

Recurrent Intraoperative Asystole Induced by Tumor Manipulation in a Cervical Vagal Schwannoma: A Case Report

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Case Report

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Abstract

Background: Vagal schwannomas are rare, benign tumors arising from Schwann cells of the vagus nerve. Surgical resection is the mainstay of treatment but carries significant risks, including intraoperative hemodynamic instability due to vagal nerve manipulation and postoperative cranial nerve deficits.

Case presentation: We report the case of a 37-year-old previously healthy male who presented with an incidentally discovered right-sided cervical mass during a routine health examination. Magnetic resonance imaging revealed a **“string-of-beads”** lesion, measuring approximately 6.8 cm in length and 1.0 cm in maximum anteroposterior diameter, located between the right common carotid artery and internal jugular vein, suggestive of a vagal schwannoma. The patient underwent complete microsurgical excision of the tumor. During dissection, manipulation of the tumor elicited **three episodes of complete cardiac asystole**, each lasting approximately 3–4 seconds, with spontaneous recovery upon cessation of traction. No atropine or temporary pacemaker was administered. The tumor was completely resected under microscopic visualization with meticulous hemostasis. Postoperatively, the patient exhibited **no hoarseness, dysphagia, or Horner's syndrome**, and was discharged on postoperative day 4 with an uneventful recovery. Pathological examination confirmed the diagnosis of schwannoma.

Conclusion: This case highlights that intraoperative cardiac asystole induced by vagal schwannoma manipulation can be managed safely with immediate cessation of traction and close monitoring, even without pharmacological or pacemaker intervention. The absence of neurological deficits postoperatively underscores the importance of meticulous microsurgical technique and the potential value of considering traction-induced bradycardia as a “physiological neuromonitoring” signal.

Background

Schwannomas are benign, slow-growing, encapsulated tumors originating from Schwann cells of the peripheral nerve sheath^[1]. Vagal schwannomas (VS) are rare, accounting for approximately 3% of all head and neck schwannomas^[2]. They typically present as asymptomatic, solitary neck masses discovered incidentally, though larger lesions may cause hoarseness, dysphagia, or cough due to compression of adjacent structures.

The vagus nerve (cranial nerve X) is the longest cranial nerve and plays a critical role in parasympathetic regulation of the cardiovascular, respiratory, and digestive systems. Surgical resection of vagal schwannomas presents unique challenges: manipulation of the vagus nerve can provoke severe bradyarrhythmias, including complete cardiac asystole, due to excessive vagal stimulation. Meanwhile, postoperative vocal cord paralysis remains a significant concern. The choice between intracapsular enucleation and extracapsular resection remains controversial, balancing the goals of complete tumor removal against nerve function preservation^[3].

Herein, we report a rare case of cervical vagal schwannoma in which intraoperative tumor manipulation induced three episodes of transient complete cardiac asystole, successfully managed without pharmacological intervention, with excellent postoperative neurological outcomes.

Case Presentation

A 37-year-old male of Han ethnicity, with no significant past medical history, presented to our department with an incidentally discovered right-sided neck mass. The lesion was detected during a routine health examination one month prior, when carotid ultrasonography revealed multiple bead-like hypoechoic lesions adjacent to the right carotid artery. Subsequent contrast-enhanced magnetic resonance imaging (MRI) of the neck demonstrated an abnormal signal lesion located between the right common carotid artery and the internal jugular vein, with a characteristic **“string-of-beads”** appearance, suggestive of a neurogenic tumor, most likely a schwannoma.

The patient was completely asymptomatic, reporting no headache, dizziness, neck pain, hoarseness, dysphagia, or any neurological symptoms. Physical examination of the neck revealed no palpable mass, tenderness, or cranial nerve dysfunction. All routine laboratory parameters were within normal limits.

Preoperative MRI (Fig. 1) revealed a well-defined, **“string-of-beads”** lesion in the right carotid space, situated posterior to the common carotid artery and medial to the internal jugular vein. The lesion measured approximately **6.8 cm in length and 1.0 cm in maximum anteroposterior diameter**. It demonstrated intermediate signal intensity on T1-weighted images and hyperintensity on T2-weighted images, with heterogeneous contrast enhancement, consistent with a nerve sheath tumor.

