

DEFINITIONS AND CLASSIFICATIONS IN REPLANTATION SURGERY

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Now that replantation surgery is well established and developing rapidly throughout the world, it is extremely important to have international agreement on definitions and classifications in this new field, if functional results are to be discussed and accurately compared.

Until now, the replantation of fingers and total limbs have been discussed together as if these procedures are identical. In addition there is still confusion about the distinction between *total* and *subtotal amputation* and even the definition of *revascularisation* (Biemer, 1977).

The first attempts to clarify these terms have been made at national levels, for example in China at the Replantation Conference of 1972 in Shanghai, (Biemer, 1978) and in Germany at the first meeting of the German Speaking Society of Microsurgery of Vessels and Peripheral Nerves in December 1978 in Vienna.

At the international level this task is now being undertaken by the "Replantation Committee" of the International Society of Reconstructive Microsurgery. The members of this Committee, under the chairmanship of Josef Kutz, M.D. are Dr Alfred Berger, Dr Edgar Biemer, Paul Lendvay, M.D., Susumu Tamai, M.D. and James Urbaniak, M.D.

At the VII Symposium of this Society in May, 1979, in Guaruja, Brazil, a report was presented which dealt in detail with definitions and classifications in replantation surgery. This report was based on study of the international literature on replantation surgery, the definitions already determined at national levels, and the personal experience in replantation surgery of the members of the committee.

The conclusions of this report were discussed and accepted by the participants of the VII Symposium and the following definitions and classifications were agreed.

MACRO AND MICROREPLANTATION

Microreplantations. This term refers to amputation of parts distal to the wrist or ankle joints. It also includes other peripheral parts of the body such as the scalp, penis, ear, etc., which can be only replanted by microsurgical techniques.

Macroreplantation. This term refers to amputations proximal to the wrist or ankle joints.

The relative importance of the three major points in replantation surgery is quite different in these two groups.

Microreplantation:

1. Technique (microvascular surgery)

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2. Feasibility of replantation:
 - (a) condition of the amputated part
 - (b) anoxaemic period
 - (c) general condition of the patient
3. Indication for replantation

Macroreplantation:

1. Feasibility of replantation
 - (a) general condition of the patient
 - (b) anoxaemic period
 - (c) condition of the amputated part
2. Indication for replantation
3. Technique

In microreplantation the condition of the patient is usually very good, because the amputation of a peripheral part is usually an isolated accident.

The aetiology in macroreplantation is usually different; the amputation being only part of a severe and multiple injury, which may involve the cranium, thorax or abdomen. Therefore in most cases the condition of the patient is critical.

Due to the much shorter tolerable anoxaemic period of a totally separated arm compared with an amputated finger, the indication for replantation has to be very limited and strict. Macroreplantation after a very long anoxaemic period can lead to general toxæmia and finally to sudden death. This general reaction of the body will never occur after microreplantation.

TOTAL AND SUBTOTAL AMPUTATIONS

This classification is very important especially if one wishes to compare late functional results.

Total amputations. There must be no remaining connection with the body.

Subtotal amputations. The main vascular connections must be interrupted and there must be no evidence of circulation. Most of the functional structures must be separated and the soft tissue connection should be less than one-quarter of the circumference of the part.

For comparison of the late functional results we classify the subtotal group according to the structures which remain intact (Biemer, 1977):

- | | |
|----------|--------------------------------|
| Type I | bone connection |
| Type II | extensor tendon connection |
| Type III | flexor tendon connection |
| Type IV | nerve connection |
| Type V | skin or soft tissue connection |

Because most amputations involve the hand, amputation zones in the hand were introduced (Fig. 1).

- | | |
|---------------------|----------------------|
| Digit-amputations | (Zone I, II and III) |
| Midhand-amputations | (Zone IV) |
| Hand-amputations | (Zone V) |

The level of amputation is taken as the level of bone separation (except in degloving injuries where the skin separation is the level of amputation).

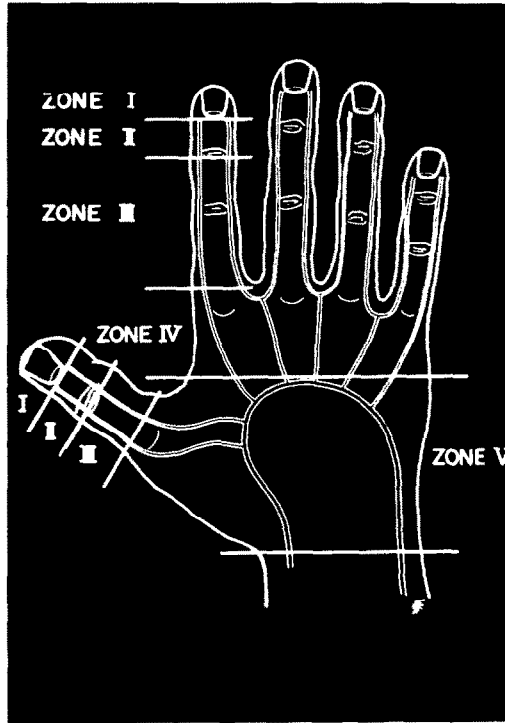


FIG. 1. Classification of amputation zones in the hand.

