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## Parapharyngeal abscess following use of a laryngeal mask airway during open revision septorhinoplasty

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## ABSTRACT

**INTRODUCTION:** A laryngeal mask airway (LMA) is an established safe tool to support the airway during surgery under general anesthetic. It is commonly used both in North America and abroad. Complications with this device are rare.**PRESENTATION OF CASE:** A 50-year old female developed a parapharyngeal neck abscess following an uneventful septorhinoplasty during use of an LMA Classic. The patient had symptoms of pain and difficulty swallowing. CT revealed extensive soft tissue edema and swelling in the right and posterior neck involving the right parapharyngeal space, right parotid space, minimal involvement of the right submandibular space, and extending across the retropharyngeal space. The abscess was incised and drained with an open approach, combined with laryngoscopy to evaluate the site of the infection at the right pyriform fossa. The patient fully recovered following discharge.**DISCUSSION:** Despite the rare incidence of LMA injuries, early recognition of parapharyngeal neck abscesses can initiate early treatment and prevention of spread to retropharyngeal space where airway obstruction and emergent complications may occur.**CONCLUSION:** Laryngeal mask airways have a high rate of success and low rate of complications. In this reported case, pressure necrosis from over-inflation of the LMA is thought to have perforated the right pyriform fossa. The perforation created a communication into the parapharyngeal space causing infection. We report this case to highlight the importance of identifying possible complications associated with a routine method of airway management during shared airway surgeries.© 2015 The Authors. Published by Elsevier Ltd. on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## 1. Introduction

The laryngeal mask airway (LMA) provides a safe, effective, and reliable artificial airway for controlled and spontaneous ventilation. This occurs through the formation of a low-pressure seal around the glottis [1]. Literature supports the safety and effectiveness of LMA, reporting high success rates and a low incidence of complications or critical incidences [2]. A review of 11,910 patients by Verghese and Brimacombe (1996) demonstrates the safety effectiveness of laryngeal mask airway in patients, finding successful insertion in 99.81% of patients and critical incidents reported in 0.15% of patients [2]. Reported complications of the LMA include coughing, gagging, retching, glottis closure, laryngospasm, vom-

iting, arytenoid dislocation, vocal cord paralysis and sore throat [3,4].

Injuries caused by the LMA are rare. Both retro- and parapharyngeal abscesses following LMA have been reported in the literature in the past. A review by Harkani et al. documents five cases of retropharyngeal abscess resulting from pharyngeal trauma [5]. One case study by Casey et al. reports a severe retropharyngeal abscess following use of a reinforced laryngeal mask with a Bosworth introducer, believed to be caused by pharyngeal trauma during the procedure [6]. Another study by Lynn et al. reports retropharyngeal abscess following LMA insertion during a breast lump excision [7]. Retropharyngeal abscesses are of high morbidity and mortality due to risk of airway obstruction, aspiration pneumonia, mediastinitis, jugular venous thrombosis, necrotizing fasciitis, sepsis and erosion in the carotid artery [7], thus require immediate management through surgical drainage and antibiotics.

A review by Tennebaum's report 51 cases of retropharyngeal abscess [8]. Patients commonly present with sore throat, dysphagia, odynophagia or neck pain without airway obstructive symptoms. 37% of these cases report posterior pharyngeal swelling

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on examination. 41% of cases involve patients with recent history of preceding procedure or impacted foreign body, which may have led to a pharyngeal tear. Approximately 10% of these reported cases were preceded by blunt trauma that may have resulted in a retropharyngeal hematoma. Common organisms grown from these reported abscesses include group A  $\beta$ -hemolytic streptococcus (GAS), *Staphylococcus aureus*, *Haemophilus influenzae*, and anaerobic species such as bacteroides, peptostreptococcus and fusobacterium.

Although less commonly reported, the parapharyngeal space also provides an area for abscesses to form. If infection of this space is left untreated it may spread to retropharyngeal space and descend into the mediastinum [9]. A review by Sethi and Stanley found 9 patients with parapharyngeal abscess. All patients presented febrile and with swelling of the upper neck. Most commonly, mild soft tissue swelling of the prevertebral area was found in 7 of the 9 patients. All patients underwent neck examination, exploration, excision and drainage. Although this complication has been previously published, it has not been published in over 20 years.

