sharp, clean cuts and 86 saw cuts and similar injuries, whereas degloving unjuries were seen in eleven cases (TABLE I). Ages were between 3 and 71 (TABLE II). 60% were complete amputations, 40% incomplete ones. In these figures only so called micro-replantation-cases are included. This means replantation cases necessitating microvascular anastomosis (4). Therefore, the wrist is considered as the borderline. Our indication and selection of cases for replantation, as a result of 4 years of experience, are as follows (1, 2, 3, 6, 7):

TABLE I

TYPE OF INJURY

NUMBER OF PATIENTS : 148

Clean sharp cuts	51
Saw cuts A.S.	86
Degloving	11

1) The so-called ability for replantation. This means the amputated part should be preserved properly and all the necessary hospital treatment should be available. The amputated part should never be perfused preoperatively and should be put into a nylon bage. Ice cubes should be placed into a separate be put into a nylon bag. Into a separate bag so that the amputated part never

TABLE III

FUNCTIONAL RESULTS
1974 — 1978

NUMBER OF PATIENTS: 148 — AMPUTATED PARTS : 227

Replanted part « integrated » again	78%
Replanted part not « integrated » again	12%
No end result	10%

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Figure 1 — *Female patient 27 years old. Crush injury to the right thumb. Complete amputation.*

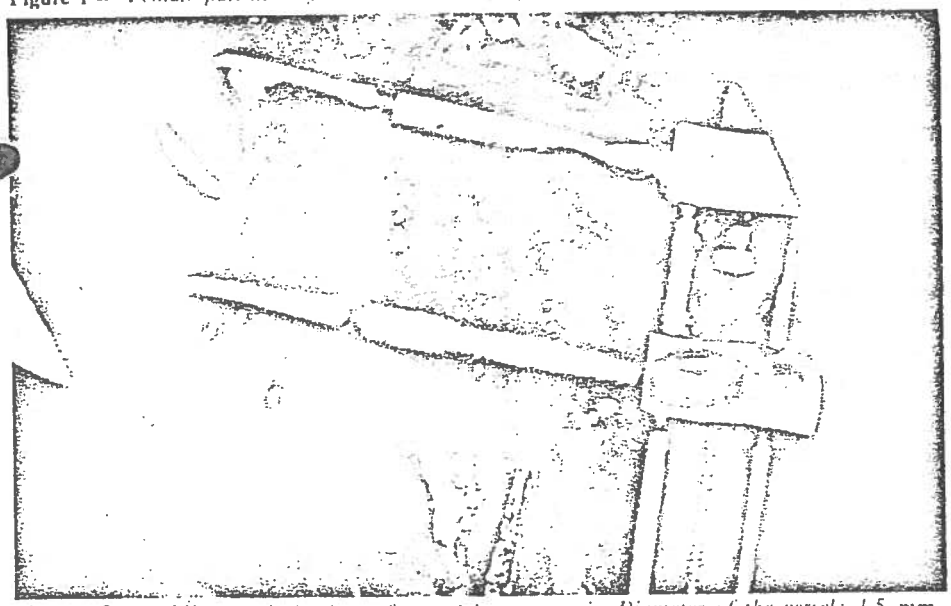


Figure 2 — *Microscopical view of arterial anastomosis. Diameter of the vessel: 1,5 mm. 10-0 monofilament Nylon.*

