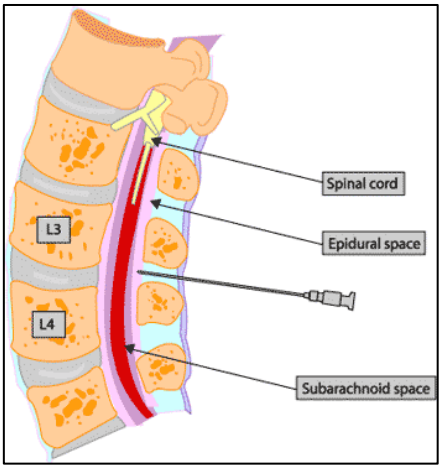
Epidural Analgesia: Narcotic Spread

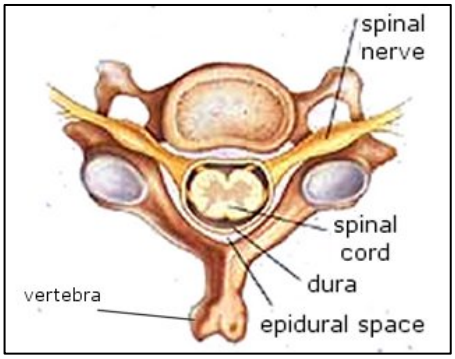
Anesthetic Pearls: Anesthetic Implications of the Spread of Epidural Narcotics



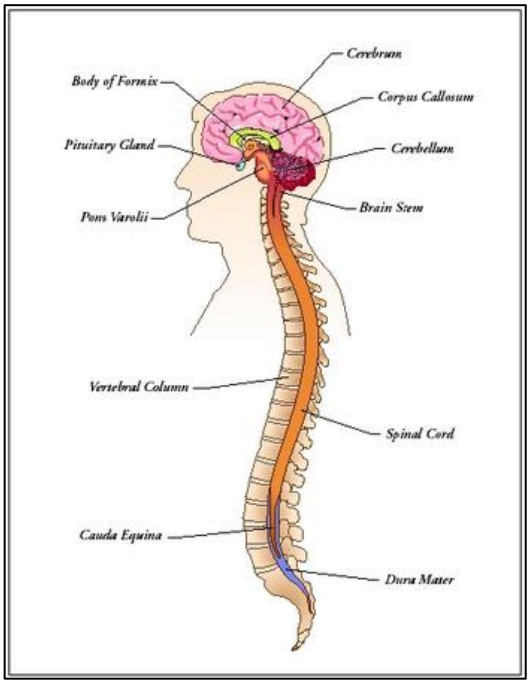
Administration of epidural opioids is affected by the pharmacokinetic aspects related to dural penetration, fat deposition, and systemic absorption. Large doses of opioids can result in clinically significant blood concentrations.

Factors having a significant pharmacokinetic effect on epidural opioids:

1. Lipophilicity of drug
2. Dose of drug
3. Mode of drug delivery (bolus vs. infusion)
4. Volume of injectate
5. Use of Epinephrine (with Fentanyl analogues but **not** Morphine)



After epidural injection of a highly ionized and hydrophilic opioid (Morphine), only low concentrations of lipid-soluble unionized drug will be present in solution in the epidural space. Thus transfer of Morphine across the dura into CSF will be slow. However, absorption into the venous system, is rapid and blood concentrations may reach those for an equivalent dose given intramuscularly. Because most of the drug present in the CSF will be ionized, only a small concentration gradient of unionized exists therefore making transfer of drug from CSF to spinal cord and egress of drug from spinal cord to CSF a slow process. The high concentrations of ionized drug in the CSF will be available to move upward with the spinal CSF flow and thus extend the level of analgesia (also to migrate to supraspinal structures). This correlates with the slow onset and long duration of analgesia as well as the observation of delayed respiratory depression with epidural Morphine.



After epidural injection of a lipophilic opioid, there will be rapid transfer to CSF, into spinal radicular arteries, and then into the epidural veins. In the presence of brisk spinal artery blood flow and relatively slow epidural venous flow, transfer of the drug to the spinal cord will predominate while the concentration gradient is high. However, significant vascular absorption into epidural veins will reduce the concentration relatively rapidly. Egress from spinal cord receptors will be equally rapid. Thus analgesia will be rapid in onset and only of medium duration (Sufentanil may have a long duration of action despite being lipophilic, possibly by nonspecific binding to spinal cord lipid, combined with higher affinity for the mu receptor). Late respiratory depression is unlikely.