

World Journal of *Clinical Cases*

World J Clin Cases 2021 December 16; 9(35): 10746-11121



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INDEXING/ABSTRACTING

The WJCC is now indexed in Science Citation Index Expanded (also known as SciSearch®), Journal Citation Reports/Science Edition, Scopus, PubMed, and PubMed Central. The 2021 Edition of Journal Citation Reports® cites the 2020 impact factor (IF) for WJCC as 1.337; IF without journal self cites: 1.301; 5-year IF: 1.742; Journal Citation Indicator: 0.33; Ranking: 119 among 169 journals in medicine, general and internal; and Quartile category: Q3. The WJCC's CiteScore for 2020 is 0.8 and Scopus CiteScore rank 2020: General Medicine is 493/793.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: Jia-Hui Li; Production Department Director: Xiang Li; Editorial Office Director: Jin-Lei Wang.

NAME OF JOURNAL

World Journal of Clinical Cases

ISSN

ISSN 2307-8960 (online)

LAUNCH DATE

April 16, 2013

FREQUENCY

Thrice Monthly

EDITORS-IN-CHIEF

Dennis A Bloomfield, Sandro Vento, Bao-Gan Peng

EDITORIAL BOARD MEMBERS

<https://www.wjgnet.com/2307-8960/editorialboard.htm>

PUBLICATION DATE

December 16, 2021

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INSTRUCTIONS TO AUTHORS

<https://www.wjgnet.com/bpg/gerinfo/204>

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<https://www.wjgnet.com/bpg/gerinfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/gerinfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>

Lingual nerve injury caused by laryngeal mask airway during percutaneous nephrolithotomy: A case report

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Author contributions: Cheng Y designed the research study; Wang ZY and Liu WZ reviewed the literature and prepared the manuscript; Wang FQ, Chen YZ, Huang T, and Yuan HS drafted the work or revised it critically for important intellectual content; all authors have read and approved the final manuscript.

Informed consent statement:

Verbal and written consent was obtained from the patient for his anonymized information to be published in this article.

Conflict-of-interest statement: The authors declare that they have no conflicts of interest related to this manuscript.

CARE Checklist (2016) statement:

The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

Country/Territory of origin: China

Specialty type: Surgery

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Abstract

BACKGROUND

Lingual nerve injury (LNI) is a rare complication following the use of laryngeal mask airway (LMA). The occurrence of this unexpected complication causes uncomfortable symptoms in patients and worsens their quality of life. We present an unusual case of LNI caused by the use of an LMA in percutaneous nephrolithotomy (PCNL).

CASE SUMMARY

A 49-year-old man presented to our hospital with a 3-year history of intermittent left lower back pain. Abdominal computed tomography showed a 25 mm × 20 mm stone in the left renal pelvis. PCNL surgery using LMA was performed to remove the renal stone. The patient reported numbness on the tip of his tongue after the operation, but there were no signs of swelling or trauma. The patient was diagnosed with LNI after other possible causes were ruled out. The symptom of numbness eventually improved after conservative medical therapy for 1 wk. The patient completely recovered 3 wk after surgery.

CONCLUSION

This is the first case report describing LNI with the use of LMA in PCNL. In our case, an inappropriate LMA size, intraoperative movement, and a specific surgical position might be potential causes of this rare complication.

Key Words: Lingual nerve injury; Laryngeal mask airway; Percutaneous nephrolithotomy; Case report

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Provenance and peer review:

Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): 0

Grade B (Very good): B

Grade C (Good): 0

Grade D (Fair): D

Grade E (Poor): 0

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Received: July 9, 2021

Peer-review started: July 9, 2021

First decision: July 26, 2021

Revised: August 7, 2021

Accepted: October 27, 2021

Article in press: October 27, 2021

Published online: December 16, 2021

P-Reviewer: Ferreira GSA, Mastrantonakis K

S-Editor: Yan JP

L-Editor: Wang TQ

P-Editor: Yan JP



Core Tip: This is the case report of a 49-year-old male patient who reported numbness on the tip of his tongue after a percutaneous nephrolithotomy surgery. A diagnosis of lingual nerve injury caused by laryngeal mask airway (LMA) was made after ruling out other possible causes. The occurrence of this rare complication may be associated with several factors, such as inappropriate LMA size, intraoperative movement, and special surgical position. The patient completely recovered after 3 wk of conservative medical therapy.

