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Thyroplasty under Conscious Sedation using Dexmedetomidine: A Case Series

Deksmedetomidin Kullanılarak Bilinçli Sedasyon Altında Tiroplasti: Bir Vaka Serisi

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ABSTRACT

Thyroplasty is a surgical procedure done on the thyroid cartilage to improve voice quality and is performed only in a few centers. Either peri-operative voice testing or confirming the vocal cord movements with a fiberoptic bronchoscope (FOB) visualization can be used as a guide to enhance the results in such cases. The anesthetic implications in such cases are less frequently reported. The published reports are mainly case series or retrospective analyses where cases were done under general anesthesia or deep sedation. This study aimed to present a series of thyroplasty cases wherein both voice testing and confirming the vocal cord movements with FOB visualization were done under conscious sedation, achieving a stable plan of sedation with dexmedetomidine infusion. Conscious sedation with dexmedetomidine as the sole agent for the maintenance of sedation can be safely adopted for these procedures.
Keywords: Thyroplasty; conscious sedation; dexmedetomidine; fiberoptic bronchoscope.

ÖZ

Tiroplasti, ses kalitesini iyileştirmek için tiroid kıkırdağında yapılan cerrahi bir işlemdir ve yalnızca birkaç merkezde gerçekleştirilir. Bu tür vakalarda sonuçları iyileştirmek için perioperatif ses testi veya fiberoptik bronkoskop (FOB) görüntüleme ile ses teli hareketlerinin doğrulanması bir kılavuz olarak kullanılabilir. Bu tür vakalardaki anestezik etkiler daha az sıklıkla rapor edilir. Yayınlanan raporlar çoğunlukla vaka serileri veya vakaların genel anestezi veya derin sedasyon altında yapıldığı geriye dönük analizlerdir. Bu çalışma, hem ses testinin hem de FOB görüntüleme ile ses teli hareketlerinin doğrulanmasının bilinçli sedasyon altında yapıldığı ve deksmedetomidin infüzyonuyla stabil bir sedasyon planı elde edilen bir dizi tiroplasti vakasını sunmayı amaçlamıştır. Sedasyonun sürdürülmesi için tek ajan olarak deksmedetomidin ile bilinçli sedasyon bu prosedürler için güvenle benimsenebilir.
Anahtar kelimeler: Tiroplasti; bilinçli sedasyon; deksmedetomidin; fiberoptik bronkoskop.

INTRODUCTION

Thyroplasty is a surgical procedure to improve the voice quality by altering the position of the vocal cords. Voice training and injection laryngoplasty with long-acting injection materials can be done as an outpatient procedure to improve voice quality. Laryngeal framework surgery (LFS) remains a gold standard and a last-resort treatment option. A retrospective study of 65 cases done over 6 years was reported from our geographical area (1). The scarcity of literature on anesthetic considerations in such cases can be attributed to the lower prevalence of this surgical procedure as a treatment option. Notably, these procedures are done only in selective centers. LFS is usually done under local anesthesia with intra-operative voice recording to test the quality. General anesthesia (GA) with a laryngeal mask airway (LMA) has been reported

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to provide good operating conditions with airway protection and allow intra-operative fiberoptic bronchoscopy (FOB) to assess the larynx (2). However, when voice testing is required, an uninstrumented larynx is preferred. In our institute, concomitant voice testing and FOB visualization of cord movements guided the surgical correction. Manipulation of the larynx can cause reflex swallowing and coughing and hinder the precision of surgery when done under local anesthesia alone. In addition, the insertion of FOB and simultaneous voice testing can put the patient under extreme stress. Deep sedation can help the patient tolerate the surgical procedure, and voice testing can be done after awakening. However, the risk of apnea, aspiration, and sharing of the airway with surgeons preponderate the advantages (3,4).

We present a series of three cases of type 1 and one type 3 thyroplasty done under conscious sedation with local anesthesia, where both voice testing and FOB were used to guide. The application of voice testing and FOB concurrently during thyroplasty under conscious sedation is not commonly practiced. Also, dexmedetomidine infusion as a sole agent for maintenance aiming the optimal sedation level has not been adopted so far.

CASE REPORT

Four cases of thyroplasty were done in our institute between January 2024 and June 2024. All patients were fasted for 8 hours for solids and 2 hours for clear liquids pre-operatively. Informed written consent was taken. All patients received 4% lignocaine nebulization pre-operatively, and nasal packing with adrenaline and lignocaine-soaked gauze was done. All patients were monitored with ECG, pulse oximetry, capnography, and non-invasive blood pressure. Premedication included intravenous (IV) glycopyrrolate 0.2 mg, fentanyl 2 mcg/kg, and midazolam 0.03 mg/kg. Infiltration of local anesthetic was done at the incision site. Infusion of dexmedetomidine 1 mcg/kg was given over the first 10 minutes, and the maintenance dose of 0.5 mcg/kg/h was continued till the surgeons intimated 10 minutes before the voice testing. All patients received supplemental oxygen via nasal prongs at 4 l/min.

