

The Use of Tourniquets within the Operating Theatre

Full Clinical Guideline

Reference no.: CG-CLIN/4272/24

1. Introduction

Surgical tourniquets enable the surgeon to work in a bloodless operative field by preventing blood flow to a limb and allow surgical procedures to be performed with improved accuracy, safety, and speed.

2. Aim and Purpose

The safe and appropriate application of a tourniquet to a limb or digit.

3. Definitions, Keywords

Tourniquet – A tourniquet is a device that restricts blood flow to help create a bloodless field during the procedure. A tourniquet may be associated with increased risk of pain and complications, (Ahmed *et al.*, 2020)

4. Guideline

The decision and application of a tourniquet is the responsibility of the operating surgeon. The tourniquet application can be delegated to a registered practitioner, (ODP/RGN). This should be discussed with the team during the team briefing.

The limb or digit must be marked and checked against the consent form at both the sign-in and at the time-out. The aim should always be to use the lowest pressure for the shortest length of time, there should also be consideration as to whether the surgery can be performed without using a tourniquet.

Checking of tourniquet equipment

The tourniquet system should be checked prior to patient use. This includes inspecting for cleanliness, integrity, and functionality of the system, checking the cuffs for leaks, worn tubing, loose connections, or faulty gauge. Any equipment found to be faulty must be labelled and removed from use and reported to clinical engineering.

Application of a tourniquet/s

Soft padding must be applied underneath the tourniquet, avoiding creases and ridges, this helps to maintain skin integrity. Too much padding can cause failure of the tourniquet. The tourniquet is applied along with a tourniquet cover or isolation drape to prevent skin preparation from soaking into the padding, which may cause a burn.

The length of the cuff should be individualised, according to the size and circumference of the patient's limb. It is recommended that the shape should allow a snug fit at both proximal and distal edges. The width should be the widest possible, whilst still allowing for surgical access and applied to an area of the limb where there is enough muscle padding. Care should be taken to ensure that the tourniquet does not encroach upon the surgical site. The length should be the minimum that assures overlap around the limb sufficient to fully engage the fasteners.

If the patient is undergoing bilateral surgery, a check must be made with the operating surgeon to discuss if both tourniquets will be inflated simultaneously, or which side will be inflated first. The tourniquet times and side should be recorded on the whiteboard in theatre and in the patient's electronic care plan.

Limb exsanguination

Limb exsanguination can be performed by simple elevation or crepe bandage.

Tourniquet pressure

There are several factors that can influence the inflation pressure of the tourniquet cuff for surgeons, and this includes the patients systolic blood pressure, the size of the limb, or both.

Upper Limb

In the adult patient undergoing upper limb surgery the tourniquet pressure recommended by the British Orthopaedic Association, (2021) is systolic blood pressure plus 50-100 mmHg. Most Surgeons will make a considered judgement on the pressure to inflate the tourniquet and is usually for the upper limb a pressure of 250mmHg, this might need to be higher if the patient is hypertensive. Please check with the operating surgeon prior to inflation the desired inflation pressure and ensure this is documented on the theatre white board and within the patient's electronic care plan, and that the anaesthetist is aware.

Lower Limb

In adult patients (over the age of 16 years), the British Orthopaedic Association, (2021) recommends a pressure of systolic blood pressure plus 70-130 mmHg for lower limb surgery, again speak with the operating surgeon and ensure that the Anaesthetist is aware of the cuff inflation pressure, and the pressures and times are correctly documented.

Paediatric patients

Patients <16 years should have a tourniquet pressure of limb occlusion pressure plus 50 mmHg or systolic blood pressure plus 50-100 mmHg, (British Orthopaedic Association, 2021).

Tourniquet time

The surgical team should aim to use the tourniquet for the shortest time by inflating as late as possible or only using the tourniquet for certain stages of the surgery, the tourniquet should also be deflated as soon as possible. The tourniquet machine should have a timer fitted to allow for ease of tourniquet time monitoring during a procedure. The surgeon should be alerted when the inflation time for the tourniquet reaches one hour and then at thirty-minute intervals, until the two-hour mark is reached. The tourniquet time should ideally be less than two hours and only extended beyond this after a clinical assessment of the relative risks and benefits, by the operating surgeon. Audible reminders of the inflation time must be given to the operating surgeon every ten minutes beyond two hours. For surgical procedures longer than two hours, the tourniquet should be deflated every 2 hours to allow ten minutes of reperfusion of the muscles beneath and distal to the tourniquet cuff, (Kam *et al*, 2001). Sharma and Salhotra (2011, cited in Kumar, Railton and Tawfic, 2016) stated that in paediatric patients, an inflation time of less than seventy-five minutes has been recommended for lower extremities.

Documentation

The time of the inflation and deflation of the tourniquet, inflation pressure, limb or digit site, and any subsequent re-inflation and deflation times, must be recorded and announced to the operating surgeon and the anaesthetist and should be recorded on the theatre whiteboard and within the patient's electronic care plan.

Decontamination

If reusable cuffs are used, they should be decontaminated according to the manufacturers instructions and under the trusts local infection control policy.

Tourniquet related complications

There are several potential complications relating to the use of the tourniquet.

- Nerve injury
- Muscle injury
- Skin Injury
- Vascular Injury
- Tourniquet pain
- Burns and blistering.

Tourniquets may also lead to systemic effects on the cardiovascular system, respiratory system, cerebral circulatory effects due to an increase in EtCO₂, haematological effects, metabolic changes, and temperature changes.

Relative contraindications for the use of a tourniquet

- Sickle cell disease
- Rheumatoid arthritis
- Regional infection (for example cellulitis)
- History of deep vein thrombosis
- Thromboembolic disease or pulmonary embolus
- Known or suspected compartment syndrome

Absolute contraindications

- History of vascular disease with absent pulses or poor capillary return
- Presence of atrioventricular fistula
- Active malignancy
- History of vascular surgery on the limb involved.

Digit tourniquets

A specifically manufactured digit tourniquet should be used for digit surgery, adapted items, such as surgical gloves are no longer recommended.

Only CE marked tourniquets that are labelled and brightly coloured should be used.

These digit tourniquets are single use only and should be disposed of after the procedure.

The digit tourniquet is counted as an accountable item and should be included within the surgical counts.

The total digit tourniquet time should be verbally confirmed to the surgeon by the scrub practitioner.

There should be verbal confirmation to the theatre team when the digit tourniquet is applied and removed, and this must be recorded on the theatre whiteboard and within the patient's electronic care record.

5. **References**

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