TOURNIQUET PAIN
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Tourniquet pain (TP) usually presents as a dull ache in the area of the tourniquet, which tends to increase in intensity to the point that general anesthesia is frequently required. There is no good correlation between the pin level and onset of TP, since pin levels anywhere from L-1 to T-3 have been noted at the onset of TP.

Although the origin of TP is controversial, it is currently believed that C fibers are more resistant to local anesthetic than A-delta fibers, especially with repetitive stimulus. This is called frequency dependant block (ie. low frequency impulses are conducted, but higher frequency impulses are blocked).

Most of the studies of TP have been done during spinal anesthetics:

- Egbert looked at TP with hyperbaric tetracaine, 12 mg versus 16 mg. He saw TP incidence of 63.6% and 33.3%, respectively. He felt that the larger dose probably caused a denser block (each dose had the same maximal spread).

- Bridenbaugh et al compared 15 mg of bupivicaine, isobaric versus hyperbaric. They saw TP incidence of 13.3% and 36.1%, respectively. They noted that although the maximum spread was similar (T-4) in each group, the isobaric group had a prolonged block in the lumbar and sacral roots. This may be related to the different spreading characteristics of isobaric versus hyperbaric mixtures in the intrathecal space. Hyperbaric solutions tend to diffuse down the thoracic curve, while isobaric solutions tend to not diffuse as far from the point of injection. The net result is that a denser block is seen in the lumbosacral roots with an isobaric mixture.

- Rocco et al compared 22.5 mg isobaric bupivicaine (without epi) with 14 mg hyperbaric tetracaine (with epi). They saw an incidence of TP of 7% and 23%, respectively. Although this comparison of bupivicaine and tetracaine was flawed by not having consistent use of epi or consistent baricity, they made an interesting observation that was reported in a followup paper. They correlated TP with the regression of "touch" level to L-2. They noted that the touch level was significantly lower than the pin level, especially when epi containing solutions were used, when hyperbaric injections were done in the sitting position, and when the levels were regressing. Thus though the pin level might be at T-4, if the touch level had regressed to L-2, TP was seen.

- Solark studied the effect of epidural fentanyl, hypothesizing that epidural narcotics inhibit the release of substance P, the proposed neurotransmitter of C fibers. Patients had lumbar epidural anesthesia with 2% lidocaine (with epi). Tourniquet pain was treated with either 100 ug fentanyl (in 10cc) epidurally or 10 cc saline
epidurally. Five of six patients given fentanyl had relief, while none of four patients given saline had relief.

Conclusions:

The goal is to avoid TP, rather than try to treat it. To avoid it, you need a dense block of the lumbosacral roots, to keep the touch level above L-2.

To avoid TP with a spinal anesthetic:

- Isobaric solutions may be preferrable to hyperbarics.
- The larger the mg dose, the less TP seen.
- Bupivicaine may be superior to tetracaine.
- Consider using an intrathecal catheter, to redose as needed.
- Consider adding intrathecal narcotics.

To avoid TP with an epidural anesthetic, I tend to use concentrated solutions (2% lidocaine with epi/bicarb). I calculate out my initial dose and give it, but give an additional 1/3 to 1/2 of this dose 15 to 20 minutes later. Dosing in this manner, you may be able to achieve a denser block without significantly raising the level. I redose conscientiously on a schedule (50 to 60 minutes for lidocaine), and give these redoses in increments over 10 minutes. I also use epidural fentanyl, to help potentiate the block. Using this regimen one can usually maintain a dense block and avoid TP.

References:


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