The patient underwent surgical excision on June 5, 2026, under general anesthesia with endotracheal intubation. The patient was positioned supine with the head rotated to the left to expose the right side of the neck. A 7-cm incision was made along the anterior border of the right sternocleidomastoid muscle. The platysma was divided, and the **carotid sheath was opened** through careful **blunt dissection**. Intraoperative findings revealed a tumor located posterior to the right carotid artery, with the vagus nerve compressed into a flattened band by the tumor mass.

Under microscopic visualization, meticulous dissection was performed to separate the tumor from the surrounding neurovascular structures. During tumor manipulation, **three distinct episodes of complete cardiac asystole** were observed on the electrocardiogram monitor, **each lasting approximately 3–4 seconds**. In all instances, **cardiac rhythm spontaneously recovered to normal sinus rhythm within seconds upon immediate release of traction on the tumor**. No atropine, vasopressors, or temporary cardiac pacing was administered throughout the procedure. Intraoperative neuromonitoring (IONM) was not available at our institution at the time of surgery.

The tumor was completely excised en bloc using sharp microdissection. Hemostasis was achieved with bipolar electrocautery and gelatin sponge compression. A negative-pressure drainage tube was placed

subcutaneously. The carotid sheath, sternocleidomastoid muscle, subcutaneous tissue, and skin were closed in layers.

Total operative time: Approximately 3 hours.

Intraoperatively, the tumor exhibited a **“string-of-beads”** gross appearance (Fig. 2), correlating with the preoperative MRI findings. The vagus nerve was identified as a flattened band adjacent to the tumor capsule, confirming the nerve of origin.

Histopathological examination of the resected specimen (Fig. 3) revealed typical features of a schwannoma, including hypercellular Antoni A areas with palisading nuclei (Verocay bodies) and hypocellular Antoni B areas. Immunohistochemical staining was strongly positive for S-100 protein, confirming the diagnosis of schwannoma. No malignant features were identified.

The patient recovered uneventfully from anesthesia and was transferred to the ward. The drainage tube was removed on postoperative day 2 with minimal output. **Neurological examination revealed no hoarseness, dysphagia, or Horner's syndrome**, indicating intact vagal and sympathetic nerve function. The patient was discharged on **postoperative day 4** in good condition. At one-month follow-up, the patient remained asymptomatic with no evidence of tumor recurrence or neurological deficits.

The authors declare that they adhered to the CARE guidelines/methodology for this case report.

Discussion and Conclusions

We report a case of cervical vagal schwannoma with three intraoperative episodes of complete cardiac asystole induced by tumor manipulation, successfully managed without pharmacological or pacemaker intervention, and with excellent preservation of vagal nerve function. This case provides several important clinical insights.

Mechanism of intraoperative cardiac asystole

The vagus nerve provides parasympathetic innervation to the heart via the cardiac branches, which synapse on the sinoatrial node, atrioventricular node, and ventricular myocardium. Excessive vagal stimulation—whether from surgical manipulation, traction, or mass effect—can precipitate severe bradyarrhythmias, including complete heart block and asystole. In our case, traction on the tumor during dissection likely activated the cardiac inhibitory fibers within the vagus nerve, triggering a vagal reflex with transient cessation of sinus node activity.

Sharma et al. ^[2] reported a case of vagal schwannoma in the cerebello-medullary cistern with intraoperative bradycardia and asystole, in which two episodes of complete asystole lasting 4 seconds each occurred during tumor manipulation. Similarly, Ye et al. ^[4] described a cervical vagal schwannoma case accompanied by ventricular arrhythmia, where the patient's suppressed heart rate recovered after

tumor removal. Leviter et al. ^[5] documented a case where a carotid space mass proximal to the vagus nerve caused asystole and syncope, highlighting the potential for vagal compression to precipitate life-threatening bradyarrhythmias even without surgical manipulation.

Our case is distinctive in that **three episodes of complete asystole occurred, each spontaneously resolving within seconds upon cessation of traction, without any pharmacological intervention**. This observation suggests that in carefully selected cases where asystolic episodes are brief and self-limiting, a “wait-and-see” approach with immediate cessation of manipulation may be a safe alternative to prophylactic atropine or temporary pacing.

The role of intraoperative neuromonitoring

Intraoperative neuromonitoring (IONM) has been advocated to reduce the risk of vocal cord paralysis during vagal schwannoma surgery. Continuous monitoring of the laryngeal adductor reflex using electromyographic endotracheal tubes can provide real-time feedback on vagal and recurrent laryngeal nerve function. Sandler et al. ^[6] proposed a novel approach using continuous intraoperative nerve monitoring of the laryngeal adductor reflex for neurologic-function-sparing surgical management of vagal schwannomas.

