SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr MGR Medical University, Chennai

DEPARTMENT OF CARDIOPULMONARY PERFUSION CARE TECHNOLOGY

COURSE NAME: Introduction to Surgery

UNIT II - Haemorrhage and wound

TOPIC : Tourniquet

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EMPATHIZE: The Clinical Challenge

Problem: Excessive bleeding during limb surgeries impairs surgical visibility

Clinical Need: Safe, effective hemostasis without compromising patient safety

Complexity:

Balance between blood loss reduction and tissue damage prevention

Impact: ~27% of tourniquet placements are misapplied, leading to serious complications

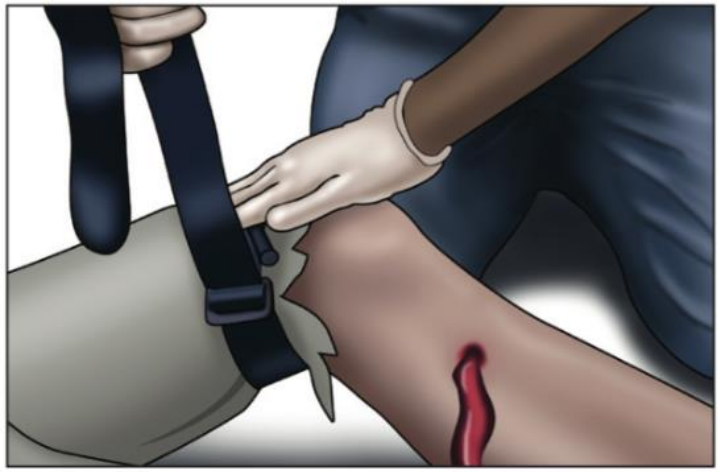
DEFINE: What is a Tourniquet?

- A mechanical device that occludes arterial blood flow to a limb, creating a bloodless surgical field
- **Mechanism:** Circumferential pressure compression on extremity circumference
- **Outcome:** Temporary ischemia for enhanced surgical precision and reduced Hemorrhage
- **Scope:** Widely used in orthopaedic, vascular, plastic, and emergency surgery

IDEATE: Classification of Tourniquets

By Clinical Use

Surgical: Elective procedures
Emergency: Trauma/hemorrhage control



By Technology

Pneumatic: Compressed gas (modern)
Manual: Esmarch/rolled glove

PROTOTYPE: Pneumatic Tourniquet Components

Inflatable Cuff (Bladder):

Exerts circumferential pressure on limb

Compressed Gas Source:

Nitrogen or compressed air (regulated)

Pressure Display:

Digital or analog gauge for monitoring (mmHg)

Pressure Regulator:

Controls inflation to desired pressure levels

Connection Tubing:

Transmits pressure from source to cuff

TEST: Tourniquet Pressure Recommendations

Based on Limb Occlusion Pressure (LOP):

- LOP <130 mmHg → Add 40 mmHg
- LOP 131-190 mmHg → Add 60 mmHg
- LOP >190 mmHg → Add 80 mmHg
- **Paediatric patients:** LOP + 50 mmHg (max safe pressure: 500 mmHg)
- **Standard upper limb:** 250 mmHg; **lower limb:** 300 mmHg

Surgical Vs Emergency Tourniquets

SURGICAL

- Elective orthopaedic/plastic surgery
- Pneumatic, pressure-controlled
- **Duration:** <2-2.5 hours
- Planned, monitored application

EMERGENCY

- Trauma, hemorrhage control
- Manual or rapid-deployment
- **Duration**: Variable, <120 min safe
- Rapid, field-based application

