

Case Report

# Anesthetic Management for Third Molar Surgery in a Patient with Concurrent Nutcracker, SMA, and Median Arcuate Ligament Syndromes

Daniel Joseph Traub<sup>1,\*</sup> , Michael Aaron Traub<sup>2</sup> 

<sup>1</sup>Maine Medical Center, Portland, United States of America

<sup>2</sup>Crystal Run Healthcare, New York, United States of America

## Abstract

**Background** Concurrent nutcracker syndrome, superior mesenteric artery syndrome, and median arcuate ligament syndrome (the clinical expression of which is referred to celiac artery compression syndrome), is an extremely rare phenomenon. The purpose of this case report is to describe the anesthetic management of a patient who presented with this rare concurrence, for removal of third molar teeth under general anesthesia. The patient additionally had a history of problematic reactions to benzodiazepines, which further complicated his anesthetic management. **Case Presentation** A 16-year-old male presented for removal of his symptomatic third molar teeth. Comprehensive history and examination was performed, and medical clarification from his physician was obtained. The patient was treated in an outpatient setting with an anesthetic technique that avoided the use of nitrous oxide and any benzodiazepine, and which included oxygen, fentanyl, decadron, propofol, and local anesthesia. Postoperative antibiotics and pain medications were prescribed. Comprehensive post-operative instructions stressed the importance of postural requirements and adequate nutrition. The patient tolerated the procedure well, and experienced an uneventful recovery. **Conclusion** This case report illustrates the importance of comprehensive preoperative evaluation, including consultation with any treating physicians of record. It also serves to highlight the efficacy of total intravenous anesthesia, without the use of benzodiazepines or nitrous oxide. The importance of postoperative postural and nutritional requirements are critical with respect to the treatment of patients with any concurrence of the syndromes described in this report.

## Keywords

Nutcracker Syndrome, Superior Mesenteric Artery Syndrome, Median Arcuate Ligament Syndrome, Celiac Artery Compression Syndrome, General Anesthesia, Third Molar Surgery

## 1. Introduction

Nutcracker syndrome (NCS) is an uncommon syndrome that presents with signs and symptoms caused by compression of the left renal vein (LRV), whereas ‘nutcracker phenomenon’ is solely used to refer to the anatomical configuration without

clinical symptoms [1] Compression of the LRV within the aortomesenteric window leads to proximal dilatation of the LRV. Although NCS can demonstrate a wide variability of symptoms at presentation, the exact prevalence of NCS is

\*Corresponding author: [djtraub55@gmail.com](mailto:djtraub55@gmail.com) (Daniel Joseph Traub)

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unknown, and as such is potentially underdiagnosed [1]. Specific signs and symptoms of NCS can include hematuria, orthostatic proteinuria, left flank and upper left quadrant abdominal or pelvic pain, dyspareunia, dysmenorrhea, and fatigue [1].

Superior mesenteric artery (SMA) syndrome is a rare condition defined as compression of the duodenum between the abdominal aorta and the superior mesenteric artery, and can be a rare cause of proximal bowel obstruction, with increased morbidity and mortality associated with its complications, particularly when concern arises for bowel obstruction in the setting of recent weight loss [2]. SMA syndrome presents with vague symptoms of bowel obstruction, including epigastric pain, nausea, vomiting, abdominal distension, weight loss, early satiety, and postprandial epigastric pain [2]. While rare, SMA syndrome can result in significant morbidity and mortality from malnutrition, dehydration, electrolyte abnormalities, gastric pneumatosis and portal venous gas, gastrointestinal hemorrhage, and gastric perforation [2]. Additionally, due to the presence of a short suspensory ligament of Treitz, resulting anatomic abnormalities may include high suspen-

sion of the duodenojejunal flexure, intestinal malrotation, and increased lumbar lordosis [3].

Median arcuate ligament syndrome (MALS) involves the compression of the celiac artery (CA) by the median arcuate ligament, and refers to the underlying anatomic abnormality, while celiac artery compression syndrome (CACS) describes the resulting clinical syndrome characterized by postprandial abdominal pain, weight loss, epigastric pain during exercise, nausea, vomiting, and occasional abdominal bruit, with potential for pseudoaneurysm of the gastroduodenal artery, which can lead to fatal bleeding [4]. Symptomatic MALS, again referred to as CACS, is a rare condition.

It is important to recognize that chronic vascular compression syndromes, such as those described above, can cause epigastric pain which intensifies with forced inhalation and after meals, and there are still controversies about the origin of these painful symptoms [5].

The three syndromes discussed above, NCS, SMA syndrome, and MALS/CACS, including their underlying anatomic anomalies and most common presenting symptoms, are presented below in Table 1.