Citation: Wang ZY, Liu WZ, Wang FQ, Chen YZ, Huang T, Yuan HS, Cheng Y. Lingual nerve injury caused by laryngeal mask airway during percutaneous nephrolithotomy: A case report. *World J Clin Cases* 2021; 9(35): 11095-11101

URL: <https://www.wjgnet.com/2307-8960/full/v9/i35/11095.htm>

DOI: <https://dx.doi.org/10.12998/wjcc.v9.i35.11095>

INTRODUCTION

Lingual nerve injury (LNI) is an extremely rare complication after general anesthesia and is mostly related to the use of airway devices[1]. LNI commonly manifests as paresthesia, including unilateral or bilateral numbness, altered taste sensation, and loss of gustatory function. Compression of the surrounding tissues due to overinflation of the mask cuff is considered to be the most likely cause of LNI[2]. We report a rare case of LNI after laryngeal mask airway (LMA) use in a kidney stone patient and present a literature review. The patient underwent percutaneous nephrolithotomy (PCNL) to remove stones from the left kidney and reported tongue tip numbness after the surgery. The numbness symptom was thought to be associated with the use of LMA and disappeared after 3 wk of drug therapy.

CASE PRESENTATION

Chief complaints

A 49-year-old male patient was admitted to our clinic with a chief complaint of left lower back pain.

History of present illness

The patient experienced intermittent lower back pain on the left side that worsened when tired. He had a 3-year history of this symptom.

History of past illness

The patient had a history of hypertension that was well controlled by medicine.

Personal and family history

The patient was a heavy smoker and smoked at least two packs of cigarettes a day for 30 years. His family history did not reveal anything of significance to the present illness.

Physical examination

The patient's vital signs were within normal limits. Physical examination revealed percussion tenderness over the left kidney region.

Laboratory examinations

Routine urinalysis revealed a white blood cell count of 61/ μ L, and the result of the urine culture was negative.

Imaging examinations

An abdominal computed tomography scan showed a 25 mm $\times$ 20 mm stone in the left renal pelvis (Figure 1).

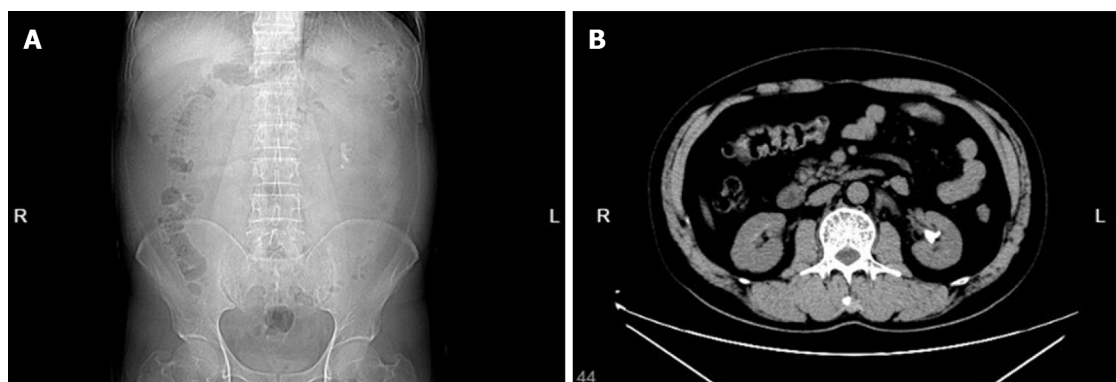


Figure 1 Computed tomography scan showing left kidney stone. A: Coronal computed tomography image; B: A stone located in the left kidney pelvis.

