

Role of postoperative anaesthesia visits in hoarseness following surgery

INTRODUCTION

Postoperative anaesthesia visits (PAVs) conducted by anaesthesiologists are commonly a part of perioperative management. At our institution, anaesthesiologists usually visit surgical patients postoperatively on the day of surgery and the next day to monitor vital signs, pain control, and anaesthetic complications.

Postoperative short-term hoarseness is a common symptom observed following surgery performed under general anaesthesia with endotracheal intubation. Hoarseness is a vague and nonspecific symptom that patients use to describe a breathy quality of the voice, roughness, pitch change, or some degree of dysphonia as per clinical practice guideline.^[1] Although the symptom usually improves without any intervention within three to seven days following surgery, and the probability of developing prolonged hoarseness (lasting for >7 days) is <1%,^[2] a previous study has reported that 28% of patients with prolonged hoarseness were diagnosed with vocal cord palsy (VCP) or arytenoid cartilage dislocation (ACD).^[3] VCP and ACD related to tracheal intubation (0.077% and 0.097% in surgical patients with tracheal intubation, respectively^[2,3]) can lead to worse outcomes such as aspiration pneumonia and dyspnoea following surgery. Patients who are discharged without being diagnosed with the aforementioned complications may experience critical airway problems outside the hospital or permanent phonetic dysfunction.

As these intubation-induced complications cause dysphonia, and the patients often complain of hoarseness, it is essential for anaesthesiologists to detect these symptoms during their routine PAVs on the day of and/or on the day after surgery, and perform follow-ups for the purpose of diagnosis. Additionally, it is also recommended to consult an otorhinolaryngologist promptly since early surgical intervention and/or airway and respiratory management are warranted.^[4,5] However, it is unknown whether PAVs can detect hoarseness. Hence, we hypothesised that routine PAVs are inadequate to identify postoperative hoarseness, which may be a sign

of VCP and ACD. In this study, we aimed to investigate the number of cases of prolonged hoarseness and detection of hoarseness during PAVs, and outcomes using the incident reporting system, which has recently been used as a briefing tool. We also aimed to discuss ways to detect hoarseness (dysphonia) more reliably during PAVs.

METHODS

This study was approved by the institutional ethics committee of our institution. Informed consent was waived due to the retrospective nature of the study. This manuscript adheres to the applicable EQUATOR guideline. This was a single centre, retrospective cohort study performed at a tertiary care teaching hospital.

PAVs in our department are conducted on the day of and on the first day after surgery.

Each anaesthesiologist who conducts airway management asks questions face to face “Isn’t it hard to speak?” on the day of and on the first day after surgery. If answered “Yes” or obvious phonic disorder is detected, they describe it in the medical record on the day after the surgery. The patients are followed up until they recover from dysphonia, and in case the symptoms continue for more than a few days, an otorhinolaryngologist or a surgeon is consulted.

We obtained data retrospectively from our institutional electronic incident reporting system. All anaesthesia-related incident reports from April 2012 to March 2019 were extracted. The keyword ‘hoarseness’ was used to search the reports and we extracted data from the reports of the patients who had prolonged hoarseness (lasting for >7 days) after general anaesthesia with intubation. The electronic incident reporting system is operated by our institution; any health care provider can access the system and submit incident reports. An anaesthesia-related incident is defined as ‘any anaesthesia-related event that affected or could affect the safety of the patient under perioperative care’. Postoperative hoarseness is included in the incidents. We obtained the following data from the anaesthetic and medical records: patient characteristics (preoperative diagnosis, age, sex, height, weight, comorbidities, American Society of Anesthesiologists physical status and Mallampati classification), surgery details (surgical procedure, positioning, surgical and anaesthetic duration, and anaesthetic method), airway

management (laryngoscope blade type, endotracheal tube or laryngeal mask airway, size and cuff volume, depth and side of tube securement, and number of laryngeal exposure attempts made using direct laryngoscopy or videolaryngoscope [Airwayscope® (Pentax Corporation, Tokyo, Japan) or McGrath® (Covidien, Tokyo, Japan)]; findings during the PAV, timing of consultation with the otorhinolaryngologist, diagnosis, treatment, and the patient outcome regarding hoarseness.