However, IONM was not available in our institution at the time of surgery. Despite this limitation, the patient experienced **no postoperative vocal cord palsy or other neurological deficits**. We attribute this excellent outcome to several factors: (1) microscopic visualization enabled precise identification of the nerve-tumor interface; (2) sharp microdissection minimized thermal and traction injury to the nerve; and (3) **the intraoperative asystolic episodes served as a form of “physiological neuromonitoring,”** signaling the presence of functional vagal fibers and guiding the surgeon to adjust dissection strategy.

While IONM is undoubtedly valuable, our case demonstrates that meticulous microsurgical technique and vigilant intraoperative monitoring of vital signs can achieve favorable outcomes even in resource-limited settings.

Surgical strategy: enucleation vs. resection

The optimal surgical approach for cervical vagal schwannomas remains debated. Intracapsular enucleation may better preserve nerve function but carries a higher risk of tumor recurrence, whereas extracapsular resection offers more definitive removal but increases the likelihood of nerve injury. A recent systematic review by Montañez-Azcarate et al. ^[3] summarized surgical considerations and outcomes in the management of cervical vagal schwannomas. In our case, complete extracapsular resection was achieved with preservation of vagal function, likely due to the tumor's favorable anatomical characteristics and meticulous microsurgical technique. The **“string-of-beads”** morphology

observed both on imaging and intraoperatively may have facilitated dissection by providing natural cleavage planes.

Clinical implications

This case has several important implications for the management of cervical vagal schwannomas: (1) preoperative recognition of arrhythmia risk—surgeons and anesthesiologists should be aware that vagal schwannoma manipulation can provoke life-threatening bradyarrhythmias; (2) **“traction-induced asystole as a safety signal”**—in our case, recurrent asystole upon traction served as a real-time indicator of functional vagal fibers; (3) conservative management of brief asystolic episodes—our experience suggests that brief (3–4 seconds), self-limiting asystolic episodes may be managed conservatively; and (4) feasibility of surgery without IONM—excellent outcomes can be achieved with meticulous microsurgical technique and careful intraoperative monitoring.

Limitations

This report has several limitations. First, as a single case report, our findings may not be generalizable. Second, intraoperative neuromonitoring was not available, limiting our ability to provide objective data on nerve function during dissection. Third, long-term follow-up is needed to assess for late recurrence or delayed neurological sequelae.

Conclusions

Cervical vagal schwannoma resection carries a risk of intraoperative cardiac asystole due to vagal nerve manipulation. We report a case in which three episodes of complete asystole, each lasting 3–4 seconds, occurred during tumor dissection and resolved spontaneously upon cessation of traction, without pharmacological or pacemaker intervention. The patient recovered with no neurological deficits and was discharged on postoperative day 4. This case demonstrates that brief, self-limiting asystolic episodes may be managed conservatively with immediate cessation of manipulation and close monitoring. Meticulous microsurgical technique remains the cornerstone of successful nerve-sparing surgery, and traction-induced bradycardia can serve as a valuable “physiological neuromonitoring” signal in the absence of IONM.

Conclusions

Cervical vagal schwannoma resection carries a risk of intraoperative cardiac asystole due to vagal nerve manipulation. We report a case in which three episodes of complete asystole, each lasting 3–4 seconds, occurred during tumor dissection and resolved spontaneously upon cessation of traction, without pharmacological or pacemaker intervention. The patient recovered with no neurological deficits and was discharged on postoperative day 4. This case demonstrates that brief, self-limiting asystolic episodes

may be managed conservatively with immediate cessation of manipulation and close monitoring. Meticulous microsurgical technique remains the cornerstone of successful nerve-sparing surgery, and traction-induced bradycardia can serve as a valuable “physiological neuromonitoring” signal in the absence of IONM.

Abbreviations

VS: Vagal schwannoma

IONM: Intraoperative neuromonitoring

MRI: Magnetic resonance imaging

ECG: Electrocardiogram

H&E: Hematoxylin and eosin

Declarations

Ethics approval and consent to participate: Informed consent was obtained from the patient for publication of this case report and accompanying images. Institutional review board approval was obtained from Gansu Provincial Hospital.

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

Competing interests: The authors declare that they have no competing interests.

