

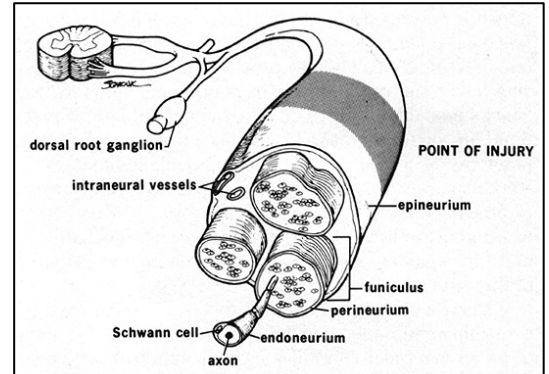
Tourniquet Physiology

Anesthetic Pearls: Anesthetic Implications of Physiologic Changes of Tourniquet Deflation

Peripheral orthopedic procedures often require the use of a tourniquet around upper or lower extremities to minimize blood loss and provide better operating visualization. Tourniquet placement is a non-physiologic effector that causes many regional and systemic pathophysiologic changes.

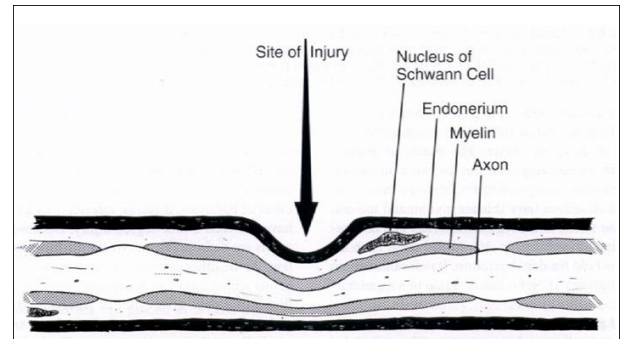
Neurologic Effects

1. Abolition of SSEP's and nerve conduction past the tourniquet within 30 min of concurrent inflation
2. Tourniquet pain and hypertension after 60 min of concurrent inflation time
3. Post-op risk of neuropraxia (temporary loss of motor and sensory function due to blockage of nerve conduction; usually lasts an average of 6 - 8 weeks before full recovery) is greatly increased if concurrent inflation time more than 2 hrs
4. Nerve injury may occur at a skin level under the edge of the tourniquet cuff



Muscle Changes

- A. Cellular hypoxia develops within 10 min
- B. Cellular creatine declines
- C. Progressive cellular acidosis
- D. Endothelial capillary leak develops after 2 hrs
- E. Limb becomes progressively colder



Systemic Effects of Tourniquet Inflation

Elevation in arterial and pulmonary artery pressures occurs as the concurrent tourniquet time approaches 60 minutes. This is usually slight to moderate if only one limb is occluded. The response is more severe in patients under anesthesia that do not include a potent inhalational anesthetic agent.

Physiologic Changes of Tourniquet Deflation

1. Transient fall in core temperature (typically $\sim 0.7^\circ\text{C}$)
2. Metabolic acidosis (transient)
3. Decreased local central venous oxygen tension (systemic hypoxemia is unusual)
4. Release of acidic metabolites into central circulation (Thromboxane, Prostaglandins, Leukotrienes, and CO_2)
5. Transient (but significant) decrease in pulmonary and systemic arterial pressures
6. Increase in end-tidal CO_2 (transient)
7. Increase in heart rate ($\sim 10\%$)
8. Increase in serum potassium ($\sim 5\text{-}10\%$)

