

Editorial I**Cuffed or uncuffed tracheal tubes during anaesthesia in infants and small children: time to put the eternal discussion to rest?**

Few things in anaesthesia are as delicate and as vulnerable as the paediatric airway. In our smallest patients, the airway must be protected to allow adequate ventilation but must also be handled with utmost care to ensure no injury occurs to the laryngo-tracheal structures. Although the introduction of the laryngeal mask airway has been a major breakthrough in paediatric and adult anaesthesia, the vast majority of major surgical procedures carried out in newborns and infants still require tracheal intubation in order to provide safety for the patient and optimal conditions for both the anaesthetist and the surgeon.

There is no doubt that the first generation of tracheal tubes (TTs) made out of red rubber with a low volume–high pressure cuff had significant potential to cause harm to the larynx and trachea both in adults and in children, sometimes resulting in severe damage with drastic long-term sequelae (e.g. the need for permanent tracheotomy). The subsequent development of TTs made out of much less irritant plastic materials with high volume–low pressure cuffs solved this problem for adult patients, making the use of cuffed TTs the universal standard for procedures carried out in the grown-up population.

Despite the simultaneous development and production of paediatric sized cuffed TTs of more modern design, these tubes were still suboptimal in many ways.¹ This was especially true regarding the cuff design, and anything but very short-term use (e.g. airway management for adenotonsillectomy) has been the focus for an almost eternal discussion within the paediatric anaesthesia community.

Some paediatric airway experts have cited individual horror-cases of children who have had damage associated with cuffed TTs, and based on a huge personal experience, claimed that cuffed TTs should not be used, or even be banned, in paediatric anaesthetic practice.²

A completely different view has been put forward from other centres, for example, the paediatric cardiac centre in Lund, Sweden. Their interest in metabolic monitoring for

all paediatric cardiac cases (including cases needing cardiopulmonary bypass) requires a good seal of the airway to allow accurate metabolic measurements of oxygen consumption and carbon dioxide production in this complex patient population. This patient category does represent a distinct high-risk population due to the long periods of low perfusion pressures when on bypass (or even circulatory arrest), thereby seriously limiting capillary mucosal circulation in the area of the trachea that is in contact with the TT cuff. These paediatric cardiac cases are obviously subjected to repeated and stringent follow-up for a prolonged period due to their cardiac problems, but no cases of serious airway complications that could be attributed to the TT cuff have been identified, despite having their use in thousands of infants and children. This obviously does not rule out the existence of minor lesions but does argue against the experience of the 'uncuffed camp'. Positive experiences with regard to the use of cuffed TTs in paediatric anaesthesia have also been reported both from the USA and from France.^{3,4}

As there has been, up to now, a complete lack of prospective randomized clinical trials of adequate size, comparing the use of cuffed and uncuffed TTs in infants and children, the debate has gone back and forth for ages, based on personal experience and no end to this dilemma has been in sight.

However, based on the design deficiencies of commercially available cuffed paediatric TTs,¹ Weiss and colleagues^{5–10} from Zürich decided to develop a paediatric TT with a high-volume/low-pressure cuff and adequate distance markers that potentially could resolve the stalemate concerning cuffed vs uncuffed TTs in small children. On the basis of the positive results of a pilot study,¹¹ the Zürich group decided to take their new concept one step further.

In the current issue of the *British Journal of Anaesthesia*, the Zürich group present the results of one of

the largest prospective randomized multicentre studies within the field of anaesthesia.¹² In this study, more than 2200 children (newborn–5 yr old), undergoing a large variety of surgical interventions requiring tracheal intubation, were prospectively randomized to be intubated either with a standard uncuffed TT or with a Microcuff TT. The incidence of post-extubation stridor was chosen as their primary effect parameter, with the hypothesis that the incidence of post-extubation stridor should not differ between the groups (equipose).

The study nicely shows that the risk of post-intubation stridor did not differ if a cuffed or an uncuffed TT was used (4.4% vs 4.7%). Furthermore, a highly significant reduction in the number of TT exchanges was found in advantage of cuffed tubes (2.1% vs 30.8%). The reduced number of TT exchanges is not only important from an economic perspective, but repeated laryngoscopy and TT passage through the larynx and subglottic area should reasonably increase the likelihood of trauma to the airway. Furthermore, the better airway seal with cuffed TTs was found to result in a small but statistically significant improvement in the quality of the exhaled CO₂ trace.

As always, it is necessary to evaluate the strengths and potential weaknesses of a study before drawing your final conclusions and the current study has a number of strengths. First, the number of patients enrolled is large, which is an important strength of any study. Secondly, the strict and elaborate study protocol, including a pre-study information and quality visit to all participating centres by one of the principal investigators, mirrors the high ambitions of the steering committee. The fact that this study reports a slightly higher overall incidence of post-intubation stridor (~4.5%) than previous studies (~2.5%)³ can be taken as evidence of the stringency of the strict study protocol used. Thirdly, the large number of participating centres supports the general applicability of the study findings.

