[NM-178] Variation in the intracuff pressure of cuffed endotracheal tubes during cardiac surgery in infants and children

Ramesh A, Kako H, Krishna S, Khan S, Naguib A, Tobias J
Nationwide Children's Hospital , Columbus , Ohio, United states of america

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INTRODUCTION

Recent studies have shown that cuffed endotracheal tubes (cETTs) can be used safely in pediatric patients. However, various factors may affect the intracuff pressure (CP) during prolonged surgical procedures. In children undergoing cardiac surgery, the relative hypotension seen during cardiopulmonary bypass (CPB) can be an additional concern, where even a small unintended increase in the CP may compromise perfusion of the tracheal mucosa. In this study, we monitored the CP continuously in infants and children subjected to cardiopulmonary bypass (CPB) during cardiac surgery.

METHODS

After obtaining IRB approval, the prospective study was conducted in 17 pediatric patients who underwent cardiac surgery using CPB. Following induction of general anesthesia and cETT placement, the cuff was inflated to the desired level using the air-leak test to 20 cmH2O CPAP in the circuit. Subsequently, the CP was continuously monitored using the transducer of the invasive pressure monitoring device as previously described.[1] The CP, body temperature, and MAP were recorded every 30 minutes during the intraoperative course.

RESULTS

The patients ranged in age from 8 days to 6.6 years (1.5 ± 1.8 years) and in weight from 3.3 to 22.5 kilograms (8.2 ± 4.9 kgs) respectively. The size of the cETT used ranged from 3.0 mm to 5.0 mm ID. The mean CP immediately after inflation of the cuff was 13.0 ± 6.8 cmH2O. Over time, the change in the CP from the baseline was: 0.1 ± 4.3 cmH2O at a body temperature of 35-37°C, -4.8 ± 2.6 cmH2O ($p<0.01$) at 31-33°C, -10.6 ± 5.4 cmH2O ($p<0.01$) at 27-29°C and -13.2 ± 4.9 cmH2O ($p<0.01$) at <27°C respectively. With normalization of the body temperature (36-37°C), the CP increased back to baseline (mean of -0.3 cmH2O from the initial value).

DISCUSSION

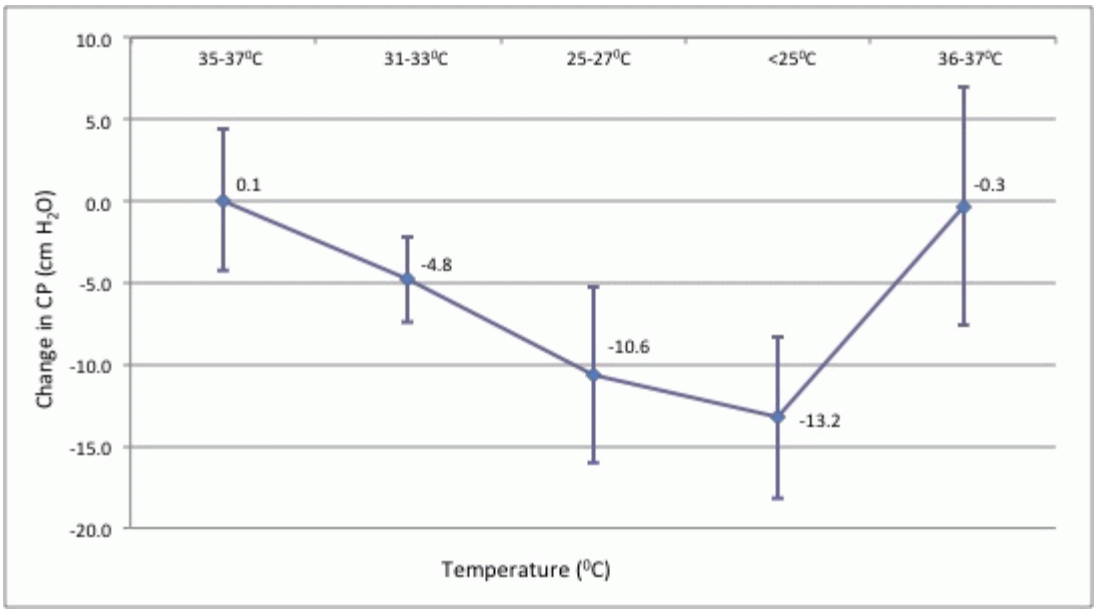
The CP of a cETT is influenced by multiple intraoperative factors including body temperature, use of nitrous oxide, depth of anesthesia, and the position of the head and neck of the patient. The current study revealed a linear decrease in the CP with decrease in temperature during CPB followed by a return of the CP to baseline as the temperature was normalized. This variability of the CP and its multi-factorial dependence suggest that continuous monitoring of CP may be beneficial. The decrease in the CP as the core temperature decreases with the initiation of CPB may serve as a protective mechanism against the relative hypotension that occurs during CPB.

REFERENCES

1. Int J Pediatr Otorhinolaryngol 2013;77:1135-8.
2. Br J Anaesth. 1995;74:283-6.
3. Acta Anaesthesiol Scand. 1999;43:333-7.

FIGURE LEGEND

1. The figure shows the variation of CP from the baseline over time with changes in body temperature


10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
35-37°C
31-33°C
25-27°C
<25°C
36-37°C
0.1
-4.8
-10.6
-13.2
-0.3
Change in CP (cm H2O)
Temperature (°C)