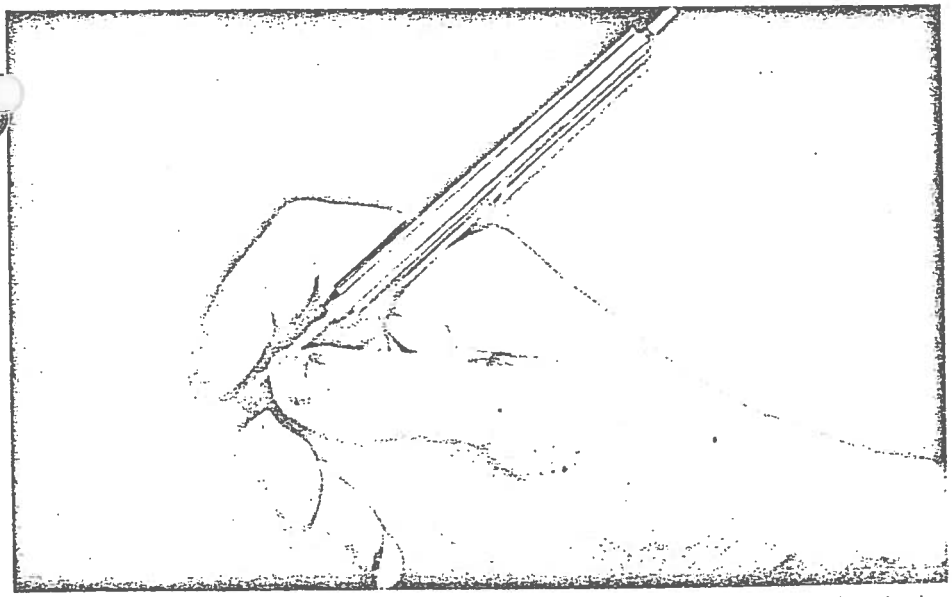


Figure 3 — *Female patient, 27 years old. Replantation of the thumb. Functional result after 4 months.*

comes in direct contact with iced water. Temperature is kept under 4° C. The time factor is not as important as once believed: a warm ischaemia time between 6 and 8 hours and a cold ischaemia time between 12 and 24 hours may be considered as the limits for replantation. The condition of the amputated parts may also limit this procedure.

2) The dignity for replantation (Fig. 1, 2, 3) — This means that the thumb has to be replanted in any case. Long fingers should be replanted if more than one is lost to provide the patient with a counter grip. A single long finger transplantation is only done in cases of special interest to the patient, according to his profession, skill or passion. If possible, the operative procedure and the functional result should be discussed with the patient preoperatively.

3) The acceptance of the replantation *(Fig. 5, 6, 7)* — This means the patient's will to accept the severed part again. This is an extremely important point. If a patient does not cooperate, and is not really interested in having the replantation performed, he will never have a good functional result because of the lack of cooperation in the postoperative rehabilitation period.

Our Method

All reconstructive procedures should be done at once, insofar as possible. After the preparation of the arterial and venous stumps, we start with the osteosynthesis using kirschner wires or possibly AO-plates or screws. Normally no resection of bone fragments is performed.

The arterial anastomosis is then performed, and during this procedure the infusion with Dextran 40 may begin. If the gap is not large, nerves are repaired by adapting sutures (8), the extensor tendons are then sutured. Venous anastomosis and flexor tendon sutures follow. For the flexor tendon sutures we mostly use Kleinert's technique. Any tension at the suture site of the microvascular anastomosis should be avoided. Therefore, autologous vein grafts are frequently used. The anastomosis is performed under microscope, using 10-0 or 11-0 monophilament (Fig. 8) nylon sutures. Mostly, no adaptors have been used, only micropullies. Skin should be closed without tension. If necessary, free skin grafts or local flaps should be applied. In special

cases, e.g. the MP-joint being completely destroyed, a joint prosthesis can be inserted.

Postoperatively, Dextran 40 infusions are administered for 5 days. Acethylsalycilic acid tablets are administered for a period of 21 days. Heparin is used locally during the operation and only if necessary during the postoperative period. Antibiotics are given routinely.

Results

The survival rate in our group is of 86 %. Four years ago, it was about 50 to 61 %, like in any other group (9, 10). The evaluation of our cases calls for the following conclusions:

- there is no relationship between the age of a patient and a successful replantation;
- clean, sharp cuts and saw cuts were of no significance in our results;
- in about 40 % of our cases a second procedure, such as tendon grafts and tenolysis or nerve grafts, had to be performed.

To express our functional results we now use the following categories (Table 3):

- the replanted part is integrated into the patient's daily life with normal use;
- the patient did not integrate the replanted part.

