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Case Report

Awake Intraoperative Voice Adjustment via Cord Medialization Using Remifentanil and Dexmedetomidine: A Case Report

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ABSTRACT

Thyroplasty, the treatment for vocal fold paralysis, is usually managed under local anesthesia with sedation. This poses difficulties for the surgical team, as inadequate suppression of laryngeal reflexes may lead to coughing and laryngeal movement. A rapid offset of sedation is also critical to allow for intraoperative voice assessment and pitch adjustment. This paper describes an anesthetic approach using total intravenous anesthesia with a combination of remifentanil and dexmedetomidine for a patient undergoing the procedure. The elderly patient was able to remain immobile and relaxed with good spontaneous respiration during surgical dissection and was able to emerge and phonate appropriately during voice monitoring. The technique provided a quiet surgical field and improved patient comfort.

Introduction

Unilateral vocal cord paralysis is a common complication of a thyroidectomy procedure resulting from iatrogenic recurrent laryngeal nerve injury [1].

This is managed with medialization thyroplasty, which aims to move the paralyzed vocal fold closer to midline using an implant, adducting it with the functional vocal cord during phonation [2].

Historically, thyroplasty is done under local anesthesia with sedation to allow for intraoperative voice assessment; however, this poses challenges such as incomplete blockade of laryngeal reflexes resulting in coughing and laryngeal movement [3].

This case report describes an anesthetic technique for thyroplasty using total intravenous anesthesia (TIVA) with remifentanil and dexmedetomidine to provide sedation, analgesia, immobility, and rapid awakening for intraoperative voice assessment.

Case Report

This is a case of a 67-year-old female, 45 kg, classified as ASA (American Society of Anesthesiologists) The patient is classified as ASA Physical Status 2 due to dyslipidemia and post-thyroidectomy hypothyroidism, and she is scheduled for revision thyroplasty to address right vocal cord paralysis. The patient had a history of multinodular non-toxic goiter, for which she underwent total thyroidectomy followed by medialization thyroplasty 15 years prior. She now presents with persistent postoperative hoarseness despite corrective surgery. Airway examination reveals Mallampati 2, adequate mouth opening and thyromental distance, and no limitations in neck movement. Preoperative laboratory results were all within normal limits.

The patient was received in the operating room awake and anxious. She was positioned on the operating table, supine, with her neck hyperextended (Figure 1). Monitors were attached, including a 5-lead electrocardiography,

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pulse oximetry, and non-invasive blood pressure apparatus. Oxygen was administered via nasal cannula at a flow rate of 3 liters per minute. After premedication with intravenous midazolam (0.02 mg/kg) and atropine (0.01 mg/kg), dexmedetomidine and remifentanil infusions at rates of 0.5 mcg/kg/h and 0.05 mcg/kg/min, respectively, were started.

Figure 1- Set-up for thyroplasty. The image on the left shows the patient induced with TIVA, and a nasolaryngoscope inserted for intraoperative assessment of vocal cords. The image on the right shows the remifentanil and dexmedetomidine infusions.

A flexible nasolaryngoscope was inserted to directly visualize the laryngeal inlet for intraoperative vocal cord monitoring (Figure 1,2). Local infiltration using a lidocaine-bupivacaine mixture was applied to the anterior neck before an incision was made. Paracetamol (10 mg/kg), ketorolac (0.5 mg/kg), and dexamethasone (0.01 mg/kg) were given intravenously. Vital signs were maintained at a BP of 110-130/70-80 mmHg, a heart rate of 80-90 beats per minute, a respiratory rate of 12-18 cycles per minute, a sinus rhythm, and 100% oxygen saturation. The surgeons notified the anesthesiologist about the need for voice assessment 20 minutes in advance, at which time dexmedetomidine and remifentanil infusions were down titrated to 0.02 mcg/kg/h and 0.03 mcg/kg/min, respectively. Intraoperative assessment of phonation guided the degree of medialization during thyroplasty. A silastic implant was incrementally shaped and inserted into the paraglottic space through a thyroid cartilage window to achieve optimal medial displacement of the paralyzed vocal fold. The patient remained comfortable and cooperative during phonatory testing. Progressive adjustments were made based on voice quality, with specific attention to reducing hoarseness and achieving a stronger, more stable vocal output. Satisfactory glottic closure and improved voice projection were confirmed intraoperatively before securing the implant in place. Incisions were closed and infusions were eventually turned off. The patient was transferred to the post-anesthesia care unit awake with stable hemodynamics, with no subjective complaints or discomfort.

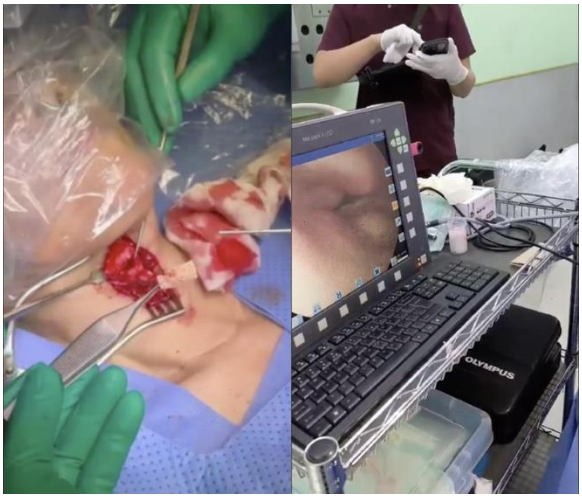

Figure 2- Intraoperative voice assessment. The image on the left shows the application of the silastic implant. The image on the right shows the monitor view of the nasolaryngoscope during intraoperative voice assessment.

