



## Patient and Process Outcomes among Pediatric Patients Undergoing Appendectomy during the COVID-19 Pandemic: An International Retrospective Cohort Study

Matava et al. *Anesthesiology* July 2023, Vol. 139, 35–48; DOI: [10.1097/ALN.0000000000004570](https://doi.org/10.1097/ALN.0000000000004570)

This is a retrospective multicentre cohort study of children aged 0-18 years undergoing primary appendectomy.

### Methods

Although the title refers to a cohort study, the authors' methods also describe performing case matching (not propensity score matching) wherein they match on age, sex and ASA grade. This is further described in their statistical analysis plan in the supplementary data as meta-analysis of identical case control studies. However, it appears they ultimately decided to perform a cohort study instead where the primary exposure was appendectomy during two months (April-May 2020) of the first wave of the Covid-19 pandemic versus appendectomy in the same months of the preceding year (April-May 2019). The primary outcome was duration of hospital stay in hours. The authors' hypothesized that appendectomy early in the pandemic was associated with increased hospital length of stay.

### Results

The cohort of 3,302 children had a primary appendectomy, 1684 prior to the pandemic and 1618 during the first wave, with data submitted from 28 centres (USA: 24, Canada: 2, Australia: 1, Qatar: 1). Age, sex, ASA grade, ethnicity and insurance status were not different between the groups. Covid-19 infection in the pandemic cohort was uncommon (n=3, 0.27%). The primary outcome (length of stay) was shorter in the pre-pandemic group than the pandemic group (28 hours vs 29 hours,  $p=.001$ ). Time to surgery also increased during the pandemic from 540 (IQR 305-840) mins to 648 (357-1006) mins, absolute difference 108 (95%CI 106-110) mins ( $p<0.001$ ).

### Discussion

Whilst a statistical increase in length of stay for appendectomy was found in the pandemic cohort, this was only an increase of 1 hour, which most clinicians would not consider clinically relevant. This is furthermore the case when considering the pre-pandemic interquartile range for length of stay for primary appendectomy was 18-67 hours. The more clinically interesting finding was the increase of 108 minutes in time to operate. This is undesirable for patients, clinicians and hospital administration alike. It would also be sufficient to account for the increased hospital length of stay (were it not for the delay to theatre the total length of stay would have remained unchanged). There was also an associated increase in the rate of

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complicated appendicitis (18.6% vs 24.1%) absolute difference 5.5% (aOR 1.32 [95%CI 1.1-1.59];p =.003).

### **Conclusion**

The Covid-19 pandemic was associated with a minor increase in hospital length of stay for this common paediatric surgical condition. This increase appears to have been associated with a delay to accessing operating theatres and, unfortunately, an increased rate of complicated appendicitis.

Reviewed by Dr Matthew Luney

## **Efficacy of a hybrid technique of simultaneous videolaryngoscopy with flexible bronchoscopy in children with difficult direct laryngoscopy in the Pediatric Difficult Intubation Registry**

Stein et al. *Anaesthesia* 2023; 78(9) 1093-1101; DOI: [10.1111/anae.16049](https://doi.org/10.1111/anae.16049)

This is a retrospective cohort study using a multicentre international registry of difficult paediatric intubation cases.

### **Methods**

The authors' used propensity score matching to test the hypothesis that a hybrid approach of videolaryngoscopy in addition to flexible bronchoscopy (hybrid) increased first pass success at tracheal intubation compared with flexible bronchoscopy alone (scope only). The data source was the Pediatric Difficult Intubation (PeDI) registry, using data from 2017–2021.

Patients were matched on age, weight, sex, ASA grade, genetic syndrome and anticipated difficult tracheal intubation, abnormal physical exam, and known previous difficult direct laryngoscopy. Cases (hybrid) to controls (scope only) were matched 1:4.

### **Results**

140 cases were identified from the registry having undergone a hybrid approach. There were 182 intubation attempts in this group. These were matched with 560 patients who had a bronchoscopic approach comprising of 800 attempts. Patient groups were closely matched as to be expected by the above methodology.

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For the primary outcome of first pass success the rates were 70% (n=98/140) vs 63% (n=352/560) in hybrid vs scope only respectively (OR 1.4 [95%CI 0.9–2.1],  $p=0.114$ ). Eventual success rates were 90% and 89% respectively. When the hybrid approach was used as a rescue technique it was associated with higher success rate than flexible bronchoscopy as rescue (39% hybrid vs 25% scope, aOR 2.1 [95%CI 1.4–3.2]  $p<0.001$ )

Airway complication rates did not differ between hybrid vs. scope only approaches in the following domains in the registry: airway trauma, laryngospasm, bronchospasm, bleeding, hypoxaemia, oesophageal intubation nor death.

### Discussion

From this international registry the authors demonstrated that adding videolaryngoscopy to flexible bronchoscopy was not associated with increased first pass success in children with a previous or anticipated difficult airway, nor eventual success rates. However, they did show that there was an increase in successful intubation rates when videolaryngoscopy was used in combination with flexible bronchoscopy as a rescue technique. This is in keeping with similar findings adult difficult airway literature. Reassuringly airway complication rates were comparable between hybrid and bronchoscopic approaches.

### Conclusion

Whilst superiority between hybrid or bronchoscope only approaches has not been demonstrated, clinicians can find reassurance that the best evidence to date is that either technique has high success rates without differential complication rates. This study also provides evidence to consider combining videolaryngoscopy with flexible bronchoscopy as the rescue technique of choice when the primary plan in an anticipated difficult airway is unsuccessful.

Reviewed by Dr Matthew Luney

## **Comparison of radial, dorsalis pedis, and posterior tibial arteries for ultrasound-guided arterial catheterisation with dynamic needle tip positioning in paediatric patients: a randomised controlled trial**

Takeshita et al. *British Journal of Anaesthesia* 2023;131(4)739-44 DOI: [10.1016/j.bja.2023.07.022](https://doi.org/10.1016/j.bja.2023.07.022)

This open-label, randomised controlled trial was conducted at a single hospital site, the Osaka Women's and Children's Hospital, Osaka, Japan, and compared three sites for arterial catheterisation; radial artery, dorsalis pedis and posterior tibial artery. The study population was

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paediatric patients aged over 3 years undergoing cardiac surgery that required arterial catheter insertion, children were excluded if they already had an arterial catheter in situ. Arterial catheterisation was achieved using an ultrasound-guided dynamic needle tip positioning technique following induction of anaesthesia, and performed by one of six experienced anaesthetists. Participants were randomised into one of three groups determining the location of arterial catheterisation, and allocations were revealed just prior to the intervention. The primary outcome was first-attempt success rate and secondary outcomes included success rate within 10min, puncture duration and number of attempts, evaluated by secondary assessor. Other recorded data included age, sex, height, weight, puncture side and presence of trisomy 21.

270 patients were randomised, resulting in 90 patients in each group. The researchers conducted a non-inferiority analysis with the following assumptions; first attempt success rate of 80% and non-inferiority margin of 20%, and found that first-attempt and overall success rates of arterial catheterisation using ultrasound-guided dynamic needle tip positioning in the dorsalis pedis and posterior tibial arteries were not inferior to those in the radial artery. Overall and first attempt success rates were high; radial artery 94% and 82%, dorsalis pedis 93% and 76%, posterior tibial 91% and 81%. Multiple logistic regression analysis to identify determinants of first-attempt success found that diameter of the artery (OR:1.32,95%CI:1.09-1.6,  $P=0.0044$ ) and trisomy 21 (OR:0.43,95%CI:0.2-0.92,  $P=0.028$ ) were independent predictors of difficulty. No adverse events were reported at any site.

This study finds evidence to challenge the assumption that it is more difficult to insert a cannula into the dorsalis pedis or posterior tibial arteries when compare to the radial artery. This is reassuring in cases where there may be contraindications or difficulty when using the radial site. The authors offer one limitation to their study being that all operators are experiences anaesthetists and therefore the results may not be applicable to learners and those with less experience. In addition, this study does not gather any data on the long-term outcomes of lower limb arterial lines for example durability, quality of measurement, rate of loss, and rate of infection which would be important considerations when siting an arterial line.

**Reviewed by Dr Anna Ratcliffe**

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## Difficult or impossible facemask ventilation in children with difficult tracheal intubation: a retrospective analysis of the PeDI registry

Garcia-Marcinkiewicz et al. *British Journal of Anaesthesia* 2023; 131(1): 178-187;  
DOI: [10.1016/j.bja.2023.02.035](https://doi.org/10.1016/j.bja.2023.02.035)

This retrospective, observational cohort study of The Paediatric Difficult Intubation Registry (PeDI) registry sought to determine which patient characteristics and anaesthetic factors are associated with difficult mask ventilation (DMV) or impossible mask ventilation (IMV) in patients who had difficult intubation.

### Methods:

Data over a 10-year period was analysed. 483 patients were identified as DMV (n=429) or IMV (n=54), accounting for 9% of all difficult intubations.

Secondary outcomes included:

- rescue use of supraglottic airway device (SAD)
- mask ventilation efficacy following neuromuscular blocking drug (NMBD)
- incidence of complications

### Results:

Factors associated with DMV or IMV:

- Pierre-Robin sequence (14.9%), followed by Goldenhar (7.5%) then Treacher Collins (5.4%) syndromes.
- Glossoptosis
- Weight <5<sup>th</sup> centile or increased weight
- Use of IV induction
- Intubation in ICU

SAD Rescue:

- Only attempted in a third of DMV and just over half of IMV cases.
- Improved ventilation in 71% with DMV and 48% IMV.