**Table 1.** The anatomic anomalies and most common presenting signs and symptoms of NCS, SMA syndrome, and MALS/CACS.

Syndrome	Anatomic Anomaly	Signs and Symptoms
Nutcracker syndrome (NCS)	Compression of the left renal vein (LRV)	Hematuria, orthostatic proteinuria, left flank and upper left quadrant or pelvic pain, dyspareunia, dysmenorrhea, fatigue
Superior mesenteric artery (SMA) syndrome	Compression of the duodenum between the abdominal aorta and superior mesenteric artery	Epigastric pain, nausea, vomiting, abdominal distension, weight loss, early satiety, postprandial epigastric pain
Median arcuate ligament syndrome (MALS)/Celiac artery compression syndrome (CACS)	Compression of the celiac artery by the median arcuate ligament	Postprandial abdominal pain, weight loss, epigastric pain with exercise, nausea, vomiting, weight loss, occasional abdominal bruit

As noted above, these syndromes are reportedly rare, and while case reports suggest that concurrences of these syndrome do occur, such concurrences may have been overlooked due to nonspecific symptoms and potentially conflicting imaging findings [6]. Indeed, as these syndromes often present with incidental findings, and may be asymptomatic, their concurrence can be challenging to diagnose [7].

## 2. Case presentation

A sixteen-year-old male presented for examination and consultation regarding removal of his four impacted third molar teeth, #'s 1, 16, 17, 32, due to impaction, intermittent pain, and planned orthodontic treatment. Past medical history was found to be significant for multiple medical disorders related to renal and gastrointestinal tract function, including NCS, SMA syndrome, and MALS. He had undergone multi-

ple surgical procedures, including duodenojejunostomy and excision of the celiac ganglion, both of which, by history, improved his overall symptomatology. His medications were Dexilant, Zofran, and Tylenol. He additionally reported no gastritis or other complications associated with prior use of ibuprofen. He apparently had experienced seizure activity with possible extrapyramidal reactions to previously administered benzodiazepines, including Versed and Ativan. He did complain of intermittent abdominal pain, as well as left hip pain. He utilized a well-balanced diet, and reported normal stools and urinary output. His past medical history was otherwise noncontributory.

Physical examination demonstrated a well-appearing 16 year old, in no apparent distress, interactive and pleasant in manner. Musculoskeletal examination demonstrated normal muscle strength and tone, normal range of motion, no laxity or swelling of joints, and no back or hip tenderness to palpation.

Abdominal examination demonstrated no tenderness, masses or bruits.

Head and neck examination was normal, with no tenderness, masses, or lymphadenopathy noted. His cranial nerve function was intact grossly. Intraoral examination demonstrated dentition in a good state of repair, without visibility of his third molar teeth. He demonstrated slight crowding of his dentition, which was otherwise stable. His oral hygiene was good, with no soft tissue lesions. No masses or swelling were present, and his peritonsillar tissues were atrophic, without pharyngeal injection. His airway was classified as Mallampati Class 2. His mandibular range of motion was adequate, with unforced mandibular vertical opening over 35mm, and with good lateral excursive and protrusive function. No temporomandibular joint (TMJ) pain, clicking or popping was observed.

His panoramic radiograph demonstrated impacted third molar teeth #'s 1, 16, 17, 32 (Figure 1).



**Figure 1.** Panoramic radiograph demonstrating impacted third molar teeth #'s 1, 16, 17, 32.

Medical clarification with the patient's treating physician of record was obtained, and proposed anesthetic management and postoperative concerns were discussed.

The patient subsequently returned for removal of his third molar teeth under general anesthesia in an outpatient oral and maxillofacial surgery setting. It was decided that nitrous oxide and any benzodiazepines would not be administered, and as such a total intravenous anesthesia (TIVA) technique, without the use of any inhalation anesthetics, was determined to be the most appropriate option for anesthetic management for this patient. He was administered four liters/minute of oxygen by nasal mask, intravenous access was obtained, and a 0.9 sodium chloride solution was utilized for infusion. He was then administered 50 micrograms of Fentanyl, 190 milligrams of Propofol, and 4 milligrams of Decadron, supplemented by appropriate local anesthesia, consisting of Lidocaine with epinephrine, Septocaine w/ epinephrine, and Marcaine with epinephrine. The four third molar teeth were removed in standard fashion for complete bony impacted third molar teeth, and the duration of the procedure was forty-eight

minutes. He tolerated the procedure well, and was observed and monitored for an appropriate time period. He was discharged shortly thereafter in stable condition, having tolerated the procedure well. He was given appropriate postoperative instructions, which included specific and detailed instructions as to postural and nutritional recommendations, and was prescribed amoxicillin and hydrocodone with acetaminophen. It was advised that the opioid should be utilized conservatively, and should be supplemented with alternating administration of ibuprofen and acetaminophen. The patient experienced an uncomplicated postoperative course, and was doing well at his two-week postoperative evaluation.

