SNS COLLEGE OF ALLIED HEALTH SCIENCES

SNS Kalvi Nagar, Coimbatore - 35

Affiliated to Dr MGR Medical University, Chennai

DEPARTMENT OF PHYSICIAN

COURSE NAME : SURGERY

2ND YEAR

TOPIC : TOURNIQUETS

CASE DISCUSSION

Mr. Gopalan, 32 yrs pld male was brought to the casualty with history of Sustaind injury in the Lower leg following Road Traffic Accident , The X-Ray was Taken , and the report shows Fracture of Tibial bone(RT) and the patient was advised for Surgery ... How will you assist the surgeon to perform the surgery without pooling of blood in lower leg????

INTRODUCTION

- A tourniquet is a constricting or compressing device used to control venous and arterial circulation to an extremity for a period of time.
- Pressure is applied circumferentially upon the skin and underlying tissues of a limb; this pressure is transferred to the walls of vessels, causing them to become temporarily occluded..

MECHANISM

- A tourniquet allows for pressure to be applied to the arm so that venous blood returning to the heart can be slowed down. As a result, the blood vessel walls become temporarily occluded and the veins distend due to the pooling of blood.
- This allows veins to become more visible and easier to palpate

MEANING

The word Tourniquet is derived from the French verb-TOURNER

Which means - TO TURN

DOs & DONTs OF TOURNIQUET

- Tourniquets are to be used when major haemorrhage is present and standard control techniques will not be effective.
- Tourniquets must be placed proximal to the injury to control bleeding.
- Once a tourniquet have been placed, do not remove it. Even in the event of discomfort or pain to the patient, post placement.
- Apply constant pressure to the tourniquet until the bleeding slows or stops.
- Note the time in which tourniquet was placed.

PROPERTIES OF TOURNIQUET

- TOURNIQUETS ARE MADE UP OF
- Some tourniquets are made out of Velcro
- a stretchy material
- Latex(Natural rubber latex (NRL)

INDICATIONS

Indications

- Surgery
- Trauma
- "Hand surgery without tourniquet is like
- repairing a clock in an ink container"

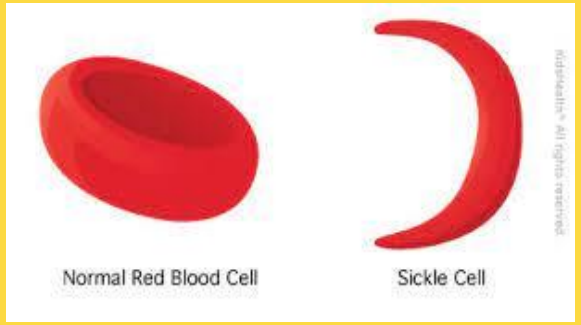
- For blood loss

- IVRA anesthesia and sympathectomy

CONTRAINDICATIONS

Contra indications

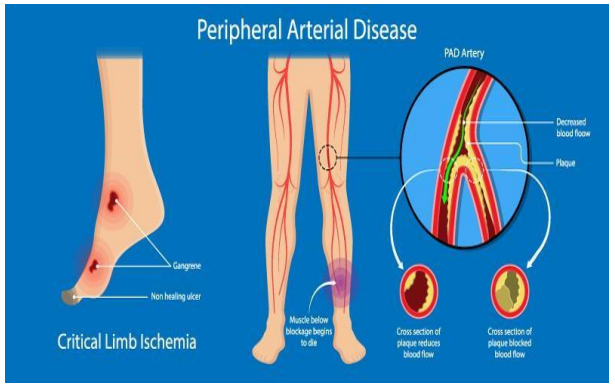
- Open fractures
- Sickle cell disease
- Plastic reconstructive surgery done
- Sever hypertension
- Compartment syndrome and compressions

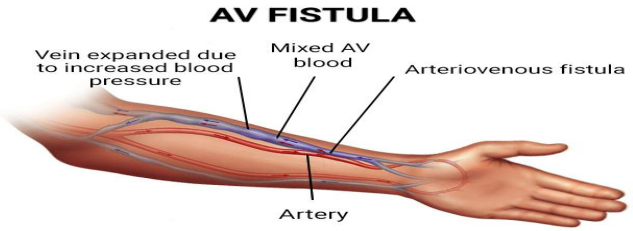


CONTRAINDICATIONS

Contraindications

- Peripheral vascular disease
- Arteriovenous (AV) fistula
- Peripheral neuropathy
- DVT in the limb
- Severe infection of the limb
- Severe trauma to the limb
- Poor skin condition of the limb
- Sickle cell haemoglobinopathy





SIZE OF TOURNIQUET

Size

- 3 inches to 6 inches overlap
- Width more than half the diameter
- Tourniquets should be positioned on the limb at the point of the maximum circumference.
- Soft padding – but no loose cotton
- The choice of size of tourniquet should allow placement of two fingers between the cast padding and the cuff

HISTORY OF TOURNIQUET

History

- Jean Louis Petit coined the word "Tourniquet" from theFrench word tourner (to turn) in 1718 when he used them for lower limb amputations to reduce blood loss.
- In 1873 , Johan friedrich august von esmarch introduced flat rubber tube wrapped repeatedly around the limb as tourniquet
- In 1904 Harvey cushing introduced pneumatic tourniquet to limb surgery

Johan friedrich august von esmarch

TYPES OF TOURNIQUET

Surgical Tourniquets prevent blood flow to a limb and enable surgeons to work in a bloodless operative field and are frequently used in orthopaedic surgery.

