Prehospital amputation
Keith M Porter

Emerg Med J 2010 27: 940-942 originally published online October 29, 2010
doi: 10.1136/emj.2009.074500

Updated information and services can be found at:
http://emj.bmj.com/content/27/12/940.full.html

These include:

References
This article cites 4 articles
http://emj.bmj.com/content/27/12/940.full.html#ref-list-1

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://journals.bmj.com/cgi/ep
Prehospital amputation

Keith M Porter

ABSTRACT
Prehospital surgical amputations are rarely necessary. This paper gives a historical perspective, the indications and contraindications for limb amputations, and details a simple technique for both surgeons and non-surgically qualified medical personnel.

Sushruta1 practising sometime between 600 and 800 years BC reported distal limb amputation below the wrist and ankle without excessive blood loss. Proximal tourniquets to facilitate a bloodless field were frowned upon because of the perceived risk of gangrene distal to the tourniquet. Surgical practice included the use of ligatures for haemorrhage.

Hippocrates2 in the 4th century BC restricted amputation to the excision of already dead tissue because of the problems associated with haemorrhage and pain control.

In Roman times Celcus3 described the use of a ligature for haemorrhage control in major limb amputations for trauma. During the post-Roman era cautery became state of the art and was preferred to ligatures by some clinicians.4

By the mid-14th century major vessel ligation associated with limb amputation was common practice for open fractures.5 Some regarded it as a precursor to rehabilitation.

Not all open fractures were associated with amputations. Of note, two eminent surgeons, Ambroise Pare and Percival Pott, both survived open tibial fractures without amputation following horse riding incidents.6

Developments during the 16–18th century included the re-introduction of tourniquets.7 John Hunter8 introduced the concepts of septic contamination, inflammation and weapon muzzle velocity associated with tissue destruction. Larrey, Napoléon Bonaparte’s surgeon, introduced the concept ballistic cavitation and the ‘flying ambulance’ for the provision of a forward surgical capability for early amputation, and for those soldiers with lesser injuries the provision of first aid to enable the soldier to return to the battlefield.

Subsequent amputation rates during the Crimean war, American civil war,9 world war I and world war II have been the outcome of the enhanced destructive power of weapons versus enhanced surgical skills, antiseptic technique and blood transfusion.

CONTEMPORARY EXPERIENCE
There are no published series of civilian prehospital amputations in the UK.

In 18 years of prehospital practice I have performed three amputations. In two patients this involved dividing residual skin and muscle bridges. The third patient was a critically injured lorry driver trapped by a leg in a vehicle on its side with his leg trapped between the cab and a tree (figure 1). Extrication involving heavy lifting gear and tree felling would have taken too long, making amputation the only life-saving option. Fortunately the limb would have been non-salvageable because of catastrophic injuries (figure 2).

INDICATIONS FOR PREHOSPITAL AMPUTATION
These can be summarised as follows:
1. An immediate and real risk to the patient’s life due to a scene safety emergency (figure 3).
2. A deteriorating patient physically trapped by a limb when they will almost certainly die during the time taken to secure extrication (figure 4).
3. A completely mutilated non-survivable limb retaining minimal attachment, which is delaying extrication and evacuation from the scene in a non-immediate life-threatening situation (figure 5).
4. The patient is dead and their limbs are blocking access to potentially live casualties (figure 6).

PROCEDURE (THIS DOES NOT INCLUDE CUTTING SIMPLE REMAINING SKIN BRIDGES)
Pre-amputation preparation
If there is an immediate risk to the patient’s life, for example, fire, proceed to amputation with minimal preparation. In all other cases agree with senior ambulance and fire and rescue personnel (and if possible a second experienced prehospital care doctor) that amputation is necessary to release the patient, and that the patient’s general clinical state and urgency warrants amputation and cannot wait for the patient to be released.

Extreme care with scalpels and sharp instruments is mandatory. Establish a site for your equipment close to the patient so you can undertake the procedure and reach for instruments without involving another person. Passing a scalpel from one person to another can be dangerous and should be avoided if possible.

Ensure emergency personnel close to you are vigilant to avoid personal injury during the procedure.

The necessary equipment is illustrated in figure 7. Following optimisation of oxygenation, ventilation and intravenous or intraosseous access, ketamine as a bolus followed by incremental doses provides safe anaesthesia.

The procedure can be summarised as follows:
   ▶ Apply an effective proximal tourniquet.
   ▶ Amputate as distally as possible.
   ▶ Perform a guillotine amputation.
   ▶ Apply haemostats to large blood vessels.
   ▶ Leave the tourniquet in situ.
For the non-surgeon or inexperienced surgeon, divide the skin circumferentially as distally as possible. Cut through the subcutaneous tissues and open the fascia of the underlying muscle groups. Then using the gloved hand identify muscle groups and divide with tuff cut scissors. Apply clips to longitudinal structures presumed to be major blood vessels. Divide the bone with a gigli saw. Once amputated examine the stump for any obvious blood vessels and apply artery clips. In the event of the tourniquet being dislodged catastrophic bleeding is then less likely to occur. Apply a padded dressing (figure 8) and transport to hospital.

If available undertake a pre-amputation photograph and administer broad-spectrum antibiotics. The amputated limb
should be transported to hospital once released. In some cases donor tissue, for example, skin from the amputated part may assist surgical reconstruction.

**Contraindications**

There are no specific contraindications only immediate risk to the rescuer making the procedure too dangerous. As in all open procedures precautions must be taken to reduce the risk of hepatitis/HIV infection. Extreme care with scalpels and sharp instruments is mandatory.

**CONCLUSION**

The requirement for prehospital amputation other than cutting minimal soft tissue bridges is rare. This paper describes the indications and a safe technique, which in the absence of a surgeon can be undertaken by non-surgically trained medical personnel.

**Competing interests** None.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**REFERENCES**