NODIC technique - (*Nasal oxygenation during infraglottic coblation*) to increase the safe apnoea time

Sir,

Coblation (plasma ablation) procedures are performed for various infraglottic conditions like subglottic stenosis, laryngeal papillomatosis (LP) to name a few. Various anaesthesia protocols used for these procedures include the use of a smaller sized endotracheal tube but it often hampers the surgical vision or infra glottic jet ventilation, which is associated with the risk of barotrauma. Others include either maintaining spontaneous ventilation, which can lead to a moving surgical field or apnoeic oxygenation with intermittent ventilation, which is limited by short apnoea time and oxygen desaturation leading to frequent disruptions in between the procedure.

Despite the institutional practice of the use of nasal prongs for high flow oxygen during apnoea, there is a paucity of literature on this subject. Therefore, we describe this simple technique of nasal oxygenation during infraglottic coblation (NODIC) at 10–12 L/min of oxygen with a nasal cannula to increase the safe apnoea time in 5 patients scheduled for infraglottic coblation procedures.

All the patients were pre-oxygenated with 100% oxygen at 20 degrees head-up position till fractional end-tidal oxygen was >92%. Nasal cannula @ 6 L/

Table 1: The demographic and intraoperative data of 5 patients											
Age yr	Wt Kg	Diagnosis	Apnoea Time Min	Min SpO_2 %	PaO_2 (1) mmHg	PaO_2 (2) mmHg	$PaCO_2$ (1) mmHg	$PaCO_2$ (2) mmHg	CO_2 rise/min mmHg/min	pH (1)	pH (2)
2	12	LP	6.2	92	320	102	62	89	4.3	7.22	7.13
4	14	LP	7.4	96	450	156	48	78	4	7.34	7.12
5	13	Tracheal stenosis	9.8	94	466	144	53	88	3.5	7.38	7.16
11	17	Tracheal stenosis	5.5	97	159	79	63	73	1.8	7.26	7.18
28	58	Tracheal mass	24	95	280	130	26	66	1.5	7.42	7.24

[Time periods: (1) - before the procedure, (2)- after the procedure]

min was connected through the auxillary port of the anaesthesia workstation. Anaesthesia was induced with injection fentanyl 2 mcg/kg with propofol 2–3 mg/kg and injection atracurium 0.5 mg/kg was given for neuromuscular relaxation after confirming mask ventilation. Oxygen flow through nasal prongs was increased to 10–12 L/min once the mask was removed. Without endotracheal intubation, Millers blade with endoscope was inserted, and surgery was allowed to proceed under apnoeic oxygenation with continuous nasal oxygenation through the nasal prongs.[1] Arterial blood gas analysis was performed before the initiation of apnoeic oxygenation (T1) and at the end of the apnoeic period (T2). After the culmination of the procedure, the patients were ventilated, and end-tidal CO_2 ($ETCO_2$) was measured. Following, the return of spontaneous respiration, neuromuscular blockade was reversed. The patients were shifted out of the operation theatre when the $ETCO_2$ reached the baseline value.

The $ETCO_2$ before and after the apnoeic period, the partial pressure of CO_2 ($paCO_2$), the partial pressure of oxygen (paO_2), pH, minimum oxygen saturation and complications were also recorded. The time when the face mask was removed to the time either the procedure was complete or the saturation was <92% was defined as a single safe apnoeic time (SAT).

There were 4 children with a mean age of 7 (2–11) years and one adult who had SAT of 24 min. The mean SAT in children was 7.3 (5.5–9.8) min. [Table 1]. The mean increase in CO_2 was 3.3 mmHg/min in children and 1.5 mmHg/min in the adult patient. All procedures were accomplished in single apnoeic time without any haemodynamic perturbations or cardiac arrhythmias.

High flow nasal cannula oxygen insufflation provides an oxygen-rich mixture in the pharynx. Due to the negative pressure generated, there is a mass movement of oxygen from the pharynx into the alveoli, which improves the oxygenation and prolongs the safe apnoeic period.[2]

Oxygen was kept at 10–12 L/min for all patients. Despite the higher flow of oxygen/kg in children, the adult patient had a much longer SAT, which could be attributed to relatively lesser oxygen consumption, lower functional residual capacity and degree of stenosis compared to children. In children, even mild to moderate stenosis can result in faster desaturations.

Owing to smaller children with laryngeal pathology we kept the threshold of 92% for single SAT.[3] Although, none of our patients had any airway difficulty, the use of the NODIC technique in this group of patients may pose additional challenges.

The higher baseline $PaCO_2$ levels could be due to the existing laryngeal pathology.[4] Apnoeic ventilation further accentuated this resulting in respiratory acidosis. Rajan *et al*. observed an increase of 3.7 mmHg CO_2/min in their study, which was higher than our series.[5]

Transnasal humidified rapid-insufflation ventilatory exchange (THRIVE)_ is another technique, which uses high-flow nasal oxygen up to 70 L/min, creating a flow depend on positive pharyngeal pressure. Lyons *et al*. successfully demonstrated the use of THRIVE to increase the apnoeic time during laryngeal surgeries.[6]

Compared to THRIVE, a nasal cannula for apnoeic ventilation is affordable and much easier to administer. Although nasal prongs have been used for apnoeic oxygenation during the peri-intubation period, our series highlights its extended application for short laryngeal procedures with appropriate monitoring. However, further validation by randomised controlled trials is warranted.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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Submitted: 03-Mar-2020
Revised: 09-May-2020
Accepted: 23-Jun-2020
Published: 31-Jul-2020

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Access this article online	
Quick response code	Website: www.ijaweb.org
	DOI: 10.4103/ija.IJA_193_20

How to cite this article: Jain D, Arora S, Virk RS, Gupta M, Arora K. NODIC technique - (*Nasal oxygenation during infraglottic coblation*) to increase the safe apnoea time. Indian J Anaesth 2020;64:717-9.