Patient outcome was defined as: complete resolution (no symptoms), partial improvement (improved but persistent symptoms), and no improvement (persistent symptoms). The time until recovery or the final clinic encounter (for patients without recovery) was recorded as the number of weeks after the surgical procedure was completed.

RESULTS

Ten cases (3%) from the 365 anaesthesia-related incident reports were related to prolonged hoarseness. Patient characteristics, surgical information, and details regarding the airway management and postoperative course were tabulated [Tables 1-3]. All surgeries were elective. Airway operators conducted PAVs in each patient. Hoarseness was detected during the routine PAV in three cases. Only one of the 10 patients was reported by the anaesthesiologist; the remaining nine cases were reported by the surgeon. All patients were assessed by an otorhinolaryngologist using a flexible laryngeal fibroscope on the day of the consultation. Three patients underwent further radiological examination. Eight cases of hoarseness were caused by unilateral recurrent nerve palsy and two were caused by ACD. After careful observation, one of the patients with arytenoid dislocation underwent closed reduction

under general anaesthesia at 16 days post-surgery. Complete phonation recovery was observed in eight of the nine patients (89%), while one patient had an unknown outcome. One patient showed partial improvement and was required to resign from her job. There was no report of dyspnoea in any of the patients.

DISCUSSION

Considering that we perform around 3,000–4,000 surgeries per year under general anaesthesia with tracheal intubation, the estimated incidence of prolonged postoperative hoarseness, based on the incident report system at our institution, was ~0.04%. In most patients in the current study, the outcome was a complete resolution of symptoms; however, medical interview in the PAV was not found to be useful in identifying hoarseness. Hence, simple objective examinations need to be added to PAVs.

Neck^[6] or thoracic surgeries,^[7] age \geq 50 years, intubation lasting \geq 3 hours, comorbidities such as diabetes mellitus and hypertension in VCP,^[3] and difficult intubation for ACD^[8] have been reported as risk factors. In this study, no incident report was submitted after neck and thoracic surgery by surgeons, possibly since surgical factors were contained. We cannot explain why all patients were female; more studies with larger sample sizes are needed to clarify this. Ninety percent of the patients were intubated for $>$ 3 hours; however, 60% of the patients were aged $>$ 50 years, and 60% were intubated during the first attempt. Specifically, there were more than a few patients in whom the risk factors were not consistent with those previously reported. In our department, for endotracheal intubation, we use a 7-mm tube for females and 8-mm tube for males; the tube includes a stylet made of malleable aluminum covered with a plastic sheath with a lubricated Satin-

Table 1: Patient characteristics

Case	Age (years)/ gender	Height/Weight (cm/kg)	Smoker	BA	HT	DM	GERD	OSAS	Mallampati grade	ASA-PS	Preoperative diagnosis
1	49/F	153/62	...	Yes	...	...	...	...	2	II	Myoma
2	71/F	153/30	...	...	...	Yes	Yes	...	...	II	IPMN
3	42/F	156/64	...	...	...	...	...	Yes	2	II	Myoma
4	69/F	145/38	...	...	...	...	Yes	...	2	I	Right breast cancer
5	51/F	156/49	...	...	...	...	...	...	2	I	Uterine cancer
6	44/F	159/60	...	Yes	...	...	...	...	2	II	Ovarian tumor/myoma
7	46/F	158/55	...	...	...	...	...	...	2	I	Ovarian tumor
8	27/F	155/49	...	...	...	...	...	...	1	I	Cholesteatoma
9	48/F	164/58	Yes	...	Yes	...	...	...	2	II	Hemifacial spasm
10	43/F	156/49	Yes	...	...	...	...	...	2	II	Ovarian tumor

BA, bronchial asthma; HT, hypertension; DM, diabetes mellitus; GERD, gastroesophageal reflux disease; OSAS, obstructive sleep apnoea syndrome; ASA-PS, American Society of Anesthesiologists physical status; IPMN, Intraductal papillary mucinous neoplasm