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Figures

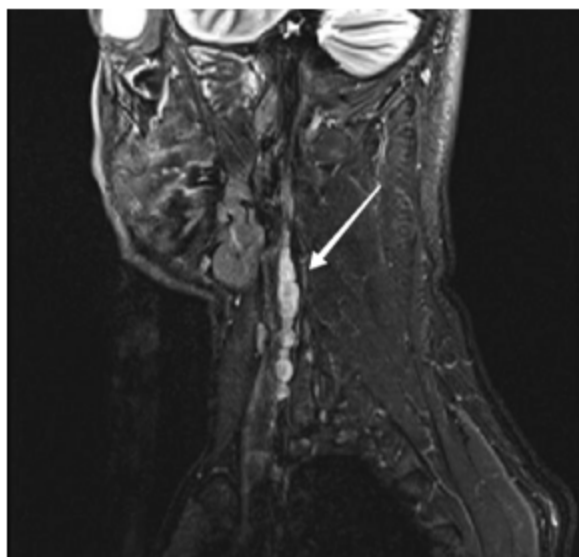


Fig.1

Figure 1

Preoperative contrast-enhanced MRI showing a **“string-of-beads”** lesion (approximately 6.8 cm in length and 1.0 cm in maximum anteroposterior diameter) in the right carotid space between the common carotid artery and internal jugular vein.

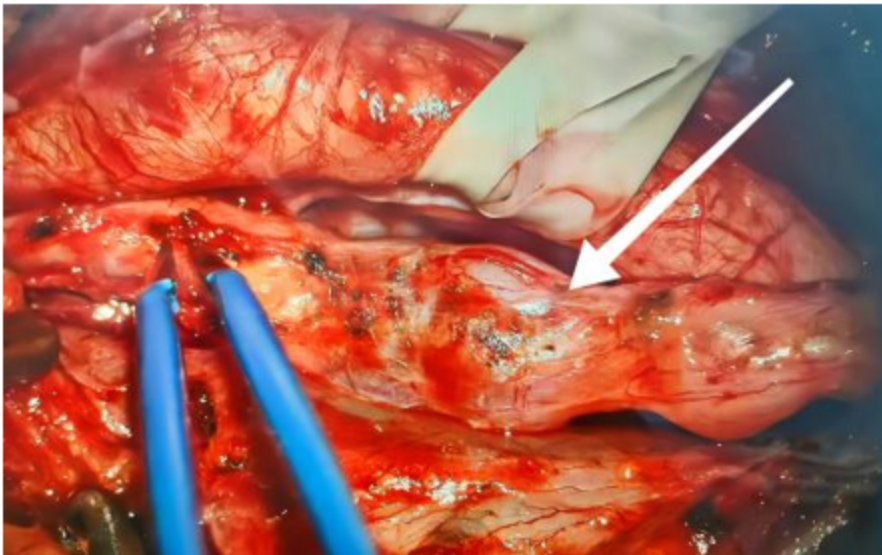


Fig.2

Figure 2

Intraoperative photograph demonstrating the **"string-of-beads"** gross appearance of the tumor.

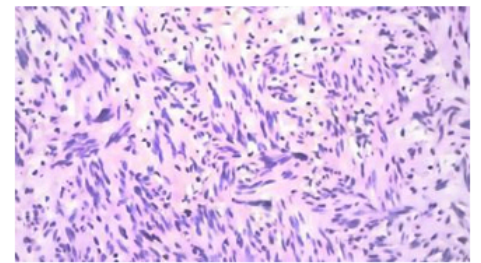
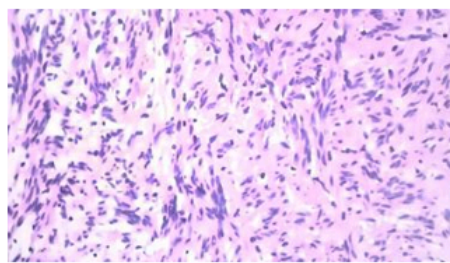
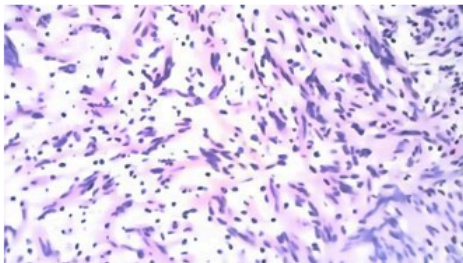


Fig.3

Figure 3

Histopathological examination showing typical schwannoma features with Antoni A and Antoni B areas (HE stain, ×200); S-100 protein immunostaining (positive).