In addition it should be noted if the joints are destroyed or damaged at different levels.

REVASCULARISATION

The term revascularisation has sometimes been used synonymously with subtotal amputations. Now it is defined as a condition in which most of the functional structures are separated but in which there is evidence of a residual circulation which can only be improved by a vessel anastomosis.

OTHER RECOMMENDATIONS

Mechanism of injury. In order to facilitate discussion on the aetiology of the amputation and the type of injury the following classification was suggested:

1. Guillotine amputations (including the circular saw)
2. Crushing amputation (localised crush area at the site of amputation)
3. Avulsion (separation of different structures at differing levels of amputation)
4. Combined amputation (this means a combination of crushing, avulsion or heavy crushing with damage to the amputated part: for example explosions, dog bites, etc.
5. Degloving injury.

Replantation reports. To obtain exactly comparable information, it was suggested that a standard replantation report sheet should be introduced internationally. For this purpose the sheet illustrated in Fig. 2 was recommended.

REPLANTATION REPORT										
HOSPITAL _____						No _____				
DATE AND TIME OF ADMISSION _____										
PATIENT Name: _____		Male: _____		Female: _____		Right		Left		
No: _____		Date of Birth: _____		(If both hands use 2 reports)						
Occupation: _____			Hobby: _____			DIGIT		Midhand		Hand
Previous hand injuries _____						Total				
Previous diseases: _____						Subtotal:				
Medication _____						Type 1 (bone)				
Alcohol Yes _____ No _____						Type 2 (ext. tend)				
Smoker Yes _____ No _____						Type 3 (flex.)				
ACCIDENT Date: _____ Time: _____ Place: _____						Type 4 (nerve)				
						Type 5 (skin)				
Place and nature of first aid _____						Type of amputation: Guillotine Crushing Severe combined Avulsion Degloving injury				
Transport _____										
Nature of accident: _____										
Other injuries _____										
AMPUTATED PART _____		Type of preservation _____		Level of amputation: _____		D1		D2		D3
Cooling _____		Duration of cooling: _____		Zone I						
Condition of the amputated part: _____				Zone II						
Destroyed joints: _____				Zone III						
				Zone IV						
				Zone V						

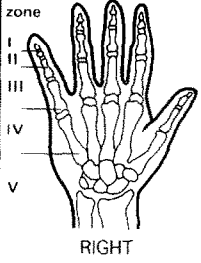
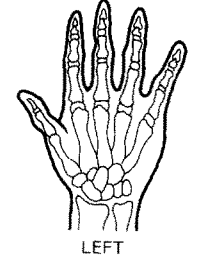
<p>zone</p>  <p style="text-align: center;">RIGHT</p>	Operation	Surgeon: _____		Nurse: _____													
		Assistant: _____		Others: _____													
 <p style="text-align: center;">LEFT</p>	Medication	Anacsthetist: _____		Type of anaesthesia _____													
		Start of operation: _____		End of operation: _____													
		Time of anaemia: _____		D1		D2		D3		D4		D5		Midhand		Hand	
		Complications: _____															
		Primary finger transfer: _____															
		Skin transplantation: _____															
		Medication pre op. _____															
		Medication intra op. _____															
		Medication post op. _____															
		Photo _____															
		Remarks: _____															

FIG. 2. Recommended replantation report sheet.

Replantation services. Another aim of the replantation committee is to build up an international list of replantation services and for this reason the following classification was introduced:

A. Replantation centre. These units offer a 24-hour service and are fully equipped to deal with pre- and postoperative care: intensive care unit, physiotherapy, occupational therapy etc.

B. Replantation service. This can be built up in the smaller unit which can carry out replantation but due to the limited number of staff, cannot offer a 24-hour service. Such replants can only be performed upon request.

C. Units with microvascular-surgical experience. Units where one or two colleagues are familiar with microsurgery and replantation-surgery and only occasional replantations can be performed.

These places are of great value especially for early postoperative care and secondary procedures.

SUMMARY

Attempts have been made internationally to introduce clear definitions and classifications in the new field of replantation surgery.

A special Committee of the International Society of Reconstructive Microsurgery has developed and suggested clear definitions in this new field and has recommended an international replantation sheet.

The next step will be to define criteria to assess the late functional results of such replantations.

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