Case 1

A 45-year-old female weighing 75 kg presented with hoarseness post-thyroidectomy for 18 months. She was on medication for diabetes and thyroid replacement post-surgery. Right vocal cord palsy with the cord in paramedian position was noted in the videolaryngoscopy (VDL), and she underwent medialization or type 1 thyroplasty. The procedure was completed in 2.5 hours, and sedation was maintained for 2 hours, and a total dose of 150 mcg dexmedetomidine was used. At the time of voice testing, Ramsay sedation score (RSS) was 2. She did not require any additional anesthetic agents to maintain the plane.

Case 2

A 55-year-old male weighing 77 kg presented with hoarseness following excessive retching, which did not improve with conservative management for 1 month. He was on medication for diabetes and dyslipidemia. He also had the habit of smoking and chewing tobacco. Left vocal cord palsy was noted in VDL, and left-sided medialization or type 1 thyroplasty was planned. He was prepared in the pre-operative room and sedated in the operating room as per our protocol. However, the patient was very anxious and required deeper sedation to RSS of 3-4 using propofol 30 mg and ketamine 20 mg intravenously before skin infiltration. During the procedure, the patient also required intermittent boluses of propofol 10 mg up to 50 mg along with dexmedetomidine 0.5 mcg/kg/h, which maintained RSS of 3-4. Sedation was stopped 15 minutes before voice testing, during which his RSS was 2. The total dose of dexmedetomidine until 1.5 hours was 135 mcg, and the surgery was completed in 2 hours.

Case 3

A 55-year-old professional folk singer, weighing 52 kg, presented with hoarseness for 5 years and had previously undergone injection thyroplasty with no improvement in voice. He was a smoker and an alcoholic and was also on medication for diabetes and hypertension. Right vocal cord paresis with a phonatory gap was noted in VDL, and he underwent right-sided type 1 or medialization thyroplasty. Surgery lasted 1.5 hours, and sedation was maintained till 1 hour after which voice testing was done at RSS of 2. The total dose of dexmedetomidine used was 75 mcg.

Case 4

A 26-year-old male weighing 50 kg had a traumatic ear bleed following a fall from a bike. Computed tomography of the brain was normal, and the ear bleed was conservatively managed. He was incidentally identified with puberphonia, and a type 3 thyroplasty or shortening of the vocal cords was suggested. His vocal cords were free and mobile in VDL. He underwent the procedure following the same pre-operative preparation and sedation protocol, and the surgery was completed in 2 hours. Sedation was continued using dexmedetomidine infusion for 1.5 hours, and the total dose used was 85 mcg. At the time of voice testing, the RSS was 2.

The hemodynamic parameters of the cases were compiled in Table 1. All patients underwent voice testing during which vocal cord movements were also monitored using an FOB inserted nasally (Figure 1). Sedation was stopped 10-15 minutes prior to voice testing as indicated by the surgeon, so that at the time of voice testing, RSS was 2, and the corresponding modified observer's assessment of alertness or sedation scale (MOASS) was 5 (5). Voice testing was done in all the patients to confirm the accuracy of the surgery, and all the patients responded promptly to verbal

Table 1. Case-wise hemodynamic parameters

TIME		Case 1	Case 2	Case 3	Case 4
Baseline	PR (/min)	78	88	68	80
	BP (mmHg)	110/60	140/80	120/88	130/70
5 min	PR (/min)	82	80	72	76
	BP (mmHg)	112/68	130/78	128/70	118/68
10 min	PR (/min)	76	76	69	68
	BP (mmHg)	120/76	120/70	118/70	118/68
30 min	PR (/min)	68	72	65	64
	BP (mmHg)	110/70	118/72	112/68	108/62
60 min	PR (/min)	66	74	70	62
	BP (mmHg)	110/67	120/78	120/70	110/70
90 min	PR (/min)	75	73	68	58
	BP (mmHg)	140/70	109/68	122/78	112/70
120 min	PR (/min)	78	78	-	72
	BP (mmHg)	132/72	130/80		126/78
150 min	PR (/min)	86	-	-	-
	BP (mmHg)	126/72			

PR: pulse rate (per minute), BP: blood pressure

commands. All patients received IV dexamethasone 8 mg and paracetamol 1 g. There was neither any hemodynamic disturbance nor any other complication requiring airway intervention during the surgery. There was no recall of events on the first post-operative day, and all patients had a comfortable experience during the surgery.