Laryngeal mask airway injuries and parapharyngeal abscesses are rare. Here, we report a 50-year-old female who suffered a parapharyngeal neck abscess following an open revision septorhinoplasty with use of an LMA.

## 2. Case presentation

A 50-year-old female presented to our community hospital on May 10 with right neck pain and odynophagia following surgery on May 5. The patient had an uneventful, open revision septorhinoplasty, using a laryngeal mask airway for airway management. A number 4 LMA Classic™ laryngeal mask airway (LMA) was used and the procedure took approximately two hours to complete.

The insertion of the LMA was uneventful. It was done without laryngoscopy, being inserted successfully on the first attempt, by an experienced staff anesthetist, very comfortable in the use of LMA for airway management. There was no air leak during the case. In conversation the anesthetist recalled placing 20 mL of air in the cuff initially, but also noted that further air was added shortly afterwards by the operating room nurse. He was not certain how much was added, and did not measure the cuff pressure during the case.

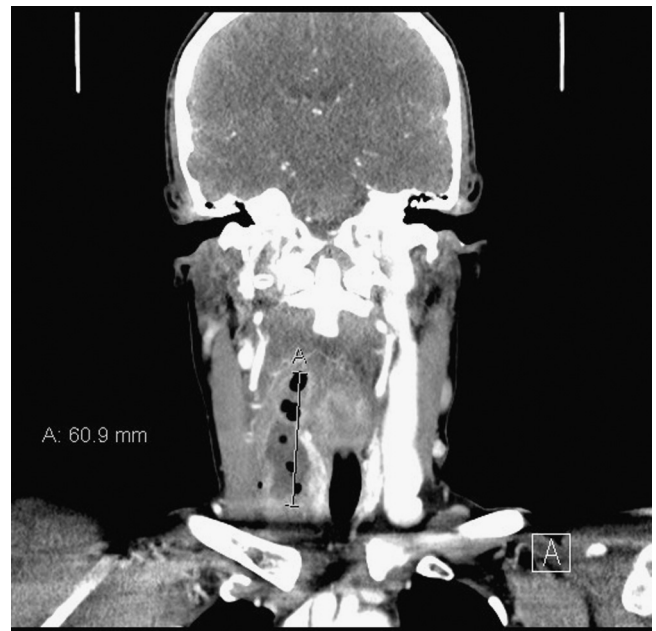
The patient complained of pain with swallowing and right otalgia in PACU, which settled with IV morphine. She was discharged with Percocet for pain management to be used every 4–6 h as needed, with intolerance to Codeine.

The patient experienced difficulty swallowing since her surgery and had used oxycodone for pain management. She experienced little relief from the oxycodone, having difficulty eating any solid foods. The patient's primary complaint was of pain on the right neck, which also extends across to the left. There was no shortness of breath, no stridor, and no dysphonia.

Five days post-operatively, the patient presented to the ER, no longer able to manage her pain, before returning home and then coming back again several hours later for reassessment. The patient was given IV ceftriaxone and a computed tomography (CT) scan of the neck was done after a soft tissue X-ray showed a collection in the right neck. The CT scan revealed a collection in the right neck, lateral to the thyroid with air tracking up towards the pyriform sinus (Fig. 1). There was limited extension inferiorly, and did not extend into the mediastinum. There was extensive soft tissue edema and swelling in the right and posterior neck involving the right parapharyngeal space, right parotid space, minimal involvement of the right submandibular space, and extending across the retropharyngeal space. A loculated collection of fluid and air was present, measuring 2.0 cm  $\times$  1.9 cm, and extending 6.1 cm in length from C4 to T1 vertebral level (Fig. 2).



**Fig. 1.** An axial view CT scan with contrast at the level of the thyroid cartilage showing the injury into the right pyriform sinus.



**Fig. 2.** A coronal view CT scan with contrast of the thyroid cartilage, at the level of the pyriform fossa as well, showing the extent of the neck abscess inferiorly.

