

## ANESTHESIOLOGY

### ■ Comparison of Cricothyrotomy Methods Performed by Inexperienced Clinicians. Eisenburger *et al.* (page 687)

Insertion of a tracheal tube *via* cricothyrotomy is one of the final airway management options in a cannot-ventilate/cannot-intubate scenario. However, because this tends to be a rare occurrence, many physicians have little experience with either the conventional surgical or blind Seldinger technique of cricothyrotomy.

Accordingly, Eisenburger *et al.* recruited 20 intensive care unit physicians, each of whom had performed numerous conventional endotracheal intubations but had no previous cricothyrotomy experience. The aim of the team was to compare methods of cricothyrotomy *vis a vis* speed and reliability in first-time performers. The physicians participated in a 60-min training session using slides detailing neck anatomy and written instructions regarding the methods of both conventional surgical and Seldinger techniques.

The study was performed in 40 consecutive unembalmed adult human cadavers. Physicians were assigned to perform cricothyrotomies in random order and were allowed only one attempt per procedure and cadaver. One member of the research team watched each attempt and put participants under stress by constantly reminding them of the time constraints. Three time intervals were measured with a stop watch: from start of the procedure to location of the cricothyroid membrane, from start of the procedure to either tracheal puncture or penetration with scalpel (depending on method being evaluated), and from start of procedure to first ventilation with a breathing bag.

Participants rated the difficulty of the cadavers' anatomic situations and of using both cricothyrotomy methods using a visual analog scale. A pathologist dissected the neck after each procedure and assessed correct placement of cannulae in the trachea and any potential injury inflicted by the procedure.

Tracheal placement was achieved in 70% of group 1 (surgical) procedures and in 60% of group 2 (Seldinger) procedures. Failures in group 1 were caused by paratracheal, esophageal, or subcutaneous misplacement; failures in group 2 were attributed mainly to kinking of the guidewire during insertion. Incidence of tissue injury was similar for both methods. The researchers concluded that although cadavers do not reflect real-life clinical situations, the incidence of failure in these first-time performers underscores the need for further studies

to define the learning curve for both techniques and to determine more effective methods for teaching such critically important techniques.

### ■ Characterizing Intrathecal Morphine-induced Scratching and Antinociception in Monkeys. Ko *et al.* (page 795)

Using eight rhesus monkeys, Ko *et al.* evaluated time course and dose dependency of scratching responses and antinociception after intrathecal administration of morphine. One monkey had been previously exposed to short-term opioids, whereas three had long-term exposure before the study. However, none of the monkeys received any opioids for 1 month before the present study.

Initially, the monkeys were anesthetized with ketamine, and spinal needles were inserted into the subarachnoid interspace between L4/L5 or L5/L6 lumbar vertebrae. A 1-ml saline solution of morphine was slowly infused through the spinal needle within 30 s, and monkeys were then returned to their home cages. Experimental sessions took place a maximum of three to four times per month in each monkey and were spaced 8–10 days apart to prevent possible development of opioid tolerance.

The first four monkeys were used only to study intrathecal morphine-induced scratching responses and to evaluate the efficacy of intravenous nalmeferene in attenuating scratching responses. Monkeys were videotaped 15 min/h for 6 h after intrathecal morphine administration. Scratching responses, defined as 1-s episodes of scraping contact of the forepaw or hind paw on the skin surface, were counted by independent observers blinded to experimental conditions. The researchers found that low to medium doses of intrathecal morphine (1–32  $\mu$ g) induced scratching in a dose-dependent fashion. Peak effects were observed at 1–2 h after intrathecal injection, and scratching lasted for at least 6 h. The team observed that monkeys had different susceptibilities to intrathecal morphine-induced scratching, with 32  $\mu$ g intrathecal morphine inducing profound scratching responses in two monkeys but not in the others. Statistical analysis indicated that intrathecal morphine from low doses (1 or 3.2  $\mu$ g) to high doses (320  $\mu$ g) significantly evoked scratching responses compared with saline injections and reached a plateau for most monkeys at higher doses in the range of 100–320  $\mu$ g.

The second group of four monkeys had been previously trained in the warm-water tail-withdrawal procedure for assessing antinociception and were therefore used for both scratching responses and antinociceptive studies. The effects of intrathecal morphine were studied during six 1-h test sessions by giving different doses randomly in a single dosing procedure. These monkeys displayed a consistent profile in warm-water tail-withdrawal responses. Medium to high doses of intrathecal morphine (10–320  $\mu\text{g}$ ) dose-dependently produced thermal antinociception in 50°C water. However, the researchers admit that this behavioral measurement may

have been influenced by ketamine administered before the intrathecal injection.

Nalmefene, an opioid antagonist, attenuated maximum scratching responses when given intravenously (10–32  $\mu\text{g}/\text{kg}$ ). Pretreatment with nalmefene produced 10-fold rightward shifts of the intrathecal morphine dose-response curve for both scratching and antinociception.

This is the first primate mode of itching produced by intrathecal opioids and may prove useful for both exploring the mechanisms and treatment of this bothersome side effect of a valuable clinical technique.

**Gretchen Henkel**