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Bloodletting acupuncture for the prevention of stridor in children after tracheal extubation: a randomised, controlled study

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Summary

Bloodletting acupuncture has been used for the treatment of a variety of upper respiratory tract problems, especially those of laryngeal origin. This study assesses its efficacy in reducing the incidence of stridor after tracheal extubation in children undergoing general anaesthesia with halothane. Sixty children were randomly allocated to an acupuncture group and a control group. In the acupuncture group, bloodletting acupuncture was performed before extubation. A blinded observer determined the presence and severity of postextubation stridor. The incidence of stridor in the acupuncture group was significantly higher than in the control group. In addition, the severity of stridor was significantly greater in the acupuncture group. It is concluded that in children undergoing halothane anaesthesia, the incidence of postextubation stridor cannot be reduced by bloodletting acupuncture.

Keywords *Acupuncture*: bloodletting. *Laryngospasm*: stridor; extubation. *Paediatric anaesthesia*: perioperative care.

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Adverse events related to tracheal intubation and extubation account for 7% of respiratory-related closed claims [1]. One common problem is postextubation laryngospasm, to which children are particularly prone. There is no one method that is universally effective in preventing this complication. Different studies have tried extubation at deep planes of anaesthesia [2, 3], prophylactic steroid therapy [4] and intravenous lidocaine [5, 6], with equivocal results.

Bloodletting acupuncture has been used in the treatment of acute upper respiratory tract problems such as hoarseness, vocal cord paralysis, dysphonia and laryngopharyngitis [7]. This is an alternative technique of acupuncture in which a hypodermic needle is used to puncture the skin, after which the needle is withdrawn and the site of puncture is allowed to stop bleeding spontaneously, hence the term *bloodletting*. This remedy has also been used with good effect for the treatment of sore throat after anaesthesia [8]. Bloodletting acupuncture at the Shao Shang acupuncture point has been shown to decrease the incidence of postextubation laryngospasm in children anaesthetised with isoflurane [9]. However, there were two potential problems with this study's methodology. One was the definition of laryngospasm as any combination of true laryngospasm, stridor or cyanosis. The other was the unusually high incidence of laryngospasm in the control group (23.7%), which may have been related to the use of isoflurane as the maintenance agent [3] or the use of a cuffed tracheal tube. Halothane may be a more appropriate inhalational agent than isoflurane for use in children and it is therefore of interest to determine whether the use of bloodletting acupuncture can decrease the incidence of laryngospasm in this setting. Since true postextubation laryngospasm is relatively uncommon in paediatric anaesthesia, especially when halothane is used, it is more convenient to study the incidence of postextubation stridor. This study was designed to assess the effect of bloodletting acupuncture at the Shao Shang

Table 1 Modified Downes system for scoring severity of stridor (after [10]).

	Score		
	0	1	2
Stridor	None	Inspiratory	Inspiratory and expiratory
Cough	None	Hoarse cry	Bark
Retraction, nasal flaring	None	Flaring, suprasternal retraction	Flaring, suprasternal, subcostal and intercostal retraction
Breath sounds	Normal	Harsh, wheezing or rhonchi	Delayed

point on the incidence of postextubation stridor in children after halothane anaesthesia.

Methods

After Local Research Ethics Committee approval and written, informed parental consent, 60 ASA physical status I children aged 1–5 years who were scheduled for elective surgery were studied in a double-blind, randomised trial. Subjects with a history of recent upper respiratory tract infection and those scheduled for head or neck surgery were not studied. Other exclusion criteria were: operation lasting >2 h; difficult tracheal intubation; traumatic laryngoscopy or intubation; duration of laryngoscopy >15 s; more than one attempt at intubation; use of controlled ventilation during maintenance of anaesthesia; coughing or straining on the tracheal tube; anal procedures. Premedication comprised intravenous atropine 10 $\mu g.kg^{-1}$ and midazolam 25–100 $\mu g.kg^{-1}$, titrated to provide moderate sedation. Anaesthesia was induced with thiopental 5 $mg.kg^{-1}$ and fentanyl 1 $\mu g.kg^{-1}$, followed by succinylcholine 2 $mg.kg^{-1}$ to facilitate tracheal intubation, for which an uncuffed tube was used. The same anaesthetist performed all intubations. Anaesthesia was maintained with 50% oxygen in nitrous oxide, supplemented with halothane 1–2%. At the end of surgery, the patients' tracheas were extubated on emergence, when the patients started to swallow. All patients were given 100% oxygen by a tight-fitting anaesthesia mask immediately after extubation and, on transfer to the recovery room, they were given 40% oxygen via a transparent oxygen mask. Patients were randomly allocated to two groups to receive either bloodletting acupuncture at the Shao Shang point bilaterally when swallowing occurred, i.e. immediately before extubation, or a control group, members of which did not undergo acupuncture. The Shao Shang point is located on the thumb at the intersection of the following two lines: the lower margin of the nail root and a line at right angles to this line running along the medial side of the nail [9]. The puncture was performed with a sterile 25 G hypodermic needle and the puncture site was allowed to stop bleeding spontaneously.

An independent observer who was waiting outside the operating room door, and was therefore unaware of the intervention performed, was brought in immediately after extubation to determine the presence of postextubation

Table 2 Demographic and operation data. Values are mean (SD) where appropriate.