On examination, the patient did not appear to be in distress, but initially presented very tachycardic with a heart rate of 130 BPM, febrile at 38.6 C. She had been fluid resuscitated and pain was managed intravenously. The patient had some tenderness over the right

neck, just anterior to the sternocleidomastoid muscle at the level of the thyroid. No obvious cellulitis was identified.

Flexible endoscopy was performed via the left nostril, identifying a normal nasopharynx, some swelling and edema at the right pyriform fossa, with normal vocal cord mobility and mild right tongue base swelling. No airway compromise was identified. Some deviation of the trachea from mass effect was identified on CT.

The patient underwent incision and drainage of the neck abscess with laryngoscopy at a community hospital before being transferred to a larger regional hospital. There was a nasogastric (NG) tube inserted at the time of surgery for feeds as she was kept NPO for 6 days post operatively. The incision and drainage contents were sent for culture and three organisms were identified in varying levels. A moderate amount of streptococcus anginosus group, a light amount of anaerobic gram positive cocci, and a light amount of prevotella species were all identified.

Following incision and drainage, the patient progressively improved before being discharged eight days after admission. At this point she was able to tolerate a soft food diet well. The patient fully recovered from the parapharyngeal abscess following discharge.

### 3. Discussion

Reported here, we have a case of parapharyngeal abscess resulting from a laryngeal mask airway (LMA) insertion. This required incision and drainage of the abscess, followed by a course of IV ceftriaxone throughout an 8-day hospital admission. We suspect that the over-inflation of the cuff, positioning of the classic LMA, lead to soft tissue necrosis. Unfortunately cuff pressures are not routinely measured in our institution so this is, in part, conjecture. There was discussion with the anesthetist who managed this patient for the original surgery about the complication. While he was not available to co-author this paper, he did recall adding 20 cc of volume to the cuff initially and then noted that a nurse had later added more volume shortly afterwards. The exact volume and pressure are therefore not available for this report. It seems most likely that over inflation of the cuff resulted in the parapharyngeal space being traumatized leading to local necrosis. The local soft tissue necrosis created a communication externally into the pyriform fossa and the deep neck and parapharyngeal spaces. This area is vulnerable to infection, became infected, ultimately leading to a neck abscess.

The maximum cuff volume, as suggested by the product instruction leaflet, are 20 mL for a size 3, 30 mL for a size 4, and 40 mL for a size 5 [13]. More importantly, it discusses a maximum cuff pressure of 60 cmH<sub>2</sub>O [13]. This distinction is important, as the maximum volume is made in regards to the properties of the LMA, the maximum volumes at which the LMA can be distended without damaging the silicone [13]. The maximum recommended pressure, 60 cmH<sub>2</sub>O, is based on safety and function [13]. At pressures higher than 60 cmH<sub>2</sub>O, the LMA can be harmful to the mucosa by decreasing mucosal bloodflow and can affect the quality of the seal. The maximum accepted volumes have been shown to generate cuff pressures twice the recommended limits, and in some cases up to 200 cmH<sub>2</sub>O [13].

It is also possible that the relatively rigid airway tube of the LMA classic and its flexion caudad may have led to the generation of mechanical forces leading to hypoperfusion/pressure injury. In this case an LMA flexible, which is wire reinforced and more flexible, may have been more appropriate. The use of an LMA ProSeal would be another consideration for use in a similar case in the future, given it has a softer silicone cuff which would reduce the likelihood of throat irritation, also allowing for higher seal pressures without increasing mucosal pressures. Alternatively, the use

of an endotracheal tube could also be considered for secure airway management without the risk of over-inflation.

The parapharyngeal space is a potential space that makes up the lateral pharynx of the neck. It is a central, fat-filled space in the deep neck. Medially, the border of the potential space consists of the middle layer of the deep cervical fascia and edges of the pharyngeal mucosa. It is defined laterally by the superficial layer of the deep cervical fascia and borders of the masticator and parotid spaces. The carotid sheath forms the posterior border as well as the carotid space. Superiorly, the space begins at the skull base and continues inferiorly to the hyoid bone. No fascia separates the inferior portion from the submandibular space, providing an opportunity for pathologies in one space to move into the next [10].