### 3. Discussion

For the patient with concurrent Nutcracker syndrome, Superior mesenteric artery syndrome, and Median arcuate ligament syndrome (Also referred to as Celiac artery compression syndrome), anesthetic and surgical planning presents numerous challenges, which include high risk of aspiration, potential sensitivity to neuromuscular blockers, and avoidance of and careful management of nausea and vomiting. Additionally, when providing anesthesia to a patient with these concurrent problems, key considerations include careful management of intra-abdominal pressure, utilizing an anesthetic approach including a combination of light general anesthesia with careful titration of opioids, close monitoring of vital signs, maintaining adequate intravascular volume to prevent hypotension, while at the same time avoiding excessive fluid administration that could increase abdominal pressure, and prioritizing gentle handling of the abdominal area during surgery.

The decision to utilize total intravenous anesthesia (TIVA) with propofol in this case, while not utilizing an inhalation agent, such as sevoflurane, was based upon the fact an inhalation technique for this case may have required medication for postoperative nausea and vomiting (PONV), which would have been problematic with this patient's symptomatology [8]. Additionally, it has been demonstrated that TIVA without intubation is an efficient anesthetic technique for head and neck surgery [9].

In the case presented above, an additional consideration included the avoidance of nitrous oxide, due to its blood: gas partition coefficient being 34 times greater than that of nitrogen [10]. As such, due to its propensity to diffuse rapidly into closed spaces more rapidly than nitrogen can diffuse out, this can lead to increased gas volume and pressure within closed spaces. As such, nitrous oxide was considered to be contraindicated in this case, due to its potential to affect intra-abdominal pressure. Therefore, only oxygen was utilized as an inhalant agent, which is the standard of practice in anesthetic management, either singly or utilizing a balanced approach. Additionally, as the patient had previously experienced seizure activity, with possible extrapyramidal

reactions, to intravenous and orally administered benzodiazepines, no benzodiazepine was administered in this case. As TIVA is widely practiced with adjunctive medications which serve to overcome any disadvantages of each, and provide a balanced technique with additional benefits, it was important to include decadron, due its anti-inflammatory and antiemetic effects [11]. As the primary drawback to the selected technique, the inability to utilize a benzodiazepine negated the potential benefits of the sedative, anxiolytic, and amnesic properties of this drug class [12]. As Midazolam, which is the dominant benzodiazepine utilized for outpatient procedural sedation in oral and maxillofacial surgery, has significant synergistic effects with both propofol and opioids, it would have been beneficial to utilize it in this case as an adjunctive agent [13].

It was also important to pay close attention to posture during and after surgery, which is important with regard to any patient with Nutcracker syndrome, so as to avoid excessive pressure on the renal vein. Postural considerations are also critically important with respect to proper nutritional support, as a hallmark of medical treatment for patients with these maladies involves a conservative approach with a focus on weight gain and monitoring caloric needs, combined with a focus upon positional changes, including the prone and left lateral decubitus positions, as an aid to tolerating enteral feeding [14].

As with all surgical procedures in the oral and maxillofacial region, postoperative pain control is of critical importance to the recovery of the patient, in particular during the period of time when the patient is in the recovery suite, or has been discharged to home. As the effects of the anesthetic agents are attenuated, the local anesthetic effect will diminish as well, and it is at this point that conservative use of a balanced combination of opioids, ibuprofen and acetaminophen be utilized. As opioids can significantly impact gut motility, thereby slowing the movement of food through the digestive tract, careful consideration must be given to the need for the use of opioids sparingly, if at all, in patients with these maladies during the postoperative period. This must be approached within the context of adequate and balanced nutritional support. These considerations all serve to underscore the need for thorough evaluation and treatment planning in patients presenting with symptoms of vascular compression disorders [15].

## 4. Conclusion

The extraction of impacted third molar teeth, particularly for those patients who have been diagnosed with complex medical conditions, presents a challenge with respect to diagnosis, treatment planning, medical consultation and clarification, anesthetic management, surgical approach, and provision of appropriate postoperative care. This case highlights the importance of understanding the anatomic variabilities in any given patient, and the need to formulate an individual treatment plan for every patient. The syndromes discussed in this case

presentation provide an opportunity to appreciate a rare concurrence of syndromes, and the importance of understanding how these syndromes may affect the provision of oral and maxillofacial surgical care for the patient. It also highlights the importance of the need to adjust anesthetic technique when indicated, which in this case served to promote an enhanced surgical outcome.

## Declarations

Informed consent was obtained from the parents of the parent.

## Clinical Trial Number

Not applicable.

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## Conflicts of Interest

The authors declare no conflicts of interest.

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