The patient underwent PCNL in a prone position to remove left renal calculi. The operation was performed by a surgeon who had previously performed thousands of PCNL surgeries. The preoperative airway evaluation was normal and revealed Mallampati class I and a full set of normally arranged teeth. After intravenous anesthesia induction, a size 4 LMA (Shanyou Ltd., Hangzhou, Zhejiang Province, China) was successfully inserted and fixed on the first attempt. Continuous intravenous infusion of propofol (6-10 mg/kg/h) was used to maintain anesthesia. Then, the patient was turned over to the prone position, and his head was held in a right-side position during the entire surgical procedure.

The surgery was uneventful and lasted for 80 min. The LMA was removed successfully in the recovery room. The patient found numbness at the tip of his tongue when he returned to the ward. There was no marked swelling, hematoma, or sign of trauma to the tongue or oral cavity (Figure 2). A brain magnetic resonance imaging scan was performed on day 2 postoperatively and showed no abnormalities. We consulted with a neurologist, and no organic disease was found.

FINAL DIAGNOSIS

According to the patient's presentation and clinical examinations, the most likely diagnosis was LNI secondary to compression by LMA.

TREATMENT

To the best of our clinical judgment, nerve injury in the patient was mild (Sunderland grade I) in severity, and conservative treatment was elected. Neurotrophic drugs could promote the biosynthesis of phospholipids and proteins, which are beneficial for neurological recovery. The patient was treated by oral administration of methylcobalamin and vitamin B1. We communicated with the patient extensively to relieve his anxiety.

OUTCOME AND FOLLOW-UP

The numbness symptom gradually improved after 1 wk. The patient was subsequently discharged to his home and received weekly telephone calls for follow-up. The numbness resolved completely 3 wk after discharge.

DISCUSSION

Supraglottic airway devices, including classic LMA and other variants, are widely used in general anesthesia surgery. LNI following LMA is an extremely rare complication after general anesthesia. This unexpected complication can cause bothersome symptoms that worsen patients' quality of life. A retrospective matched

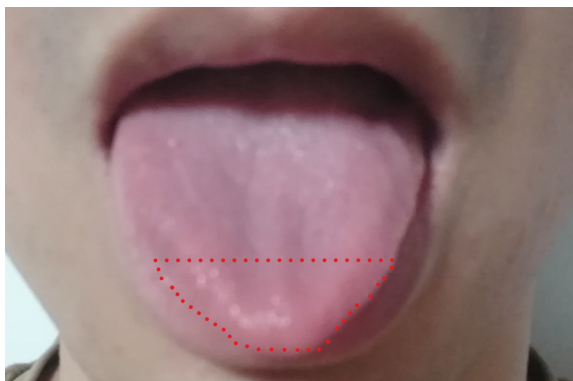


Figure 2 The numbness area in the patient's tongue.

case-control study showed that the incidence rate of LNI among patients receiving general anesthesia with airway devices is 0.066% [3]. We found 18 cases of lingual nerve injuries correlated with different LMAs over the last 20 years in the literature (Table 1). The symptoms of LNI appeared immediately after anesthesia to 24 h after surgery. Most patients recovered from their symptoms spontaneously within 6 mo.

