

# FIRST-AID IN TRAUMATIC AMPUTATIONS

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**T**raumatic amputation of limbs or digits are fortunately not very common occurrences on our islands; however, enough cases are seen to warrant a modest discussion on how to tackle the situation before the patient is received by the surgeon. I do not claim to present a complete synopsis on the subject but I hope to succeed in emphasizing sufficiently well the basic first-aid measures which should be adopted by all those who may be involved in the management of these patients.

## Aetiology

Amputations follow a traumatic event often caused by circular electric saws or motor vehicle accidents. Other cutting implements have been implicated, such as broken glass and washing machines.

Amputations may be complete i.e. with the distal part of the effected limb clearly dismembered from the rest of the body, or partial i.e. with the part still attached by tissue to a greater or lesser extent. It is always safer and wiser to consider a badly severed appendage or limb as *completely amputated* and to manage as such than to overlook the damage and risk irreversible ischaemic harm to the tissues that may, at a glance, appear viable warranting nothing more than a splint.

## Prognosis

The outcome of the amputated part depends on a multitude of factors:

1. Extent of the Injury;
2. Nature of wound;
3. Level of amputation;
4. Time interval between accident and eventual surgery;
5. Ambient temperature;
6. First-aid and resuscitative measures;
7. Facilities for replantation surgery;
8. Post-operative complications;

9. Age and general health of the patient.

Success of replantation surgery relies basically, as far as first-aid is concerned, on what is done to the patient and his traumatised limb within the first hour or so of the injury. Every attempt must be made to ensure optimal management as this may be of critical importance to the individual patient. A manual worker may not be effected by the loss of a forefinger segment whereas a musician would be badly incapacitated. Loss of a finger may not matter much to many individuals but a thumb is essential for the use of the whole hand in any situation.

## Ischaemic time

Muscle has a very low ischaemic tolerance when compared with other tissues, hence, the pre-operative ischaemic time permissible in major replantations (proximal limb injuries) is considerably shorter than for minor (more distal) replantations.

Irreversible muscle damage often occurs after 6 hours of anoxaemia without cooling. In our hot summer weather this duration of tolerance is shorter still! It follows that by cooling the amputated part to about 4 degrees celsius immediately, ischaemic tolerance can be greatly prolonged by several hours by the decrease in the metabolic rate, and therefore, of the oxygen demand of anoxic tissue at this temperature.

## First-aid measures

1. *Tourniquets:* On **NO** account should these be employed. Bleeding wounds should be packed well and a firm but not too tight bandage applied over the packing. Tourniquets often stop venous return but not arterial blood flow promoting more bleeding! Well applied, they not only aggravate the trauma by crushing the tissue over

which they are applied but deprive healthy tissue between them and the wound of a vital circulation and occlude anastomotic channels that may be providing sufficient physiological support to incompletely amputated limb segments. They also predispose to more extensive intravascular clotting of blood not to mention the risks when these tourniquets are subsequently removed in hospital.

2. *Resuscitation:* After the wound is packed well an intra-venous line should be established and normal (physiological, 0.9%) saline infusion started. It is important to note that these measures for upper limb injuries should spare the opposite limb veins; hence in such circumstances all drips should be set up in the lower limb veins. Vessels in the intact upper limb may be crucial for choosing and transplanting the correct calibre vascular auto-grafts to the severed area. Pulse and blood pressure should be recorded and a patent airway, adequate ventilation and systemic circulation ensured. Blood should be saved for cross-matching before O negative blood, plasma or dextran is infused.

3. *Amputated part:* (See illustration)

- (a) Every severed part must be saved no matter how badly damaged it appears to be.
- (b) It should be wrapped in compresses moistened (not dripping) with physiological saline or Ringer's solution.
- (c) It should be placed and sealed in a plastic bag.
- (d) This bag is then placed inside another bag containing 2/3 water and 1/3 ice.
- (e) The outer bag is fastened below the closure of the inner bag to prevent unphysiological water coming into contact with the tissue.

Cooling the part in this fashion reduces its temperature to about 4 degrees celsius without the danger of inducing frost-bite which would make





**Illustration:** Correct storage of an amputated part.

*Note:* Further protection is afforded by placing in a suitable container, such as a cardboard box or plastic lunch box.

the tissue non-viable and therefore useless. Tissue preserved thus has been shown to survive for over 20 hours!

Time taken in performing these measures before transportation to hospital, is time well spent. One must remember that although our island is small and distances are short, there is no guarantee that the patient will arrive in hospital in good time for these measures to be instituted there. Ambulances and their drivers are not immune to mishaps which may grossly delay the journey to the detriment of the patient. Although ambulances are

often equipped with swabs, dressing and saline bottles, ice and plastic bags can easily be obtained from nearby houses, shops (grocers and butchers), bars or hotels.

One must not be over-enthusiastic in executing first-aid treatment. Wound surfaces should not be tampered with in an attempt to clean them, nor should any antibiotics or antiseptics be applied. Cleaning of these wounds is to be undertaken only by the surgeon so that further trauma to the delicate neurovascular endings is prevented and reconstructive surgery and sub-

sequent healing processes are not jeopardised needlessly.

In the case of large limb segments or parts which are only partially amputated, similar management is called for. However, since it is not practically possible to put such limbs in bags as described earlier, ice-bags containing 1/3 ice and 2/3 water are placed over the limb which has been first covered by compresses moistened with physiological solution and splinted.

On arrival in hospital these measures are ensured by checking what may have been already done on site or by instituting them without further delay. Apart from briefly enquiring about mechanism of injury, medical history and noting of allergies, the patient must be promptly examined to exclude other major injuries, resuscitated as necessary, ATT and ATG given prophylactically, blood taken for base-line urgent investigations and cross-matching and urgent X-rays taken accordingly. Infusions are started before blood is available (saline, Ringer's solution, plasma or plasma substitutes e.g. Dextran-70 or GELAFUNDIN) and a record is kept of all infusions given. Wide bore cannulae are preferred to allow rapid infusions in shocked patients (colour codes of VENFLONS — grey or green at least). More than one line is often necessary and a subclavian or jugular line may be required in cases of severe hypotension and this is performed by an anaesthetist. Catheterisation of the bladder is necessary in assessing fluid balance and ensuring adequate urinary output in shocked patients.

### Conclusion

Whereas the general condition of the victim of traumatic amputations demands priority in management, all attempts to recover and preserve dismembered body parts must be made. Cooling of amputated tissues to about 4 degrees celsius by the methods described will prolong their ischaemic tolerance and viability and favours successful replantation surgery lessening morbidity and subsequent disabilities.

### Reference

Meyer, V.E. and Hubatka, G.: "Replantation Surgery of the Upper Limb" — Documenta Geigy (1980).