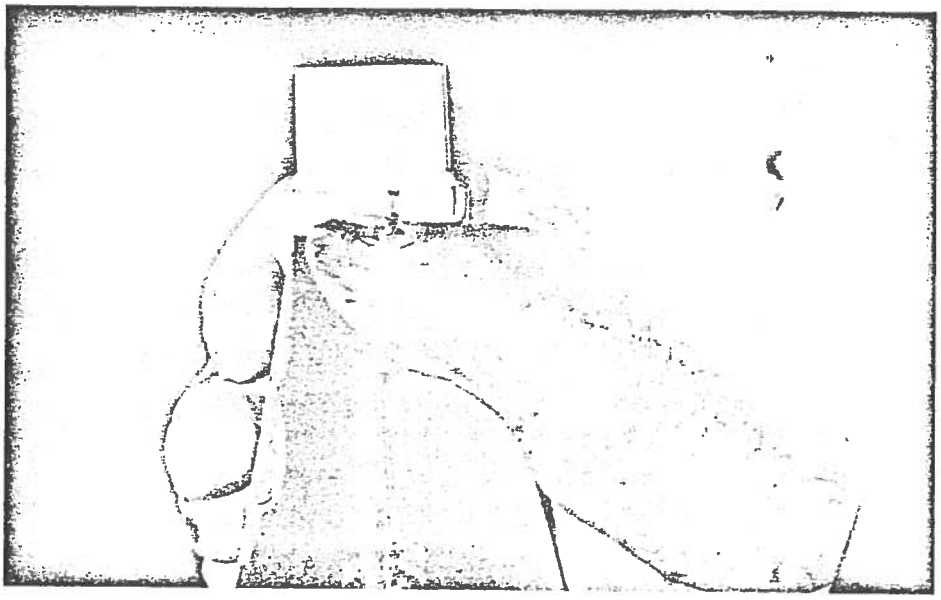
We found that 78% of our material could be included in the first group, and 5% in the second group. 10% of the cases are too recent to be evaluated at this time.

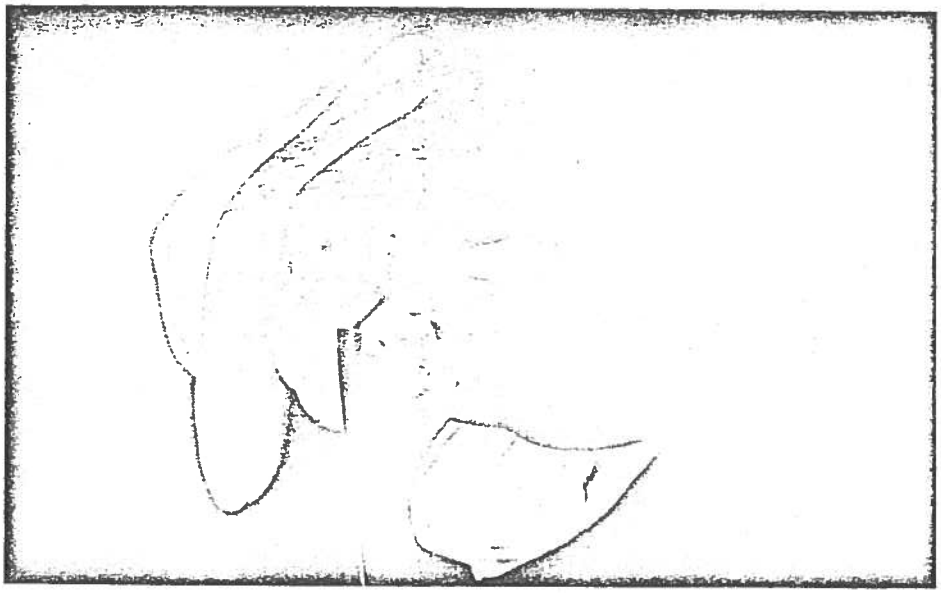
If we evaluate these figures in another way — how many people are working in their original profession? — we find that 80% of our patients are included in his group. 12% needed re-education or a new occupation. 8% are unemployed at this time.

The patient's personal feelings about the transplantation procedure plays also a very important part. When questioned on this point, 88 to 90 % of the patients gave a positive answer. And good results can only be achieved if the patient is cooperative and if rehabilitation and physiotherapy are performed intensively.

Therefore, after 4 years of experience, we conclude that clear answers can be given to the problem of amputation and replantation. Satisfactory functional results can be produced by taking the following factors into consideration: good preparation and preservation of

Figure 4 — *Male patient, 62 yr old. Complete amputation of left thumb, circular saw injury.*





Figures 5 and 6 — *Male patient, 62 years old. Replantation. Functional result after 3 months. Good regeneration of the finger nerves.*

the amputated part; history of the patient and of his injury; clear understanding and good patient's acceptance; good surgeon's concept in the operating ward; and sufficient postoperative monitoring with intensive physiotherapy.

