Magnets may help prevent rare complication of spinal anesthesia

June 1 2012

An simple technique using local anesthetic mixed with magnetized "ferrofluids" may provide a new approach to preventing a rare but serious complication of spinal anesthesia, reports the June issue of *Anesthesia & Analgesia*, official journal of the International Anesthesia Research Society (IARS).

With further research, the magnet technique may provide a second means—in addition to gravity—of preventing "high spinal block," which occurs when spinal anesthetics spread to the upper portions of the spinal cord. The preliminary studies were performed by Dr Robert H. Thiele of University of Virginia Health Sciences Center, Charlottesville.

Magnetic Technique May Permit Gravity-Defying Anesthesia

Although very rare—occurring at a rate of about 0.6 per 1,000 cases—high spinal block is a serious complication of spinal anesthesia. It occurs when injected anesthetics travel too high in the spinal cord, interfering with the spinal cord fibers governing heart function. This can result in sharp drops in heart rate and blood pressure, with a risk of cardiac arrest and death.

Anesthesiologists currently prevent high spinal block by modifying the anesthetic dose and by positioning the patient so that gravity distributes the anesthetic to the lower portions of the spinal cord. "However, in

certain instances, gravitational forces alone may not be sufficient to control block height," the researchers write. They evaluated a different approach: using magnetized anesthetic fluid and a weak magnetic field to control the spread of fluids.

Dr. Thiele and colleagues created a simple model of the spine using fluid-filled plastic tubing. They then prepared a local anesthetic solution with or without the addition of a water-based ferrofluid to magnetize the fluid. In this model, both fluids ran downward by gravity.

However, when a magnet placed outside the tubing, below the level of the needle, it halted the downward flow of magnetized fluid. In fact, when the magnet was moved, the fluid moved "uphill," against gravity.

Dr Thiele and coauthors believe that a similar technique using magnetized local anesthetic solution and exterior magnets could help to control the spread of spinal anesthesia during surgical procedures, thus providing a simple but effective additional safeguard against high spinal block. It might also be useful in controlling the spread of anesthetics in other situations—for example, spinal anesthesia on one side of the body.

Of course, much more research is needed before a concept demonstrated in plastic tubing can be applied in patients. Among the questions to be answered is the safety of the magnetic fluid—the ferrofluid used in the experiments is not approved for use in humans, although magnetic particles are used in other medical treatments.

Other issues include the quality of anesthesia and practical matters related to applying a magnetic field in the operating room. Pending further study, the new magnetic technique "may allow anesthesia providers a second means of controlling block spread," the researchers write.

More information: A video demonstration can be viewed online at http://links.lww.com/AA/A377.

Provided by International Anesthesia Research Society