Emergency Tourniquets are used in emergency bleeding control to prevent severe blood loss from limb trauma.

EMERGENCY TOURNIQUET

- EMERGENCY TOURNIQUETS
- A tightly tied band applied around a limb (upper or lower) to prevent severe blood loss from limb trauma during emergency.
- It should be used as a last resort to control bleeding.
- Emergency tourniquets are widely used by the military to save combat.

SURGICAL TOURNIQUETS

- SURGICAL TOURNIQUETS
- Surgical tourniquets enable the surgeons to work in a bloodless operative field by preventing blood flow to a limb and allow surical pocedures to be perfomed with improved accuracy, safety and speed.

SURGICAL TOURNIQUETSCONT....

SURGICAL TOURNIQUETS

- They have two basic designs :
- **Inflatable**
- **Non - inflatable**

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NONINFLATABLE (NONPNEUMATIC)

- NONINFLATABLE (NONPNEUMATIC)

  Noninflatable tourniquets are made of rubber or elastic cloth. Now a days their surgical use alone is limited because they have been replaced by modern torniquets system.

PNEUMATIC TOURNIQUETS

- Pneumatic tourniquets are compressed gas to inflate a bladder or cuff to occlude or restrict blood flow.
- A regulating device on the tourniquet machine can control the amount of cuff pressure exerted on the limb.
- The pressure is provided by an electrically driven pump or by a central compressed air supply.

TOURNIQUET PRESSURE

Tourniquet pressure

Tourniquet pressure :

- 50 – 100 mm of Hg above the systolic blood pressure.
- Upper limb 250 mm of Hg
- Lower limb 350 mm of hg

Doppler occlusion pressure (DOP) :

- Upper limb DOP + 50 mm of Hg
- Lower limb DOP + 75 mm of Hg Above the DOPR.
- Upper limb 135 to 255 mm of Hg
- Lower limb 175 to 305 mm of Hg

TOURNIQUET SPECIFICATIONS

Specification of Tourniquet

Tourniquet time :

- Initial time 90 minutes ideal is 45 – 60 m
- >2 hours deflate for 5 minutes for reper

Width of the cuff :

- Standard is 8.5 cm
- 15 cm conical shaped produces subsystolic pressure required to stop detectable flow.

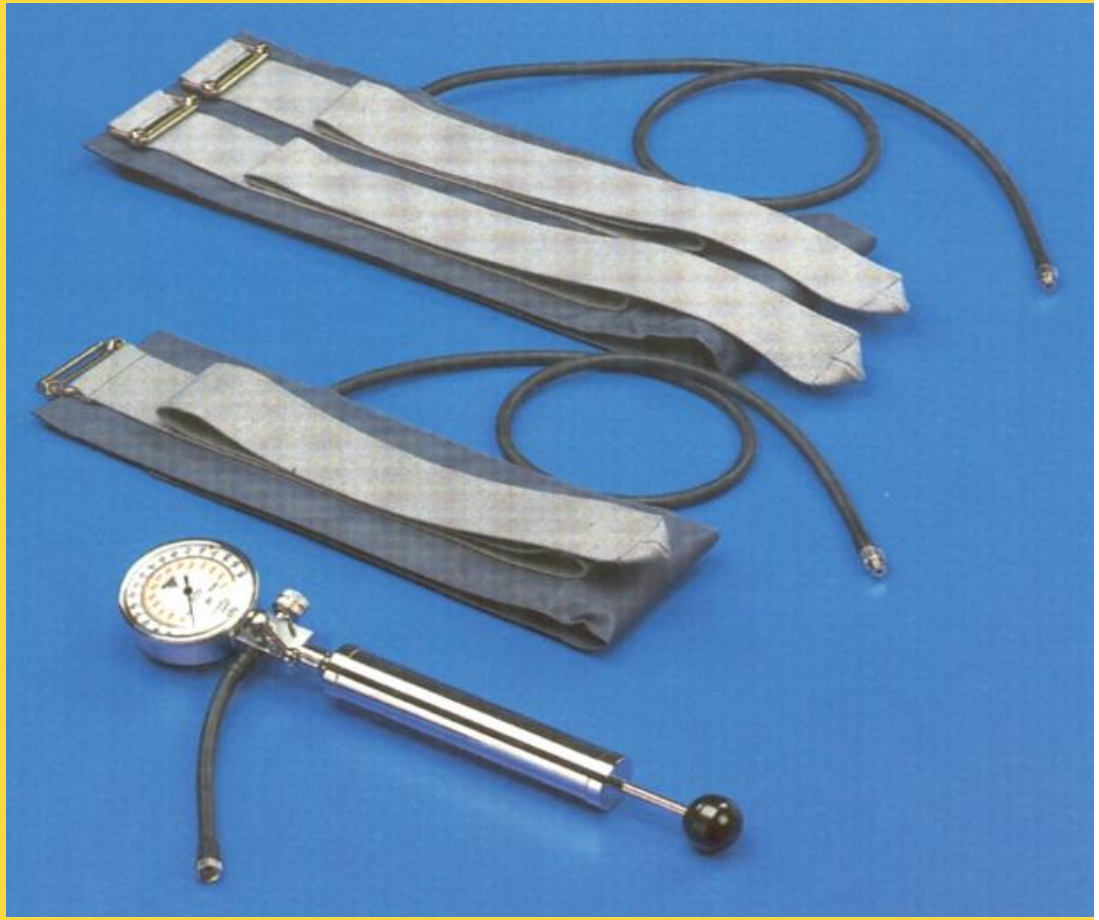
Ischaemic time information to surgeons :