This is how we obtained our 86% survival rate with 78% of good functional results. Replantation takes, indeed, a very important place in the surgical treatment of acute hand injuries.

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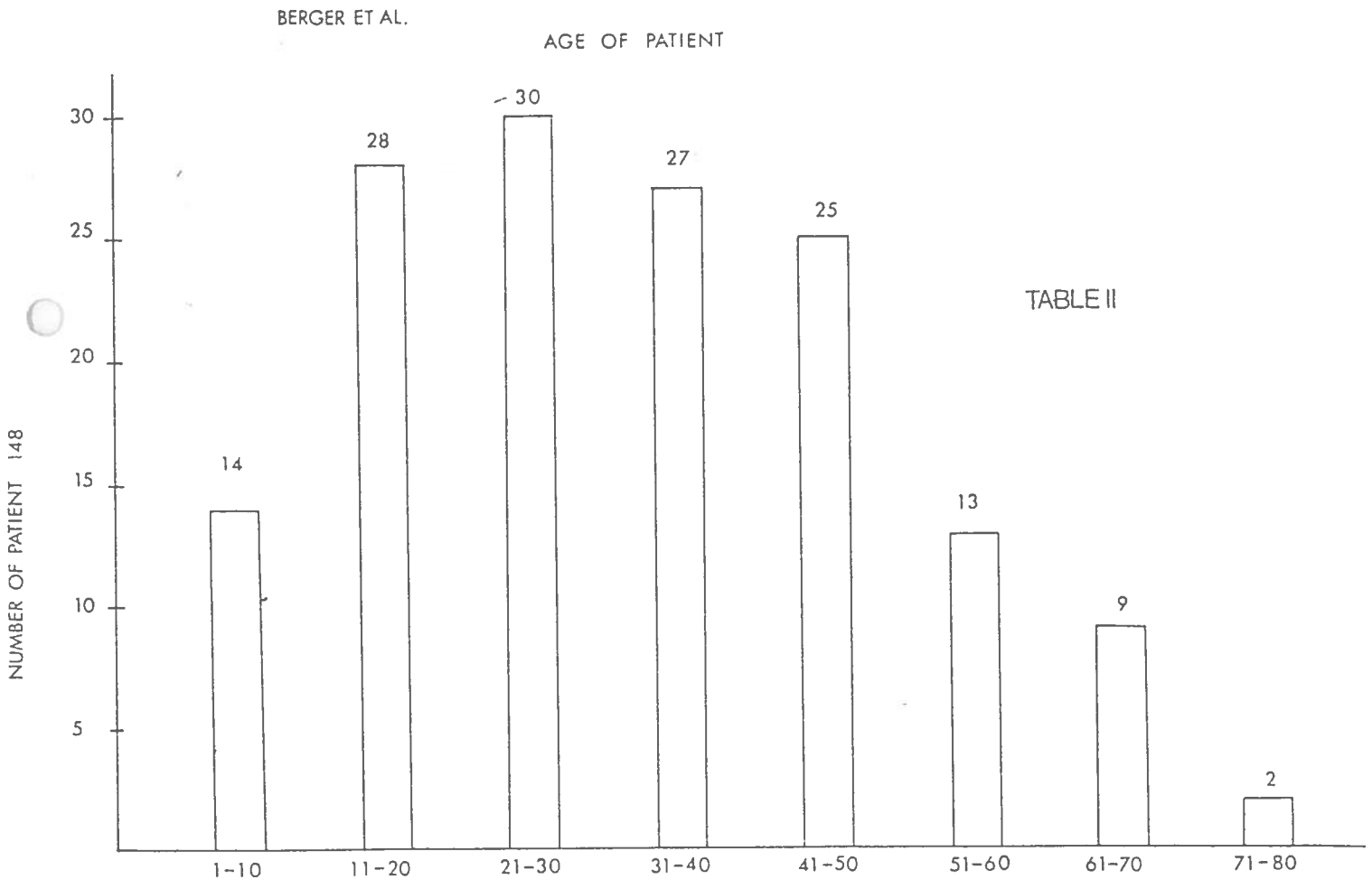

TABLE II