Opioids in Renal Disease

Anesthetic Pearls: Anesthetic Implications and Management of Opioids in Renal Disease

Opioid elimination closely follows first order hepatic enzymatic transformation into pharmacologically inactive metabolites that are excreted by the kidneys and GI tract. Morphine and Meperidine are the exceptions; both have active metabolites that are excreted by the kidneys. Morphine is broken down into Morphine 3-glucuronide and Morphine 6-glucuronide which can result in respiratory depression. Meperidine is broken down to produce Normeperidine which has residual opioid intrinsic activity (mu receptor effects) and epileptogenic potency (seizures). Elimination of lipophilic opioids such as Fentanyl and Meperidine also have prolonged elimination times due to the redistribution from lipid stores. Sufentanil and Alfentanil which are less lipophilic have smaller volumes of distribution and elimination times so they usually do not accumulate. Alfentanil is excreted almost entirely by the liver and highly protein bound.

Depending on the severity of the renal disease and whether or not the patient has had dialysis, consideration for their volume status is necessary in the initial dosing. Another factor is neurologic sequalae of renal failure pre-operatively and the need to evaluate the patient post-op. Both of these conditions usually result in lower dosages given in renal failure as well. One very important rule is medication titration. Generally one dose of Meperidine will not harm the patient and is stated by one source to take multiple repeated injections with eventual build up of Normeperidine often taking several days. However, surgeons typically do not want Meperidine to be given.

Remifentanil is an ultra-short acting opioid. It is not an issue in renal disease because it is so rapidly metabolized to a substantially less active compound. The molecule has an ester side chain that is extremely susceptible to metabolism by the blood and tissue esterases.

Opioid	Protein Bound	Route of Elimination	Liver Disease
Alfentanil	90%	99% Hepatic 1% Renal	Decrease dose
Fentanyl	80%	92% Hepatic 8% Renal	None
Meperidine	65%	95% Hepatic 5% Renal	Decrease oral dose by 50% in cirrhosis or acute viral hepatitis
Methadone	80%	80% Hepatic 20% Renal	None or decrease dose
Morphine	35%	90% Hepatic & GI tract 10% Renal **Extensive Glucuronidation**	None, but avoid in severe liver disease