- First 2 hours – half hourly intervals.
- Next at 2.5 hours.
- Next every 15 minutes interval thereafter.

Components of Pneumatic Tourniquets

The five basic components are:

- An inflatable cuff (bladder)
- A compressed gas source
- A pressure display
- A pressure regulator
- Connection tubing.



PRE PROCEDURE

Exsanguination

- Exsanguination before inflation of the tourniquet improves the quality of the bloodless field and minimizes pain associated with tourniquet use.
- It is normally done by limb elevation or using an elastic wrap of the extremity.
- Malignancy, infection thrombi,fracture – simple elevation or nothing – no wrapping
- Rapid inflation – veins and arteries simultaneous

PRE PROCEDURE CONT ...

Exsanguination and inflation pressures

- Maximal exsanguination can be achieved by elevation of the arm or leg for 5 min at 90◦and 45◦ respectively, without mechanical compression.
- 250 mmHg for upper limb and 300 for lower limb
- 100 and 150 above systolic for limbs – arbitrary

COMPLICATIONS

Tourniquet related complications or side effects either local or systemic.

LOCALIZED COMPLICATIONS

- **N**erve injuries

The pathophysiologic cause of nerve injury follwing tourniquet is thought to be a combination of compression and ischemia. The prognois of touriquet induced nerve injuries is generally good-pemanent deficits are rare, and most injuries will heal spotaneously within 6 months.

MUSCLE INJURY

- Muscle injury following the application of the tourniquet is due to the combined effect of ischemia and mechanical deformation of the tissue.

VASCULAR INJURY

- Direct vascular injury is uncommon complication of tourniquet use. it occurs most commonly in children, obese, elderly and patients with peripheral vascular disease

SKIN INJURY

- Skin injuries are uncommon, but excessive tourniquet time or poorly placed tourniquets may result in cutaneous abrasions, blisters and even pressure necrosis.
- The highest risk of skin injury occurs in Children, obese, elderly and patients with peripheral vascular disease.

SYSTEMIC COMPLICATIONS

- Cardiovascular effects

Tourniquet deflation is a critical stage because it causes sudden drop in central venous pressure and mean arterial pressures. Cardiac arrests have been reported following cuff deflation.

- Respiratory effects

Respiratory changes are rare and mainly seen during the deflation of tourniquet

Cerebral circulatory effects

Cerebral circulatory effects

- Patients with reduced intracranial compliance may be higher risk for adverse effects related to the increase in cerebral blood flow.
- Maintaining normocapnia can prevent this increase in cerebral blood flow during deflation.

Hematological effects

- Tourniquet use induces changes in both coagulability and fibrinolysis.
- Tourniquet inflation during surgery is associated with a hypercoagulable state that is due to increased platelet aggregation and stimulation of coagulation factors caused by tissue damage and catecholamines released in response to pain from surgery and the tourniquet application

PREVENTIVE MEASURES

preventive measures

- Tourniquets use only recommended time.
- Check accuracy of the pressure.
- Effective pressure to achieve limb occlusion pressure.
- Use a cuff that properly fits the extremity.

CONSLUSION

Conclusion

Tourniquets are useful aids for limb procedures.

Pre-determination of LOP and inflating tourniquets accordingly can help reduce the complications.

Proper patient monitoring and care after deflation for neurological deficit postoperatively can minimize the complications.

THANK YOU