	Control ($n = 30$)	Acupuncture ($n = 30$)
Sex; male: female	24 : 6	18 : 12
Age; months	33.8 (18.6)	38.37 (15.5)
Weight; kg	12.97 (3.6)	13.77 (3.14)
Time fasted; h	9.73 (1.7)	9.80 (1.6)
Midazolam dose; $\mu g.kg^{-1}$	63.6 (21.0)	65.4 (25.0)
Tracheal tube internal diameter; mm	4.5 (0.5)	4.7 (0.5)
Tracheal tube length (to teeth); cm	13.6 (1.2)	14.0 (1.4)
Duration of operation; min	63 (28)	61 (31)
End-tidal halothane concentration during maintenance; %	1.52 (0.2)	1.51 (0.15)
Time from end of anaesthetic to extubation; min	10 (2.4)	11 (2.3)
Laryngoscope blade size; 1 : 2	8 : 22	6 : 24
Surgical bleeding; minimal: moderate: severe	21 : 9: 0	20 : 10 : 0
Operation site; limbs: lower abdomen: upper abdomen	3 : 25 : 2	2 : 27 : 1

Table 3 Frequency of stridor. Values are number (%).

	Control ($n = 30$)	Acupuncture ($n = 30$)	Total ($n = 60$)
Stridor	1 (3.3)*	10 (33.3)	11 (18.3)
No stridor	29 (96.7)	20 (66.6)	49 (81.7)

*Significantly different from Acupuncture Group, $p = 0.006$.

stridor and to score each child using modified Downes scoring system [10] (Table 1). The time period between extubation and observation was very short (2–3 s). The lowest value of oxygen saturation as measured by pulse oximetry after tracheal extubation was recorded. Potential confounding factors were recorded, including: duration of fasting; laryngoscope blade size; tracheal tube internal diameter; tracheal tube length; duration of surgery; mean end-tidal concentration of halothane used during maintenance; surgical bleeding (scored as minimal, moderate or severe); time to extubation from stopping the anaesthetic.

Quantitative data are given as mean (SD) and are analysed using Student's *t*-test. Categorical data are given as frequency and are analysed using Fisher's Exact Test or the Pearson Chi-Squared Test, where appropriate. Significance was set at the 5% level.

Results

The two groups were comparable (Table 2). A total of 11 patients (18.3%) developed postextubation stridor. The frequency of postextubation stridor was significantly higher in the acupuncture group (33%) than that in the control group (3%), $p = 0.006$ (Table 3). Severity of stridor was significantly higher in the acupuncture group than in the control group, $p = 0.04$ (Fig. 1). No patient developed cyanosis or laryngospasm (complete laryngeal obstruction) after extubation. Mean oxygen saturation was not significantly different between the two groups, but patients with postextubation stridor had a significantly lower oxygen saturation than those who did not suffer stridor ((93.6 (0.5) vs. 96.33 (1.1), $p < 0.001$) (Table 4).

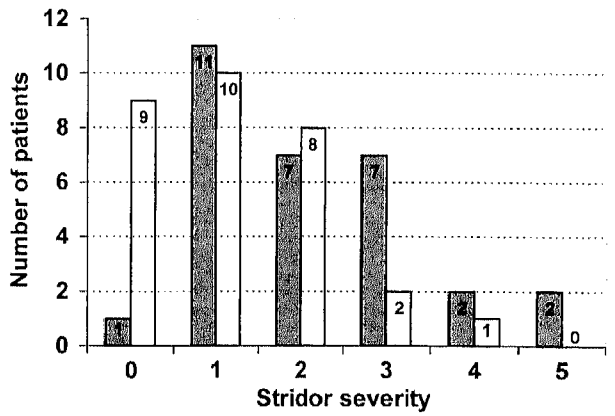

Figure 1 Frequency distribution of stridor severity. Shaded columns represent the Acupuncture Group.

Table 4 Oxygen saturations. Values are mean (SD) [range].

	Control			Acupuncture		
	Stridor	No stridor	Total	Stridor	No stridor	Total
n	1	29	30	10	20	30
S_pO_2; %	93.0 (0)* [93–93]	96.1 (1.1) [94–98]	96.0 (1.3) [93–98]	93.7 (0.5)* [93–94]	96.6 (1.0) [95–98]	95.6 (1.6) [93–98]

*Significantly different from patients in the same group with no stridor, $p < 0.01$.

Discussion

Contrary to our expectations, this study shows that prophylactic bloodletting acupuncture may not be effective for the prevention of postextubation stridor in children. We found that acupuncture at the Shao Shang point performed just before extubation caused a significant increase in the number of patients who suffered postextubation stridor. It is possible that a painful stimulus occurring while the patients were in a light plane of anaesthesia may have been responsible for this difference. The incidence of true laryngospasm after halothane anaesthesia is known to be relatively low [3, 11–13]. Therefore, the inclusion of a new stimulus (puncturing the skin) before extubation in this situation may have no effect in decreasing the occurrence of postextubation stridor. These findings suggest that the benefit of bloodletting acupuncture may only manifest itself if the incidence of laryngospasm is sufficiently high [14], as in the study by Lee *et al.* [9]. The incidence of laryngospasm in different studies varies from 0.76% to 59%, with the majority of studies reporting an incidence < 1% [15–20]. The highest incidences reported were in association with the use of isoflurane as the inhalational anaesthetic agent [3, 6].

In conclusion, we cannot recommend the use of bloodletting acupuncture to decrease the incidence of postextubation stridor in children undergoing general anaesthesia with halothane.

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