

Succinylcholine: Pharmacokinetics

Anesthetic Pearls: Anesthetic Implications of Succinylcholine Pharmacokinetics

Succinylcholine is a depolarizing muscle relaxant with two phases to its action. Phase-I is characterized by a fast onset time, muscle fasciculations, a constant train-of-four ratio and fast recovery. Phase-II block develops when succinylcholine is used for periods greater than 30 minutes. It is characterized by a decrement in the train-of-four ratio and slow recovery.

Succinylcholine has a brief duration of action because it is rapidly hydrolyzed by psuedocholinesterase enzymes of the liver and plasma. This rapid hydrolysis enables only a fraction of the original intravenous dose to reach the neuromuscular junction. Neuromuscular blockade by succinylcholine is terminated by its diffusion away from the motor endplate into the extracellular fluid. There is little to no psuedocholinesterase at the motor endplate junction.

The duration of action of succinylcholine can be prolonged by a reducing the quantity of psuedocholinesterase or by an atypical form of psuedocholinesterase. Low psuedocholinesterase levels are not a major concern in clinical practice. In the patient with low enzyme levels, succinylcholine duration of action is increased to about 23 minutes from the usual 5 to 10 minutes. Enzyme levels are lowered by 1) liver disease, 2) pregnancy, and 3) cancer. Various drugs can also reduce enzyme levels. It is in patients born with the atypical form of the enzyme that clinically significant prolonged duration of succinylcholine neuromuscular blockade occurs. These individuals are homozygous for the abnormal gene. Succinylcholine motor block may last 3 to 6 hours in these individuals.

The Dibucaine number indicates the genetic make-up of an individual. Dibucaine is an amino amide local anesthetic (cinchocaine) that inhibits normal psuedocholinesterase hydrolysis activity by approximately 80 percent. The atypical enzyme is inhibited about 20 percent. The Dibucaine number does not measure quantity of the enzyme present but rather the quality of the enzyme. Typical measurement of dibucane number in the United States yields values of 80 and above for wild type homozygotes (normal), 40-60 for heterozygotes (atypical), and 20 or less for atypical homozygotes.