Table 2: Surgical and anaesthetic data

Procedure(s)	Surgical information		Anaesthetic methods	Airway operator	Blade	Airway management				
	Position	Anaesthesia/Operatin (min)				Airway	ETT type	Size/Depth/Cuff/Side taped (mm/cm/ml)	Try	Cormack
1 ATH	Supine	183/160	AOPRF + epi	Senior resident	McGRATH	OTI	Normal	7/20/6/Right	1	1
2 Distal pancreatectomy	Supine	412/332	AOPRF + epi	Junior resident	Laryngoscope	OTI	Normal	7/20/5/Right	1	...
3 ATH	Supine	427/378	AOPRF + epi	Junior resident	Laryngoscope	OTI	Normal	7/20/3/Right	1	1
4 Bp+SN	Supine	165/100	AOSRF	Staff	Laryngoscope	OTI	Normal	7/20/7/Right	2	2
5 ATH + BSO + PLA	Supine	411/362	AOPRF + epi	Junior resident	McGRATH	OTI	Normal	7/21/5.5/Right	2	3
6 ATH	Supine	340/289	AOPRF + epi	Junior resident	AWS	OTI	Normal	7/22/4/Right	1	3
7 ATH + BSO	Supine	231/176	AOSRF + epi	Junior resident	Laryngoscope	OTI	Normal	7/22/3/Right	1	1
8 Tympanoplasty	Supine	214/158	AOPRF	Staff	Laryngoscope	OTI	Spiral	7/22/4/Right	2	1
9 Microvascular decompression	Rt-lateral	296/200	AOPRF	Junior resident	Laryngoscope	OTI	Spiral	7/21/4/Right	1	2
10 ATH+BSO	Supine	205/175	AOPRF	Senior resident	Laryngoscope	OTI	Normal	6.5/22/6/Right	2	1

A, air; O, oxygen; P, propofol; R, remifentanyl; F, fentanyl; Epi, epidural anaesthesia; ATH, total abdominal hysterectomy; Bp, breast partial resection; SN, sentinel lymphadenectomy; BSO, bilateral salpingo-oophorectomy; PLA, pelvic lymphadenectomy; AWS, airway scope; OTI, orotracheal intubation; ETT, endotracheal tube; Junior resident, rotating resident with <6 months of anaesthetic experience; Senior resident, anaesthetic resident with 6 months to 4 years of anaesthetic experience; Staff, anaesthetic with >4 years of anaesthetic experience; Normal, TaperGuard tracheal tube with stylet, (CovidienShiley, Tokyo, Japan); Spiral, Oral/Nasal tracheal tube cuffed reinforce with stylet, (CovidienShiley, Tokyo, Japan)

Slip™ surface (Shiley™ Satin Slip Intubating Stylet) as a preventive measure.^[9] These complications had occurred even when experienced staff anaesthesiologists intubated and even with smooth intubations with a smaller tube with stylet. This shows that the probability of these complications cannot be eliminated completely.

Once sustained hoarseness is recognised following surgery, VCP or ACD should be considered. VCP is caused by injury, inflammation, or compression of the recurrent laryngeal nerve.^[4] While intubation-induced VCP usually shows recovery within 2–3 months without surgical treatment,^[3] a few cases requiring tracheostomy due to dyspnoea or aspiration pneumonia have been reported.^[4] Therefore, careful observation is warranted.

ACDs require closed arytenoid reduction with direct laryngoscopy, in which the arytenoid cartilage is repositioned on top of the cricoid while ensuring that the vocal process is placed symmetrically to the contralateral vocal process. This procedure must be performed immediately following detection of the dislocation.^[10] If left for several days, the cartilage might get fixed in the dislocated position. Therefore, when the patient complains of prolonged hoarseness following surgery, an otorhinolaryngologist should be consulted within 4–7 days.

Therefore, the key factors for improving patient outcomes are careful examination during PAVs to identify dysphonia, close follow-ups, and prompt consultation with an otolaryngologist. These measures may prevent occurrence of critical airway problems such as dyspnoea and aspiration pneumonia, or permanent phonetic dysfunction.

The PAV warrants face-to-face interviews that inquire regarding the general condition of the patient, pain, and complications such as nausea, vomiting, sore throat, and hoarseness; however, specific phonetic examinations are not performed because of non-familiarity. However, our study revealed that even PAVs by staff anaesthesiologists do not detect hoarseness (dysphonia). Regardless of anaesthetic experience, trivial voice changes are often overlooked, likely due to anaesthetic amnesia masking the symptoms in the initial visit. Surgeons were able to detect the symptom because they followed up the patient for a longer duration than the anaesthesiologists.

Thus, it is recommended that simple objective examinations are undertaken postoperatively during

Table 3: Diagnosis and outcome of hoarseness

	Symptom detection in PAV		ENT examination, POD	Diagnosis	Side	Treatment	Outcome	Recovery, weeks
		POD	POD					
1	No	4	4	Vocal cord palsy	Left	OBSERVATION	Partial improvement	...
2	No	4	5	Vocal cord palsy	Right	OBSERVATION	Complete resolution	2
3	No	29	30	Vocal cord palsy	Right	OBSERVATION	Complete resolution	8
4	Yes	1	4	Vocal cord palsy	Left	OBSERVATION	Complete resolution	6
5	No	2	7	Vocal cord palsy	Left	OBSERVATION	Complete resolution	26
6	No	2	3	Vocal cord palsy	Left	OBSERVATION	Complete resolution	17
7	No	6	8	Vocal cord palsy	Left	OBSERVATION	Unknown	...
8	No	1	2	Arytenoid cartilage dislocation	Posterior	OPERATION	Complete resolution	3
9	Yes	1	2	Arytenoid cartilage dislocation	Anterior	OBSERVATION	Complete resolution	6
10	Yes	1	1	Vocal cord palsy	Left	OBSERVATION	Complete resolution	5

PAV, postoperative anaesthesia visit; ENT, ear, nose, and throat clinic; POD, postoperative day

PAVs to detect and classify dysphonia (hoarseness) in any surgical patient who is administered general anaesthesia with endotracheal intubation, since not all patients have risk factors, and the examination is simple. Two simple examinations are suggested for this. The grade, roughness, breathiness, asthenia, and strain (GRBAS) scale and maximum phonation time (MPT) could be useful in assessing hoarseness following tracheal intubation.^[1] The GRBAS scale is an auditory-perceptual evaluation method that could also be used to classify hoarseness. The scale classifies hoarseness by allocating scores for grade of hoarseness: 0, normal; 1, slight degree; 2, medium degree; and 3, high degree of roughness, breathiness, asthenia, and strain (Japan Society of Logopaedics and Phoniatrics).^[1]

Patients with VCP and ACD complain of breathy hoarseness, which is a whispery voice. MPT is the longest period during which a patient can sustain phonation of a vowel sound, typically/a/. While average MPTs are 15–20s, the MPTs in patients with unilateral VCP and ACD are shorter ($3.5 \pm 1.6s$ ^[11] and $5.5 \pm 3.6s$,^[12] respectively) (mean \pm standard deviation). Therefore, in patients with an MPT of <10s, we should consider breathy hoarseness.

The practice of PAVs is not universally followed and there are no established protocols in most institutions, including our centre. To improve patient outcomes in the future, PAV guidelines should be established to detect and follow-up on mild symptoms that may lead to critical complications.

This study had certain limitations. First, our incident reporting was performed voluntarily; hence, some cases might not have been reported; in particular, cases of hoarseness resulting from direct recurrent laryngeal nerve injury by the surgeon.

Second, the incident reporting systems differ between institutions. Hence, our results might not be applicable to other institutions. Hence, these factors should be considered when establishing a PAV protocol; nevertheless, voluntary reporting by anaesthesiologists of safety related incidents through the electronic perioperative incident reporting system can improve the quality of perioperative care and needs to be more widely implemented.^[13]

CONCLUSION

Routine medical interviews in PAVs are inadequate to identify postoperative hoarseness. Hoarseness following surgery can be a sign of a critical complication and is often overlooked during PAVs. Once hoarseness following surgery is detected, relevant patients should be followed-up until their symptoms resolve.

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Conflicts of interest

There are no conflicts of interest.

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