Discussion

The goal of the thyroplasty is to medialize the paralyzed vocal fold to allow for laryngeal closure during phonation. Visualization of the vocal cords, as well as intraoperative voice assessment, is done to assess for adequacy of vocal cord alignment [2]. This presents challenges to the anesthesiologist. The surgical site involves the vocal cords, which play a dual role in phonation and serve as an aqueduct for airflow. The most common way to secure ventilation is through endotracheal intubation or insertion of a supraglottic airway (SGA), but these can obscure the surgeon's view and limit surgical manipulation. The need for intraoperative phonation would require the patient to be awake and cooperative and the airway free of any instruments. Thyroplasty is conventionally performed under local anesthesia supplemented with deep sedation; however, this approach is often limited by insufficient suppression of laryngeal reflexes, resulting in intraoperative coughing and involuntary laryngeal movements that may compromise surgical precision. [3-5] Sedation is a spectrum, and excessive sedation may result in general anesthesia, depressing respiration and impairing patient cooperation [4]. There are currently readily available intravenous anesthetic agents that can provide continuous sedation. Propofol is a short-acting anesthetic that offers rapid onset and offset; however, its use is limited by its respiratory depressant effects, which are further potentiated when used with other agents with sedative actions [6]. Ketamine, an NMDA antagonist, is

another drug commonly used in procedural analgesia. Its fast onset and ability to prevent respiratory depression while achieving an excellent surgical anesthetic state make it an attractive option for this case. However, its lack of graded dose-response means an all-or-none dissociative trance and sedation depth cannot be fine-tuned [7]. Laryngospasm associated with its use has also been reported [8]. Emergence issues include tonic-clonic movements, confusion, delirium, and altered sensorium, which can delay recovery and patient engagement [7].

Alternatively, another agent gaining popularity is dexmedetomidine, a nonselective alpha-2 agonist used for sedation, analgesia, and sympatholysis while maintaining respiration. Context-sensitive half-life is relatively short, ranging from 4 minutes for a 10-minute procedure to 250 minutes for an 8-hour procedure. It acts on the locus coeruleus and the spinal cord, producing its sedative and analgesic effects. Its action on the endogenous sleep-promoting pathways generates natural sleep patterns, described as easy to wake up from with the ability to follow commands, allowing for cooperative sedation. This makes it desirable for surgeries requiring intraoperative assessment. Furthermore, the preservation of the hypercapnic ventilatory response, a characteristic widely observed during natural sleep, is of particular clinical significance, as it supports the maintenance of respiratory drive even under sedation [9-11]. In elderly patients like this case, dexmedetomidine is known to protect neurologic function by regulating neurotransmitter metabolism, reducing risk of postoperative delirium [12]. Infusion rates of 0.2-0.7 mcg/kg/hr are recommended for procedural sedation, and higher doses are not associated with additional clinical benefit [11]. Side effects are more common in boluses and rapid infusions, which include bradycardia, hypotension, and hypertension. Bradycardia and hypotension result from the decreased release of norepinephrine, whereas hypertension may result from stimulation of alpha receptors in vascular smooth muscles [9-10].

Remifentanil is a new piperidine ultrashort-acting opioid. It is structurally unique from other opioids because of its ester linkages, which offer rapid onset and offset due to hydrolysis by blood and tissue nonspecific hydroxylases. It is converted to an inactive metabolite and cleared renally [13]. At high doses, it is known to cause bradycardia, hypotension, apnea, and chest wall rigidity. Potent respiratory depressant effects discourage its use at high concentrations (>0.2 mcg/kg/min) in patients without a secured airway [14]. Fentanyl is another short-acting opioid that is frequently used in sedation, usually delivered in boluses. However, accurately estimating bolus doses to achieve a target plasma concentration and the corresponding level of sedation is difficult. In a study conducted by Wang et al. comparing the use of remifentanil infusion vs. fentanyl boluses in laryngeal surgery, it was found that remifentanil infusion achieved a peak effect faster; offered titration for changing levels of surgical stimulation, thus preventing side effects of over- and under-dosage; and provided faster emergence time [15].

Synergism, a key concept in pharmacology, refers to the combined use of two or more agents to achieve an enhanced therapeutic effect at lower individual doses. This interaction can potentiate desired pharmacologic actions while potentially minimizing the incidence or severity of adverse effects. The dexmedetomidine-remifentanil combination in this case provided a state of general anesthesia while preserving spontaneous respiration and stable hemodynamics. Conscious sedation and effective analgesia, the key roles of these drugs, respectively, were achieved at reduced individual doses. This pharmacologic pairing enhances the desired clinical effects while potentially minimizing dose-dependent adverse events.