DISCUSSION

In conscious sedation, in addition to anxiolysis, consciousness is depressed to the level that verbal contact can still be maintained, and airway intervention is not required. Spontaneous ventilation and cardiovascular functions are well maintained. This level of sedation corresponds to the RSS score of 2 to 3 or the MOASS level 4 to 5 (5). Type 1 thyroplasty involves the placement of a silastic prosthesis in a window created in the perichondrium of the thyroid cartilage. This pushes the involved vocal cord medially. Type 3 thyroplasty, on the other hand, involves splitting the thyroid cartilage parasagittally on either side and overlapping it to reduce the pitch of the voice.

Studies comparing the voice quality with and without sedation showed that sedation with midazolam and propofol titrated to RSS of 3-4 altered the voice quality when given as boluses or target-controlled infusions (5,6). From these studies, the authors advocated against sedation when voice testing is indicated and concluded that GA with vocal cord monitoring is the preferred method for thyroplasty. Subsequently, GA with muscle relaxation and LMA was described by Granell et al. (7) for medialization thyroplasty cases. They mentioned that oro-tracheal intubation can impede the medialization of vocal cords and arytenoid rotation, leading to the choice of LMA. Monitoring peak airway pressures helped them determine the definitive size of the prosthesis while maintaining a peak airway pressure below 40 cm H_2O. However, GA with muscle relaxation increases the risk of aspiration, and airway pressures above 30 cm H_2O can also cause gastric insufflation. Therefore, an increase in airway pressure can happen for various reasons, and LMA cannot offer safety or improve the accuracy of prosthesis size selection. In our series, titrating sedatives and withholding the infusion at appropriate times helped to maintain an RSS of 2 at the time of voice testing. This did not hamper voice testing and maintained an uninstrumented airway patent.

A case of thyroplasty under deep sedation was described with fentanyl, midazolam, and droperidol with an RSS of 4, which was later reversed with flumazenil for testing phonation (4). Hamre et al. (3) described ultra-rapid titration of deep sedation to phonation using concurrent remifentanil, dexmedetomidine, and propofol infusions. The limitations of this retrospective study included incomplete data regarding the depth of sedation maintained and cessation of sedation. They also reported complications such as transient hypopnea, desaturation, and bradycardia (3). Dexmedetomidine, a selective α2 agonist, produces natural sleep patterns from which the patients can be easily woken up, retaining the ability to follow commands. The hypercarbic arousal response is well maintained with dexmedetomidine, and at 0.3-0.6 mcg/kg, it minimizes the cardiovascular side effects. Dexmedetomidine sedation without any pre-medication, given in boluses and infusion, was described by Jense et al. (8). The depth of the sedation also varied between the MOAAS scale of 3-5 in each patient during the procedure. Tachycardia, clinical bradycardia, and airway obstruction were reported in patients with obstructive sleep apnea. Although they concluded that MOASS of 3 is also an acceptable and comfortable range for the procedure, we believe that MOASS of 4-5 is ideal, and scores of 3 or below will compromise voice testing, besides other complications they observed. Hence, instead of varying doses of dexmedetomidine producing varying depths of sedation as reported by Jense et al (8), we kept the dose of dexmedetomidine constant to maintain RSS between 2-3/MOASS 4-5 at the time of voice testing. After the initial premedication with midazolam and fentanyl, local infiltration was given without any discomfort. This was sufficient in most cases except in one, where the patient was extremely anxious and had to be sedated with propofol and ketamine to an RSS of 3-4 initially, followed by propofol boluses during the procedure. However, this also did not hamper voice testing or post-operative results as the sedation was stopped ahead of voice testing, and the level was reduced to RSS 2.



Figure 1. Describing thyroplasty under conscious sedation with a fiberoptic bronchoscope in place

From our case series, we observed that, with adequate pre-operative counseling and preparation of the patient, voice testing along with FOB monitoring could be comfortably done, maintaining RSS at 2. Monitoring voice quality and vocal cord movements can be carried out unhampered in such cases. Dexmedetomidine infusion alone can be used to maintain sedation. When used along with adequate pre-medication, the dose of dexmedetomidine can be kept minimal to avoid hemodynamic disturbances. Further scope includes brain activity monitoring using the bispectral index in such cases.

CONCLUSION

Thyroplasty, guided by voice testing and FOB monitoring, can be successfully done under conscious sedation with careful titration of sedative agents along with local anesthesia. Dexmedetomidine infusion can provide an adequate plane of sedation after the initial titration to offer a comfortable and cooperative patient while allowing a stable surgical experience. A good understanding and rapport between the surgeon, patient, and anesthesiologist is vital for successful outcomes.

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