Some limitations can of course also be identified. From a strict academic point of view, the major limitation of the study is that it had to be terminated before the initially projected number of patients ($n=3928$) had been included, due to circumstances beyond the control of the investigators. The result of equipose between cuffed and uncuffed TTs with regard to the incidence of postoperative stridor would of course have been even more reliable if the initially projected number of patients had been included. However, a very significant number of patients (>2200) were in fact recruited, and thus, the results deserve widespread scientific and clinical recognition. A further limitation is that the study results are only valid when the Microcuff TT is used and the cuff pressure is limited to ≤ 20 cm H₂O. Thus, the results cannot be extrapolated to other commercially available cuffed paediatric TTs nor to the use of Microcuff tubes without continuous pressure measurements. Finally, the present study for obvious reasons does not provide any data regarding the rare long-

term problems of tracheal intubation in general, for example, laryngeal damage or tracheal stenosis—a fact that the ‘uncuffed camp’ already has put forward as a major criticism of the study.¹³ To provide such data will necessitate repeated fiberoptic bronchoscopy after a single episode of TT intubation with a cuffed vs uncuffed TT and to gather such information will be associated with very substantial problems. Thus, it is unlikely that such data will ever be produced on a sufficiently large scale.

In what way has the present study influenced the position of the debate concerning cuffed vs uncuffed TTs in paediatric anaesthesia? First, the study provides a strong evidence base to support the finding that an appropriately designed cuffed TT does not increase the risk of post-extubation stridor in newborns, infants, and small children and is associated with a reduced number of TT exchanges. Secondly, the burden of evidence has now shifted and lies with the claim that the use of appropriately designed cuffed TTs is dangerous. Thus, the ‘uncuffed camp’ will now have to prove, based on prospectively gathered data, that the use of adequately designed cuffed TTs is in fact harmful to the paediatric airway.

So from now on, should cuffed TTs always be used in infants and small children undergoing anaesthetics and surgery that mandate TT intubation? In situations where the use of a cuffed TT is seen to be associated with significant advantages, for example, major surgery, the answer is, in my opinion, yes. However, two factors will influence whether cuffed TTs will be used routinely in other cases. First, currently the price of Microcuff TTs is substantially higher than standard uncuffed TTs. This may change with time and commercial competition, but for the time being this will most likely influence the clinician’s choice of TT to a large extent. Secondly, the use of cuffed TTs will require continuous cuff pressure monitoring. Thus, the routine use of cuffed TTs will introduce a slight increase in the workload of the paediatric anaesthetist and also introducing the cost of buying cuff pressure monitors. However, routine cuff pressure monitoring represents normal practice for our adult colleagues, so this second argument against the use of cuffed TTs does ring very hollow.

Lastly, it is very important that the current results are not taken as evidence that the use of cuffed paediatric TTs is safe also in the NICU or PICU setting. This is, of course, due to the readily apparent fact that cuffed TTs will be in place for much longer periods of time in the NICU/PICU setting than during anaesthesia and surgery. However, hopefully the results of the current study will prompt future large scale NICU/PICU studies that in a similar way compare the use of cuffed and uncuffed TTs. NICU/PICU studies will also have a greater potential of including a bronchoscopic evaluation of laryngo-tracheal injury at extubation to help shed light on the possible risks of more major airway damage of cuffed and uncuffed TTs in the paediatric population.

In conclusion, we should all be grateful to the Zürich group for their tireless effort to bring the debate on cuffed vs uncuffed TTs in paediatric anaesthesia forward—not only by designing a new and more appropriate cuffed paediatric TT but more so for going through the huge work of evaluating its use on a very large scale. I am sure that their study will prove to be one of the hallmark papers of paediatric anaesthesia and will definitely change clinical practice. Perhaps the eternal debate will not completely stop, but it will definitely stand on much firmer scientific ground and depend less on opinion.

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Editorial II

General anaesthesia vs local anaesthesia: an ongoing story

Many anaesthetists, surgeons, patients, and nurses believe that major surgery is inherently safer, if it can be performed under local or regional anaesthesia (LA) rather than general anaesthesia (GA), particularly in a sicker patient. Carotid endarterectomy is one such procedure, where views are often polarized, such that in some UK centres, GA is not offered as an option at all. Is there any evidence to support such a stance, either for this or other major procedures in the medically fit or unfit patient?

The GALA study tested the hypothesis that LA is safer than GA in a large population undergoing carotid endarterectomy (Table 1).^{1,2} A summary of the systematic review performed and an analysis of previous studies conducted by Rerkasem and colleagues³ can be found at <http://www.dcn.ed.ac.uk/gala/>. It was suggested that avoiding the physiological disturbances produced by GA is beneficial and that there may be benefits specific to carotid surgery, including the following: