

# Front of neck access: A survey among anesthetists and surgeons

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## Abstract

**Background and Aims:** Emergency front of neck access (FONA) is the final step in a Can't Intubate–Can't Oxygenate (CICO) scenario. In view of maintaining simplicity and promoting standardized training, the 2015 Difficult Airway Society guidelines recommend surgical cricothyroidotomy using scalpel, bougie, and tube (SBT) as the preferred technique.

**Material and Methods:** We undertook a survey over a 2-week period to evaluate the knowledge and training, preferred rescue technique, and confidence in performing the SBT technique. Data were collected from both anesthetists and surgeons.

**Results:** One hundred and eighty-nine responses were collected across four hospitals in the United Kingdom. The majority of participants were anesthetists (55%). One hundred and eleven (59%) respondents were aware of the national guidelines (96.2% among anesthetists and 12.9% among surgeons). Only 71 (37.6%) respondents indicated that they had formal FONA training within the last one year. Seventy-five anesthetists (72.8%) knew that SBT equipment was readily available in their department, while most surgeons (81.2%) did not know what equipment available. One hundred and five (55.5%) respondents were confident in performing surgical cricothyroidotomy in a situation where the membrane was palpable and only in 33 (17.5%) where the cricothyroid membrane was not palpable.

**Conclusion:** This survey has demonstrated that despite evidence of good training for anesthetists in FONA, there are still shortfalls in the training and knowledge of our surgical colleagues. In an emergency, surgeons may be required to assist or secure an airway in a CICO situation. Regular multidisciplinary training of all clinicians working with anesthetized patients should be encouraged and supported.

**Keywords:** Airway management, anesthetists, surgeons, survey and questionnaires, tracheostomy

## Introduction

Cricothyroidotomy is one of the several front of neck access (FONA) techniques and is defined as an incision through the skin and cricothyroid membrane to secure a patent airway for emergency relief of upper airway obstruction.<sup>[1]</sup>

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Cricothyroidotomy was previously the recommended standard for gaining a definitive airway in a Can't Intubate–Can't Oxygenate (CICO) situation; the final step is to deliver oxygen in anesthetized and paralyzed patient, where tracheal intubation and oxygenation using a supraglottic airway device or facemask have failed. Thankfully, such situations are rare; the fourth national audit project in the United Kingdom (NAP4) reports an incidence of CICO in 1:50,000 anesthetics,<sup>[2]</sup> and analysis of Danish Anesthesia Database identified

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**How to cite this article:** Mendonca C, Ahmad I, Sajayan A, Shanmugam R, Sharma M, Tosh W, *et al.* Front of neck access: A survey among anesthetists and surgeons. *J Anaesthesiol Clin Pharmacol* 2017;33:462-6.

Access this article online	
Quick Response Code:	Website: www.joacp.org
	DOI: 10.4103/joacp.JOACP_109_17

the incidence of emergency surgical airway as 3:50,000 anesthetics.<sup>[3]</sup>

The techniques available to gain FONA are broadly classified as cannula and surgical cricothyroidotomy. The NAP4 has described several reasons for failed airway access in an emergency situation; among them was the lack of familiarity, associated complexity, and lack of education with the plethora of techniques and devices available currently.<sup>[2]</sup> In view of promoting simplicity and standardized training, the 2015 Difficult Airway Society (DAS) guidelines recommend FONA by a surgical cricothyroidotomy using scalpel, bougie, and tube (SBT) as the preferred emergency technique.<sup>[4]</sup> A recent study comparing surgical versus the Melker Seldinger technique on animal larynx demonstrated a significantly shorter time (62 s versus 138 s) for surgical cricothyroidotomy.<sup>[5]</sup>

Recently, an editorial by Pracy *et al.*<sup>[6]</sup> discussed the issues with disseminating DAS guidance among surgeons, who may also be required to assist and/or intervene in a CICO situation.

We were interested in evaluating the extent of guidance circulation, training delivered, experience and preference of the technique, and the level confidence in performing the technique by anesthetists and surgeons.

## Material and Methods

A 17-question questionnaire consisting of five sections was distributed to both anesthetists and surgeons. The first section concentrated on collecting demographic data, including grade, specialty, and hospital type. The second section gathered data on knowledge and training. Participants were asked if they were aware of current DAS (2015) guidelines for the management of a CICO situation and which technique they preferred for FONA, the type of training they had received in the past 12 months, and equipment available in their hospital. The next section concentrated on clinical experience of CICO situations requiring FONA and level of confidence in securing a definitive airway by performing FONA in simple and complex (e.g., obese, where landmarks may be unpalpable) patients. The participants were asked to rate their level of confidence in performing both surgical and needle cricothyroidotomy using a Likert scale of 1 to 5 (1 being not confident at all and 5 being highly confident). The final question in the survey asked participants whether they were aware of the recent joint editorial by Pracy *et al.*<sup>[6]</sup> and its recommendations.

The survey was conducted over a 2-week period and a direct interview from both anesthetists and surgeons was conducted using printed copies of the questionnaire. One hundred and

eighty-nine responses were collected and input into an Excel spreadsheet.

Demographic characteristics, absolute count, and percentages were categorized and results were analyzed as both total workforce and as anesthetists and surgeons separately. For nominal categorical variables, such as recommended FONA technique, responses from anesthetists were compared with those of surgeons using Chi-square test or Fisher's exact test, the latter used with absolute counts of <5. For ordinal categorical variables, such as confidence level for performing a FONA technique, responses from anesthetists were compared with those of surgeons using Mann–Whitney U-test. Comparisons were made at 5% significance, with differences considered statistically significant if  $P < 0.05$ .

## Results

One hundred and eighty-nine responses were collected across four hospitals with 59% responses from two teaching hospitals and 41% of the responses from two district general hospitals: University Hospitals of Coventry and Warwickshire and Guy's and St Thomas', and Heart of England and Warwick Hospitals, respectively. The grade of participants and their specialty is as detailed in Table 1.

One hundred and eleven (59%) of the total respondents were aware of the DAS 2015 guidelines; 96.2% of the anesthetists and 12.9% of the surgeons interviewed ( $P < 0.001$ ). Of the respondents who were aware of DAS guidelines, 92 (83%) knew that the recommended FONA technique was surgical cricothyroidotomy. More than half (55.6%) of the respondents preferred a surgical cricothyroidotomy technique for gaining FONA, a higher proportion of

**Table 1: Characteristics of all respondents of the survey**

Characteristic	n (%)
Specialty	
Anaesthesia	104 (55.0)
Orthopaedics	26 (13.8)
ENT/Maxillofacial	15 (7.9)
General Surgery	12 (6.4)
Obstetrics and Gynaecology	11 (5.8)
Neurosurgery	8 (4.2)
Plastics	6 (3.2)
Urology	5 (2.7)
Other	2 (1.1)
Grade	
Consultant	82 (43.4)
Post CCT fellow	4 (2.1)
Non-consultant career grade	31 (16.4)
Specialist trainee	56 (29.6)
Core trainee	16 (8.5)

anesthetists (74%) compared to surgeons (41%), which was statistically significant ( $P < 0.001$ ). Predictably, most ENT or Maxillofacial surgeons indicated that their preferred technique was surgical tracheostomy (5/7).

The data relating to the participants' training, familiarity with available equipment, and their previous experience in managing a CICO scenario are presented in Table 2. Only 71 (37.6%) respondents indicated that they had formal FONA training within the previous year (of which 60 (85%) were anesthetists).

Confidence levels of data for performing FONA (surgical and needle cricothyroidotomy) techniques in different scenarios are summarized in Table 3. Fifty-five percent of the respondents were confident (confidence level of 4 or 5) with the surgical cricothyroidotomy technique.

Regarding the editorial by Pracy *et al.*,<sup>[6]</sup> only 17 (9%) respondents were aware of its publication – 14 anesthetists

and 3 surgeons (2 ENT/Maxillofacial surgeons, 1 Plastic surgeon).

## Discussion

This survey showed that almost all anesthetists and only 13% of surgeons were aware of revised 2015 DAS guidelines for managing unanticipated failed intubation. Among the anesthetists, 86% were aware that surgical cricothyroidotomy is the recommended technique for FONA.

A recent review of the Danish Anesthesia Database identified the incidence of an emergency surgical airway in a CICO situation as 0.6 per thousand. In patients presenting for ear, nose, and throat procedures, the incidence rose to 1.6 per thousand and emergency surgical airways performed by anesthetists failed in half the patients.<sup>[3]</sup> Although there has been divided opinion regarding cannula and surgical approach to FONA, the fourth national audit project of

**Table 2: FONA training, FONA equipment and expertise at work environment**

	All participants (n <sup>†</sup> =189)	Anesthetists (n <sup>†</sup> =104)	Surgeons (n <sup>†</sup> =85)	P <sup>‡</sup>
Number (%) with formal FONA training in last 12 months	71 (37.6)	60 (57.7)	11 (12.9)	<0.001
Number (%) trained with scalpel-bougie-tube technique	(n=69) <sup>§</sup> 64 (92.8)	(n=59) <sup>§</sup> 54 (91.5)	(n=10) <sup>§</sup> 10 (100)	1.000 <sup>b</sup>
Training model, n (%)	(n=69) <sup>§</sup>	(n=59) <sup>§</sup>	(n=10) <sup>§</sup>	
Plastic models	47 (68.1)	46 (78.0)	1 (10.0)	<0.001 <sup>b</sup>
Animal larynx	16 (23.2)	10 (16.9)	6 (60.0)	
Cadavers	6 (8.7)	3 (5.1)	3 (30.0)	
Number (%) working in a team that regularly receive training in FONA	2 missing <sup>**</sup> 32 (17.1)	1 missing <sup>**</sup> 28 (27.2)	1 missing <sup>**</sup> 4 (4.8)	<0.001
Equipment is/are immediately available in your department to perform FONA	Missing one response <sup>**</sup>	Missing one response <sup>**</sup>		
Scalpel, bougie and tube	87 (46.3)	75 (72.8)	12 (14.1)	<0.001
Other*	12 (6.4)	8 (7.8)	4 (4.7)	
Don't know	89 (47.3)	20 (19.4)	69 (81.2)	
Have you encountered CICO situation in your clinical practice? n (%)				
None	154 (81.5)	82 (78.8)	72 (84.7)	0.370 <sup>b</sup>
Once	25 (13.2)	17 (16.3)	8 (9.4)	
Twice	8 (4.2)	4 (3.8)	4 (4.7)	
Four	1 (0.5)	1 (1.0)	0 (0)	
Five	1 (0.5)	0 (0)	1 (1.2)	
Your role in CICO situation that you encountered	(n=35) <sup>§†</sup>	(n=22) <sup>§†</sup>	(n=13) <sup>§†</sup>	
First operator	16 (45.7)	10 (45.5)	6 (46.2)	0.507 <sup>b</sup>
Team member	14 (40.0)	10 (45.5)	4 (30.8)	
Observer	5 (14.3)	2 (9.1)	3 (23.1)	
Do you have ENT/maxillofacial surgeon immediately available?				
Both day and night time	15 (7.9)	6 (5.8)	9 (10.6)	0.045 <sup>b</sup>
Day time only	132 (69.8)	69 (66.3)	63 (74.1)	
Neither	41 (21.7)	29 (27.9)	12 (14.1)	

<sup>†</sup>Sample size unless otherwise stated; <sup>‡</sup>p-value comparing anaesthetists and surgeons using Chi-squared unless otherwise stated; <sup>b</sup>p-value obtained using Fisher's exact test; <sup>§</sup>This is the denominator used to obtain percentages and consists of participants with formal FONA training but excluding missing cases; <sup>††</sup>The denominator used to obtain percentages in this cell is the sample size in the column heading minus these missing cases; <sup>§†</sup>This is the denominator used to obtain percentages in this cell and consists of participants who have encountered a CICO situation; \*Examples are Ravussin cannula, Ventrain and rapid O<sub>2</sub> system

**Table 3: Confidence levels for performing FONA**

	All participants (n <sup>†</sup> =189)	Anesthetists (n <sup>†</sup> =104)	Surgeons (n <sup>†</sup> =85)	P <sup>‡</sup>
Confidence level to perform surgical cricothyroidotomy if cricothyroid membrane is palpable, n (%)				
1	26 (13.8)	4 (3.8)	22 (25.9)	0.001
2	16 (8.5)	8 (7.7)	8 (9.4)	
3	42 (22.2)	22 (21.2)	20 (23.5)	
4	76 (40.2)	56 (53.8)	20 (23.5)	
5	29 (15.3)	14 (13.5)	15 (17.6)	
Confidence level to perform surgical cricothyroidotomy even when cricothyroid membrane is not palpable, n (%)				
1	57 (30.2)	17 (16.3)	40 (47.1)	0.111
2	45 (23.8)	36 (34.6)	9 (10.6)	
3	54 (28.6)	39 (37.5)	15 (17.6)	
4	23 (12.2)	11 (10.6)	12 (14.1)	
5	10 (5.3)	1 (1.0)	9 (10.6)	
Confidence level to perform needle cricothyroidotomy, n (%)	4 missing*	3 missing*	1 missing*	
1	25 (13.5)	5 (5.0)	20 (23.8)	0.701
2	14 (7.6)	12 (11.9)	2 (2.4)	
3	48 (25.9)	32 (31.7)	16 (19.0)	
4	60 (32.4)	33 (32.7)	27 (32.1)	
5	38 (20.5)	19 (18.8)	19 (22.6)	

<sup>†</sup>Sample size unless otherwise stated; <sup>‡</sup>p-value comparing anaesthetists and surgeons obtained using Mann-Whitney U test; \*The denominator used to obtain percentages in this cell is the sample size in the column heading minus these missing cases. Confidence level was rated on a Likert scale of 1 to 5; 1 being not confident at all and 5 being highly confident

the Royal College of Anesthetists and Difficult Airway Society (NAP4) identified that cannula techniques were associated with a high failure rates, in contrast to surgical techniques, which were reported as “almost universally successful.”<sup>[2]</sup> A recent randomized comparison between three different techniques (SBT, Surgicric 2, and Melker Seldinger) demonstrated that SBT technique has fastest insertion time and higher success rate.<sup>[5]</sup>

The need for standardized universal teaching of FONA in the emergency situation has been emphasized by a recent HM Coroners case. This prompted the publication of a joint specialty editorial in *Clinical Otolaryngology*, the *British Journal of Oral and Maxillofacial Surgery*, and the *British Journal of Anaesthesia*.<sup>[6]</sup>

The SBT method for surgical cricothyroidotomy was the most common technique taught within the last year, suggesting successful implementation of DAS recommendations into the local airway training curriculum. A recent systematic review by Duggan *et al.* highlighted several important issues associated with the cannula cricothyroidotomy technique. The review revealed that device failure occurred in 42% of CICO emergencies and barotrauma occurred in 32% of CICO emergencies. During their investigations, they also found several reports that described trans-tracheal jet ventilation-related subcutaneous emphysema, which hampered

subsequent attempts at tracheal intubation and/or a surgical airway.<sup>[7]</sup>

