Tourniquet Pain

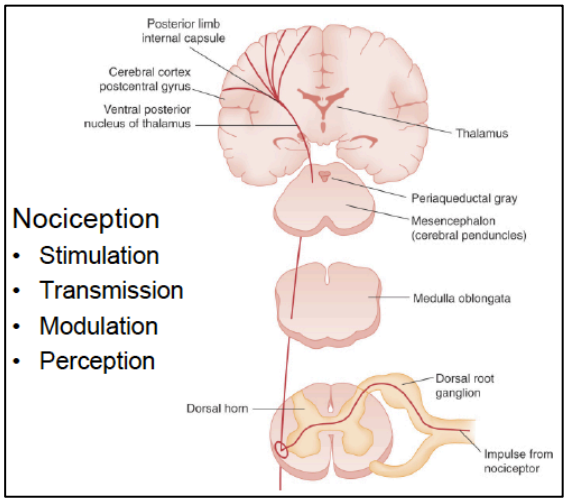
Anesthetic Pearls: Anesthetic Implications and Management of Tourniquet Pain

Pneumatic tourniquets are used for surgery of the extremities to decrease bleeding and increase surgical visualization. The tourniquet cuffs are inflated to pressures of 100 mmHg above systemic arterial pressure at the location of placement. Reversible ischemia occurs when concurrent inflation times are between 1 - 2 hours. Numerous studies have shown that non-reversible ischemia occurs when concurrent inflation times are greater than 3 hours. Tourniquet-induced pain is an ill-defined pain that occurs 45 - 60 minutes after concurrent tourniquet inflation and is often described as dull and achy with increasing intensity.

Causation theories of tourniquet-induced pain:

A. Compression and ischemia of medial / radial / ulnar nerves (upper extremity) and sciatic nerve (lower extremity).
B. Activation of very large nociceptive fibers (A-delta).
C. Transmission of very small unmyelinated fibers traveling along the sympathetic trunks (C-fibers).
D. Different nerve sensitivity to local anesthetic drug (C-fibers are more resistant to suppression than A-delta fibers).
E. Frequency dependent block (Bupivacaine / Ropivicaine have greater frequency-dependent blockade than Tetracaine).

FIBER TYPE		FUNCTION	SIZE (μm)	CONDUCTION Velocity (m / sec)
Aα	Ia	Proprioception, stretch, Primary muscle spindle afferents Motor efferent to muscles (extrafusal)	12 - 22	70 - 120
Aα	Ib	Contractile force: Golgi tendon organ afferents	12 - 22	70 - 120
Aβ	II	Mechanoreception: discriminative touch, pressure, joint rotation Secondary muscle spindle afferents	5 - 12	30 - 70
Aγ	II	Muscle spindle (intrafusal) efferents	2 - 8	15 - 30
Aδ	III	Mechanoreception: touch Nociception: discriminative pain	1 - 5	5 - 30
B	-	Sympathetic preganglionic axons	< 3	3 - 15
C	IV	Nociception: in inflammatory or visceral pain, thermal sense	0.1 - 1.3	0.6 - 2.0



Anesthetic Implications:

1. Tourniquet pain is **not** related to sensory level of anesthesia.
2. Consider using Bupivacaine / Ropivicaine for spinal anesthesia instead of Tetracaine when using a lower extremity tourniquet.
3. Add narcotics to local anesthetic induced subarachnoid or epidural blockade (improves quality of block and delays tourniquet pain).
4. May add Ketamine IV (0.5 mg kg).
5. May allow sedated but awake patients using a regional anesthetic blocks.
6. Treat pain early with IV narcotics.
7. Be prepare for general anesthesia if pain develops early in the procedure.
8. Consider release of tourniquet until pain resolves and then re-inflate (must have sympathetic and understanding surgeon).

*** **The only efficacious treatment for tourniquet pain is to release the tourniquet cuff pressure.**