The lingual nerve is distributed in the sublingual region, sublingual gland, and anterior two-thirds of the tongue, the latter of which is its main area. It provides taste and tactile sensations to the anterior two-thirds of the tongue through its branches. This nerve originates from the mandibular branch of the trigeminal nerve and carries taste fibers from the chorda tympani. It is superficially located on the distal medial side of the mandibular third molar, with only a thin layer of mucosal tissue covering the surface. It is in front of the inferior alveolar nerve, arching downward along the outside of the hyoglossus muscle to the tongue's inferior surface, which lies directly under the mucosa of the tongue [4]. It is vulnerable to injury when the lingual nerve is located in these superficial positions. LNI presents as paresthesia in the anterior two-thirds of the tongue, including unilateral numbness, altered taste sensation, and loss of gustatory function. Due to the particularity of the lingual nerve distribution area, patients with LNI may also have difficulty chewing and speaking, causing social and psychological complications. It is necessary to differentiate LNI from glossopharyngeal nerve injury, the primary symptom of which is sensory disturbance at the rear of the tongue.

Several risk factors for LNI after general anesthesia have been reported in the literature, including the selection of a small laryngeal mask, the use of nitrous oxide (N_2O), and mechanical forces generated by surgical manipulation [1,2,5]. It is necessary to consider the shape and size of the patient's oropharynx when selecting the LMA size. Using a larger mask in which the cuff is not visible in the back of the mouth and the cuff volume is inflated to the minimum necessary level seems to be an appropriate technique [1]. Using an inappropriate LMA size prevents satisfactory sealing, and too much gas is injected into the mask cuff. The lingual nerve might be compressed and injured by the overfilled cuff. Because of the special physical properties of N_2O , it diffuses into the cuff and causes the cuff pressure to increase gradually. It is important to monitor the cuff pressure if N_2O is used during surgery. The traction forces resulting from surgical procedures on the head and neck regions place additional stress on the tongue tissue through the airway device, potentially causing LNI.

The diagnosis of LNI mainly depends on a detailed invasive manipulation history and clinical symptoms and signs. Basic neurological assessments such as light touch, pin prick, and two-point discrimination may assist in LNI diagnosis and monitoring. Determining the grade of nerve injury before treatment is the key to successful treatment. Similar to most lingual nerve injuries following LMA, the injury that our patient experienced was considered a grade I injury according to the Sunderland classification [6]. Conservative medication is the most commonly used treatment for LNI following LMA. After 3 wk of drug therapy, the patient achieved complete remission of tongue tip numbness. Most patients fully recover within 4 wk, and no case of permanent nerve injury has been reported in the literature.

Several strategies are suggested to prevent this rare complication. It is vital to select LMA size in the context of not only sex but also other factors, such as oropharynx space, physical stature, and body mass index. The LMA should be inserted gently and carefully fixed. Attention should be given to whether the LMA is displaced when moving the patient; if so, the LMA should be adjusted in time. During the operation,

Table 1 Summary of lingual nerve injuries following use of different types of laryngeal mask airways over last 20 years