NMBDs:

- Use of NMBDs improved or did not affect ventilation efficacy in 90% of DMV and 86% of IMV cases.

Complications:

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- Significantly increased risk of hypoxaemia and airway trauma in this cohort.
- Incidence of cardiac arrest is 14-times higher when compared with easy mask ventilation.

### **Discussion:**

Factors which appear to be associated with DMV include infants, <5<sup>th</sup> centile weight, increased weight, glossoptosis and limited mouth opening. Once adjusted for multiple factors, Treacher Collins was independently associated with DMV or IMV.

Opiate use was inversely associated with DMV or IMV, hypothesised as blunting negative airway reflexes. The authors acknowledge conflict with previous adult and paediatric studies where opiate use can cause worsening ventilation (particularly in hypotonic children) and can cause stiff chest syndrome.

Inhalational induction was also inversely associated with DMV or IMV, perhaps due to the slower transition from spontaneous to positive pressure ventilation, allowing stepwise and more controlled ventilation intervention.

The outcome of NMBD use in this study is consistent with recommendations in current guidance (i.e. DAS and ASA guidelines) in the context of impossible ventilation. Details of the few instances where mask ventilation worsened were not included in this article and could have been useful.

Experience of the operator performing mask ventilation was not included and could be an important variable.

In summary, this study highlights patient and anaesthetic factors contributing to DMV or IMV in paediatric patients with difficult intubation. Additionally, it raises important considerations in the context of NMBDs, opiates and induction techniques, and emphasises the potential benefit of SADs for ventilation rescue.

Reviewed by Dr Alok Chauhan

## **Effect of paediatric caudal injection volume on optic nerve sheath diameter and regional cerebral oximetry: a randomised trial**

Gönen A et al. *European Journal of Anaesthesiology* 2023; 40(7): 465-471;

DOI: [10.1097/EJA.0000000000001819](https://doi.org/10.1097/EJA.0000000000001819)

This prospective, randomised study aimed to compare the effect of caudal injection volumes (0.8 vs 1.25ml kg<sup>-1</sup>) on intracranial pressure (ICP) using optic nerve sheath diameter (ONSD) as a surrogate marker.

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### **Methods:**

58 patients between 1 and 7 years old, undergoing elective urological and general surgery were recruited and randomised to receive low (L) ( $0.8\text{ml kg}^{-1}$ ) or high (H) ( $1.25\text{ml kg}^{-1}$ ) volume bupivacaine (dose of  $2\text{mg kg}^{-1}$ ) via caudal block following a protocolled induction and maintenance of anaesthesia.

ONSD measurements were taken by ultrasound prior to, and then at timed intervals following the block.

Secondary outcome of cerebral regional oxygen saturation ( $\text{CrSO}_2$ ) was measured via NIRS unilaterally.

### **Results:**

There was no significant difference in  $\text{ETCO}_2$ , PIP,  $\text{FiO}_2$  and  $\text{SpO}_2$  between groups. Greater haemodynamic effects were observed in the H group ( $p < 0.001$ ) with mean MAP falling from  $73.7 \pm 8.2$  to  $64.0 \pm 5.9$  mmHg following caudal administration.

Change in ONSD:

Group	Baseline ONSD (mm)	Peak ONSD (mm)	Time of peak value (mins)
L Group	$4.4 \pm 0.2$	$4.5 \pm 0.2$	20
H Group	$4.5 \pm 0.3$	$4.8 \pm 0.3$	10

Regarding ONSD, an increase of more than 10% from baseline was considered a significant indicator of raised ICP by the authors. 8 individuals in the H group showed a rise of more than 10% which was statistically significant between the two groups.

$\text{CrSO}_2$ :

Mean change for L group was -2.2% and for H group was -2.5% from baseline.

### **Discussion:**

Despite significant increase in ONSD of more than 10% for 8 patients in the H group, this did not correlate with a significant reduction in  $\text{CrSO}_2$  in these individuals, consistent with previous literature. The authors felt this change was not of clinical significance. Perhaps data could have been collected on post-operative neurological observations in these patients to support this.

An interesting point related to the speed of caudal injection, and how injection pauses reduce the effect on cerebral blood flow. The regular pauses in this study (every 3-4 ml) and slow injection rate ( $1\text{ ml s}^{-1}$ ) may have prevented rapid changes in flow and hence  $\text{CrSO}_2$  here.

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The authors acknowledge study limitations including deviation from proposed accurate ONSD measurement protocols (which take two measurements instead of one).

In summary, this study demonstrates a volume-dependent increase in ONSD of possible clinical significance for higher caudal volumes ( $1.25\text{ml kg}^{-1}$ ), with negligible reduction in  $\text{CrSO}_2$ . The use of higher volumes should be considered on a case-by-case basis taking into account the potential effect on pre-existing intracranial pathology.

**Reviewed by Dr Alok Chauhan**

**Edited by Dr Shivan Kanani**  
**APAGBI Trainee Representative**

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