Laryngeal mask airway is frequently used in anesthesia and rarely results in major complications. If complications occur, they are most commonly minor. Minor complications include coughing, gagging, retching, glottic closure, and sore throat. Due to the relative safety, ease of manipulation, and resultant shared airway, LMA's are frequently used during ENT surgeries [3]. The LMA classic commonly has minor morbidities described following its use, including sore throats described in almost one-third of patients. Blood has been said to be found on 13–21% of devices following cases, which provides further evidence of resultant mucosal injury. Additionally, tissue trauma can occur even with “apparent ‘easy insertion’” of the device, though it is most likely following difficult insertions where excessive force or repeated attempts are required [6].

Reporting on the mechanical impact of LMA's, Brimacombe and Berry suggest that the inflated cuff may cause compression and shearing forces on the pharyngeal mucosa [11]. These forces result in a reduction in pharyngeal blood flow and direct tissue trauma leading to injury. When discussing contraindications for the use of a laryngeal mask airway during anesthesia, it was noted at the time of this study, that use of the LMA was contraindicated in procedures longer than two hours [12]. We suspect this is directly related to the reduced blood flow to the pharyngeal mucosa and the increased risk of major complications as a result of LMA compression of the tissues.

Retropharyngeal abscesses are a major concern, and have been reported to be caused by direct tissue blunt trauma resulting in a hematoma, which ultimately leads to a retropharyngeal abscess. There is concern surrounding parapharyngeal and retropharyngeal abscesses causing a spread to surrounding areas. The spread of infection in these areas can affect the danger space potentially affecting the mediastinum, leading to mediastinitis and the potential for serious long-term consequences [8].

In the case presented here, we suspect that the increased pressure resulting from over-inflation of the cuff, for the 2 h procedure, led to soft tissue compression, perhaps combined with the rigidity of the LMA classic and its caudad positioning, causing tissue damage and decreased blood flow to the mucosa. The patient had an uneventful surgery, with no events surrounding the use of the laryngeal mask being reported. Without the reporting of any critical events such as, vomiting or laryngospasm, there was no reason to suspect that this patient would have post-operative complications.

### 4. Conclusion

Laryngeal mask airway injuries are a rare complication during surgery. We report a rare case of parapharyngeal abscess following use of a laryngeal mask airway in a patient undergoing open revision septorhinoplasty. Despite the rare incidence of LMA injuries, early recognition of parapharyngeal neck abscesses can initiate early treatment and prevention of spread to retropharyngeal space where airway obstruction and emergent complications may occur.

This case report highlights the importance of vigilance during all aspects of patient care in the operating room, where the use of a very commonly used method of airway management likely resulted in this unexpected complication. It also highlights the difficulties in truly providing full informed consent to our patients, as this is a complication that would certainly not be routinely discussed as a risk for rhinoplasty, or by the anesthetist for airway management. It is reasonable to conclude that this risk could have been significantly reduced with routine measurement of cuff pressures when a LMA is used for airway management. It also highlights the importance of choosing the correct LMA, or alternate method of securing the airway, for a given case, which can be limited at times due to availability arising from financial constraints at your institution. While another option would be to consider the use of an endotracheal tube for this procedure, it would still create other small potential risks, present in any medical intervention.

#### Conflict of interest

The authors declare that they have no competing interests.

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None.

#### Ethical approval

No formal ethics approval has been sought as the McMaster Hamilton Integrated Research Board does not require full submission for a case report, only written and informed consent. A copy of written consent has been obtained and is available for the Editors.

#### Consent

Written informed consent was obtained from the patient for the publication of this report and any accompanying images. A copy of this written consent is also available for review by the Editor-in-Chief of this journal.

#### Authors' contribution

JR operated on the patient. BV prepared the first draft of this manuscript. MG revised the draft and added important content regarding the LMA. All authors contributed equally to this manuscript. All authors have read and approved the final manuscript.

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