Ref.	Age (yr)	Gender	Weight (kg)	Position	Size of device	Duration of surgery (min)	N ₂ O used	Location	Symptoms	Time of onset	Management	Time to recovery
Classic LMA												
Koyama <i>et al</i> [8], 2006	20	M	NR	NR	NR	NR	Yes	NR	Taste loss	24 h	NR	6 mo
Arimune[9], 2007	27	M	NR	Supine	NR	NR	NR	Unilateral	Taste disturbance	NR	NR	
Cardoso <i>et al</i> [10], 2007	36	F	60	Supine	3	120	NR	Bilateral	Numbness; Taste disturbance	1 h	Conservative	3 wk
Fideler and Schroeder[11], 2009	32	F	NR	Supine	4	60	NR	Unilateral	Numbness; Taste disturbance	Few hours	Conservative	4 d
Inácio <i>et al</i> [12], 2010	55	F	75	Supine	4	150	NR	Bilateral	Numbness; Taste disturbance	1 h	Conservative	2 wk
Foley <i>et al</i> [4], 2010	21	M	79	Supine	5	45	No	Unilateral	Numbness; Taste disturbance	Few hours	Conservative	4 wk
Foley <i>et al</i> [4], 2010	50	F	101	Lithotomy	3	70	Yes	Unilateral	Numbness	PACU	Conservative	4 wk
El Toukhy and Tweedie[13], 2012	36	F	NR	Supine	4	180	No	Bilateral	Numbness; Taste disturbance	Few hours	Conservative	6 wk
Dhillon and O'Leary[14], 2012	52	F	NR	Supine	4	60	No	Bilateral	Numbness; Taste disturbance	Instant	Conservative	4 wk
Present case, 2021	49	M	75	Prone	4	80	No	Unilateral	Numbness	Few hours	Conservative	3 wk
LMA ProSeal												
Brimacombe <i>et al</i> [2], 2005	61	M	74	Semi-beach chair	5	150	Yes	Unilateral	Numbness; Taste disturbance	Instant	Conservative	15 d
Brimacombe and Keller[15], 2005	64	F	76	Supine	4	45	No	Unilateral	Numbness	2 h	Conservative	10 h
LMA Supreme												
Rujirojindakul <i>et al</i> [7], 2012	43	F	65	Prone	4	75	No	Tongue tip	Numbness	24 h	Conservative	2 wk
Thiruvengkatarajan <i>et al</i> [5], 2014	45	F	61	Supine	3	105	No	Tongue tip	Numbness	Instant	Conservative	3 wk
I-gel												
Renes <i>et al</i> [16], 2011	69	M	78	Supine	4	45	NR	Bilateral	Numbness; Taste disturbance	Few hours	Conservative	8 wk
Rujirojindakul <i>et al</i> [7], 2012	33	F	53	Lithotomy	3	45	No	Tongue tip	Numbness	24 h	Conservative	2 wk
Jenkinson <i>et al</i> [17], 2014	64	M	NR	Supine	4	300	NR	Unilateral	Sensation loss	PACU	NR	6 wk (90% recovery)
Ueshima <i>et al</i> [18], 2016	53	F	78	Supine	4	NR	NR	Bilateral	Numbness	24 h	Conservative	2 wk
Mehta <i>et al</i> [19], 2017	32	M	NR	Supine	NR	NR	NR	Unilateral	Numbness	Few hours	Conservative	6 wk

N₂O: Nitrous oxide; LMA: Laryngeal mask airway; F: Female; M: Male; NR: Not recorded; PACU: Post-anaesthesia care unit.

the cuff pressure must be monitored to keep it less than 44 mmHg[7]. If the operation time is long, the LMA should be deflated for 2 min every 1-2 h to improve regional circulation. However, before deflating the LMA, it is necessary to clean up the pharynx secretions and ensure airway patency.

PCNL is an effective surgical method for the treatment of kidney stones. The prone position has been the most widely used position in PCNL surgery, but low comfort and complications are the major drawbacks of this special position. Anesthesia-related complications after prone positioning are associated with many factors, such as changes in heart functions, malposition of airway devices, and excessive movement of the head and neck. To the best of our knowledge, this is the first report describing LNI caused by using an LMA during PCNL. We suspect that there are three possible causes associated with this infrequent complication. First, the size 4 LMA selected may not have been suitable for the patient. For a better sealing effect, excessive gas was injected into the cuff, causing the cuff to excessively expand and compress surrounding tissues. Second, the patient was passively moved from the supine position to the prone position under general anesthesia for surgery. Prolonged retraction of the nerve from positional changes of the body and head is a potential cause of LNI. Third, due to the influence of gravity, the pressure of the pharynx on the LMA in the prone position is greater than that in the supine position. This causes additional inflation of the cuff, which consequently leads to compression of the lingual nerve.

CONCLUSION

As LMA is widely used during general anesthesia, it is necessary to be aware of this potential rare complication and try to avoid it. In addition to inappropriate LMA size, intraoperative movement and special surgical position may increase the potential for LNI. The nerve injury symptoms usually disappear on their own, and no surgery is needed. Telephone follow-up is necessary, and patients should be reassured that they can recover from their injury completely in a short period.

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