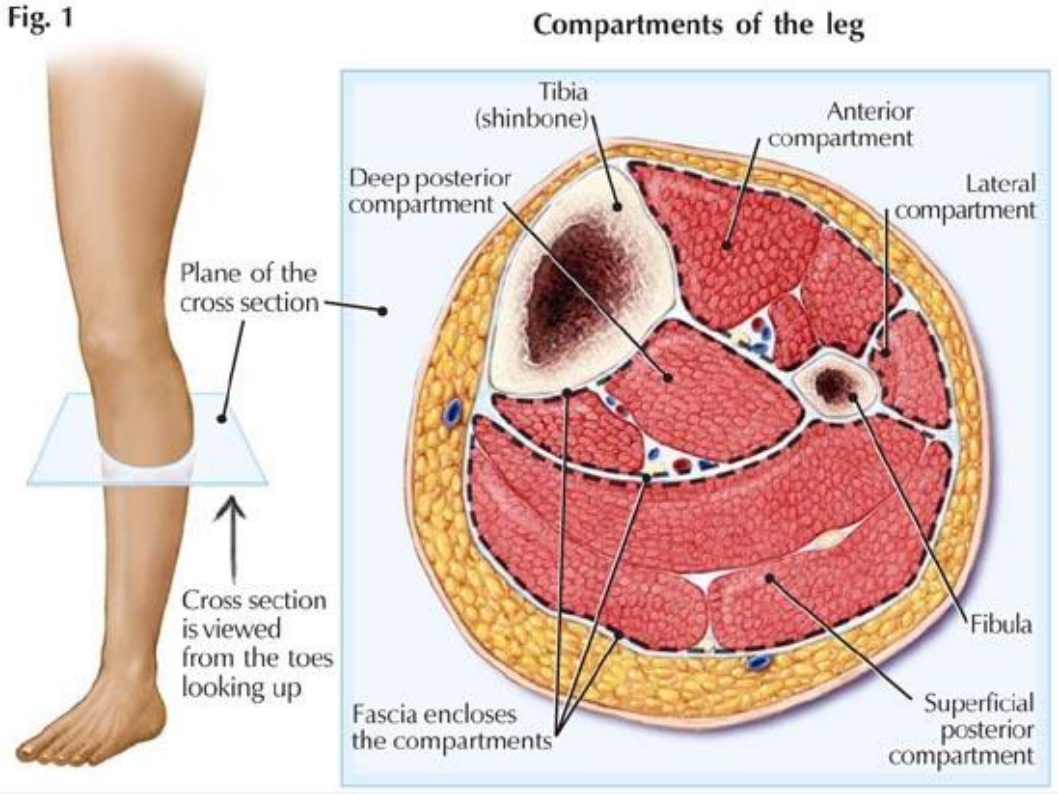
Safe Application: Timing & Duration

- **Optimal Duration:** 60-90 minutes for lower extremity; <75 min for paediatric
- **Maximum Safe Time:** 120 minutes for healthy adults
- **Deflation Protocol:** Assess at 2 hours; if >2.5 hours anticipated, deflate 10 min at 2h, then every 1 hour
- **Post-Deflation Bleeding:** Peak fibrinolytic activity at 15 min, returns to normal by 30 min
- **Monitoring:** Timer alarm mandatory; continuous pressure gauge documentation

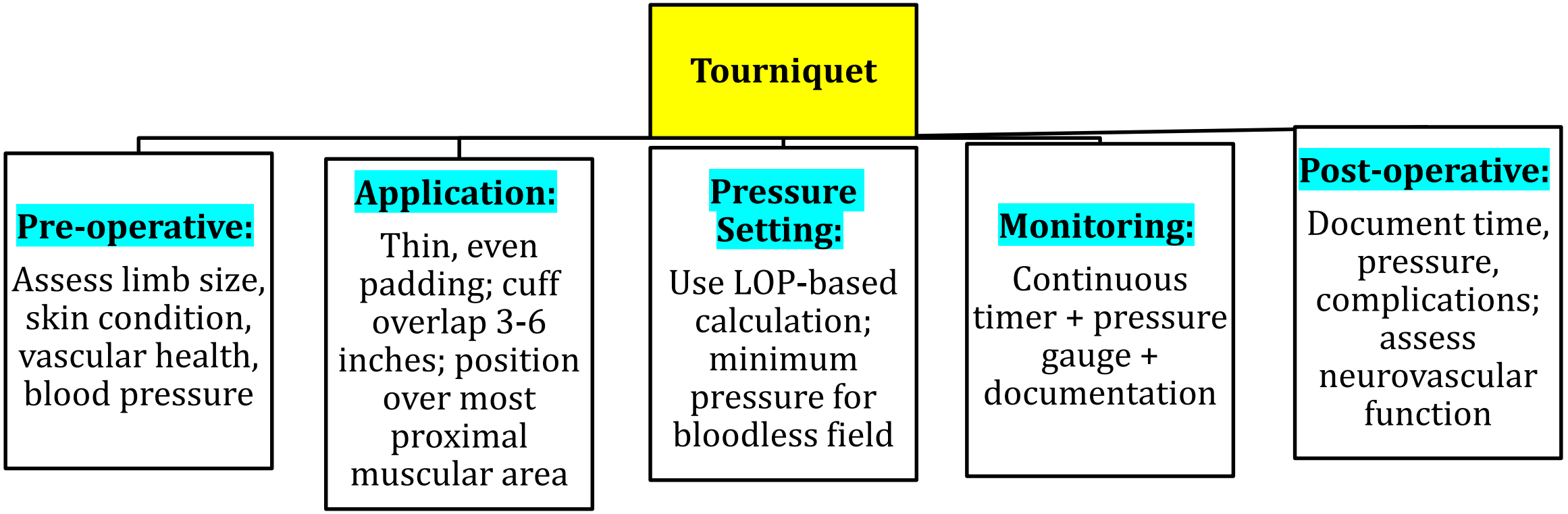
Complications & Prevention Strategies

Major Complications (with prevalence):

- **Nerve Palsy:** 10.7% - Minimize pressure and duration
- **Pressure Ulcers:** 5.6% - Adequate padding (thin, even layer)
- **Rhabdomyolysis:** 10.6% - Limit duration, avoid high pressures
- **Compartment Syndrome:** 3.9% - Monitor post-operatively, deflate if swelling occurs
- **Thromboembolic Events:** 5% - Mobilize patient post-operatively, prophylaxis as needed



Summary


Tourniquet
Pre-operative:
Assess limb size, skin condition, vascular health, blood pressure
Application:
Thin, even padding; cuff overlap 3-6 inches; position over most proximal muscular area
Pressure Setting:
Use LOP-based calculation; minimum pressure for bloodless field
Monitoring:
Continuous timer + pressure gauge + documentation
Post-operative:
Document time, pressure, complications; assess neurovascular function

References

- https://pmc.ncbi.nlm.nih.gov/articles/PMC12188649/
- https://www.slideshare.net/slideshow/tourniquet/34252488
- https://pmc.ncbi.nlm.nih.gov/articles/PMC3421924/
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THANK YOU