The DAS guidelines recommend immediate surgical review following FONA. Only eight respondents in our survey stated that they have immediate access to ENT and/or Oral Maxillofacial surgeons both during day and night time. Sixty-nine percent of respondents had immediate access to ENT and/or Oral and Maxillofacial surgeons during the day time only. Hence multidisciplinary and multispecialty training in emergency FONA is imperative. Although surgical cricothyroidotomy is quicker to perform, it is a temporary measure to rescue the CICO situation. Some of these patients may require tracheostomy as a definitive airway. However, increased sub-specialization and an increase in percutaneous tracheostomies have led to a general de-skilling of the surgical trainees. In 2014, 47% of emergency tracheostomies were performed by consultants and 41% by senior trainees.<sup>[6]</sup>

Results from our survey suggest that current training for surgeons is mainly during generic courses such as Advanced Trauma Life Support, requiring recertification only every 4 or 5 years, and mostly on plastic models and animal larynx. Our survey found an even distribution of confidence levels in performing a cannula cricothyroidotomy among anesthetists and surgeons. However, the confidence level in performing a

surgical cricothyroidotomy when cricothyroid membrane was palpable was significantly lower among surgeons (excluding ENT and Oral and Maxillofacial surgeons) compared to anesthetists. In a situation where cricothyroid membrane is not palpable, the confidence level was very low among all participants including surgeons. It is difficult to judge the decision-making skill of an individual clinician when faced with a crisis situation. The effectiveness of FONA technique is also dependent on a clinician's willingness to implement it at a right time.<sup>[8]</sup> Therefore, the technique should be simple to perform, easy to teach, and should include equipment that is easy to assemble and familiar to all staff involved in patient care. The SBT technique for FONA offers the benefit of simplicity, so is easy to learn,<sup>[9]</sup> and familiar to both surgeons and anesthetists.

Only a minority of participants in our survey felt that their team regularly received FONA training and most nonanesthetists were not sure about the equipment available in their difficult airway trolley. A regular multidisciplinary approach to such training would likely improve this lack of knowledge, familiarity with the technique, improved confidence, and success rate. Lockey and co-authors<sup>[9]</sup> reported a 100% success rate with scalpel technique, performed by anesthetists and emergency medicine doctors. The contributing factors for the success of this technique were development of a positive mental attitude; immediate availability of equipment; the presence of a trained paramedic assistant; and a simple, well-practiced technique.<sup>[9]</sup> A few of the ENT/Oral and Maxillofacial surgeons in our survey preferred surgical tracheostomy as a rescue technique for CICO. This demonstrates how the clinical decision-making may be influenced by clinician's clinical experience. However, scalpel cricothyroidotomy is quicker to perform than tracheostomy.

Our survey was limited to the four hospitals in two regions of the United Kingdom representing teaching and district general hospitals. Most the respondents were anesthetists and there was variable representation from the surgical specialties; the majority of responses were from orthopedic, ENT, and maxillofacial surgeons. A national or international survey involving anesthetists and all surgical specialties would be useful to establish a more wider practice.

Familiarization with DAS guidelines for all members of the theatre team, including anesthetists, surgeons, and operating department practitioners, is essential to successful and timely intervention in case of CICO situation. Multidisciplinary team training in managing a CICO situation can influence the clinicians to make right decision.

## Conclusion

This survey has demonstrated that despite evidence of good training of anesthetists in FONA, there are still shortfalls in the training and knowledge of surgical colleagues. In an emergency situation, surgeons may be required to assist or secure an airway and hence it is prudent for everyone to keep up-to-date with their knowledge and skills. Regular training through didactic learning of DAS guidelines and practice on models or animal larynx would be beneficial. Publication of the editorial from ENT, RCoA, DAS AAGBI, surgical colleges, specialist societies, and in other surgical journals would be beneficial to raise awareness of the issues faced and could lead to valuable discussion and prompt multidisciplinary teaching. Local training to entire team working in operating theatre is essential.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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