The rapid offset of both agents facilitated rapid and timely awakening, enabling intraoperative voice monitoring. Adjuncts were used, including atropine and dexamethasone. Atropine is an anticholinergic and an antisialogogue, which decreases secretions that may obscure the surgical field and cause aspiration. Dexamethasone, a glucocorticoid, was used for postoperative nausea and vomiting (PONV) prophylaxis and acted as an anti-inflammatory agent to decrease laryngeal swelling, which may progress to airway obstruction. A case report published in the Brazilian Journal of Anesthesiology mentioned the use of the same agents successfully for thyroplasty, with the patient quickly emerging in time for intraoperative voice monitoring. In this report, the patient was not premedicated with midazolam but given a loading dose of dexmedetomidine at 1 μg/kg x 10 minutes before a maintenance dose of 0.2-0.7 μg/kg/hr. No desaturations were noted, and vital signs were maintained within preoperative levels [4].

Total intravenous anesthesia, with a combination of well-selected agents, eliminates the need for airway devices that can obstruct the surgical field. In this case, the patient tolerated vocal cord manipulation while avoiding undesirable laryngeal reflexes or patient movement. The patient was able to emerge in time for voice assessment and was able to phonate appropriately.

Conclusion

This anesthetic approach was selected to provide a quiet surgical field and enhance the comfort of an anxious elderly patient. The combination's ability to suppress laryngeal reflexes, along with the rapid offset of both agents, makes it particularly well-suited for this type of procedure, especially those requiring intraoperative voice monitoring. This validates reported findings from

literature using the same combination and reaffirms the effectiveness and safety of use for elderly patients.

References

[1] Francis DO, Pearce EC, Ni S, Garrett CG, Penson DF. Epidemiology of vocal fold paralyses after total thyroidectomy for well-differentiated thyroid cancer in a Medicare population. Otolaryngol Head Neck Surg. 2014; 150(4):548-57.

[2] Daniero JJ, Garrett CG, Francis DO. Framework surgery for treatment of unilateral vocal fold paralysis. Curr Otorhinolaryngol Rep. 2014; 2(2):119-30.

[3] Rosero EB, Ozayar E, Mau T, Joshi GP. A sequential anesthesia technique for surgical repair of unilateral vocal fold paralysis. J Anesth. 2016; 30(6):1078-81.

[4] Andrade LR, Castiglia YMM. Sedação com dexmedetomidina e remifentanil em anestesia local para monitoração intraoperatória da fala: um relato de caso [Sedation using dexmedetomidine and remifentanil with local anesthesia for intraoperative speech monitoring: a case report]. Braz J Anesthesiol. 2018; 68(5):521-3.

[5] Handlogten KS, Ekbom DC, Hamre MC, Weingarten TN, Schroeder DR, Seelhammer TG. Anesthetic management for medialization laryngoplasty using concurrent infusions of dexmedetomidine, remifentanil, and propofol versus controls. Am J Otolaryngol. 2019; 40(2):147-51.

[6] Folino TB, Parks LJ. Propofol [Internet]. StatPearls Publishing; 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK430884/

[7] Rosenbaum SB, Palacios JL. Ketamine [Internet]. StatPearls Publishing; 2024. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470357/

[8] Green SM, Roback MG, Krauss B, Emergency Department Ketamine Meta-Analysis Study Group. Laryngospasm during emergency department ketamine sedation: a case-control study. Pediatr Emerg Care. 2010; 26(11):798-802.

[9] Gropper M, Eriksson L, Fleisher L, Wiener-Kronish J, Cohen N, Leslie K. Miller's anesthesia. 9th ed. Elsevier; 2020.

[10] Cullen BF, Stock MC, Ortega RA, Sharar SR, Holt NF, Connor CW, et al. Barash, Cullen, and Stoelting's clinical anesthesia. Wolters Kluwer; 2024.

[11] Reel B, Maani CV. Dexmedetomidine [Internet]. Treasure Island (FL): StatPearls Publishing; 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK513303/

[12] Wang D, He X, Li Z, Tao H, Bi C. The role of dexmedetomidine administered via intravenous infusion as adjunctive therapy to mitigate postoperative delirium and postoperative cognitive dysfunction in elderly patients undergoing regional anesthesia: a meta-analysis of randomized controlled trials. BMC Anesthesiol. 2024; 24(1):73.

[13] Remifentanil use in anaesthesia and critical care [Internet]. WFSA Resource Library. Available from: https://resources.wfsahq.org/atotw/remifentanil-use-in-anaesthesia-and-critical-care/

[14] Sreevastava, D., & Bhargava, A. (2004). Remifentanil hydrochloride : An opioid for the 21st century. Medical Journal Armed Forces India, 60(2), 177–178.

[15] Wang Y, Yan M, He JG, Zhu YM, Hu XS, Li X, et al. A randomized comparison of target-controlled infusion of remifentanil and propofol with desflurane and fentanyl for laryngeal surgery. ORL J Otorhinolaryngol Relat Spec. 2011; 73(1):47-52.