

SURGICAL EXCISION OF A CONGENITAL RIGHT BRANCHIAL FISTULA IN A 12-YEAR-OLD BOY

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ABSTRACT

Branchial cleft anomalies are congenital defects arising from incomplete obliteration of the branchial apparatus during embryogenesis, and the second cleft accounts for the large majority of cases. We report the case of a 12-year-old boy with a five-year history of a right-sided neck fistula, who presented with a low-grade odynophagia and no active discharge at the time of assessment. Videolaryngoscopy confirmed a normal airway with no laryngopharyngeal abnormality, and contrast-enhanced MRI with MR angiography confirmed a right Type IV branchial cleft fistula extending from the pharyngeal mucosa at the C3 level to a cutaneous opening at C7. He underwent elective open excision of the fistulous tract under general anaesthesia, with the tract traced in the subplatysmal plane to the hyoid and further dissected to its termination medial to the carotid sheath, below the right submandibular gland, where it was ligated flush with the pharyngeal mucosa. Histopathology confirmed a benign branchial cleft cyst with no atypia. The intraoperative and immediate postoperative course was uneventful. This report describes the clinical presentation, imaging, operative technique, and relevant literature on management of branchial fistulae in children.

INTRODUCTION

Branchial cleft anomalies — cysts, sinuses, and fistulae — result from incomplete obliteration of the branchial (pharyngeal) apparatus during the fifth week of embryonic development. They are the second most common congenital neck lesion in children after thyroglossal duct cysts. Second branchial cleft anomalies account for the majority of cases and are conventionally described using the Bailey classification, in which Type I tracts lie superficial along the anterior border of sternocleidomastoid, Type II (the most common) courses adjacent to the carotid sheath deep to the submandibular gland, Type III passes between the internal and external carotid arteries, and Type IV — the rarest — lies in the pharyngeal mucosal space and may open into the tonsillar fossa. A complete fistula, as in the present case, has both a cutaneous and a pharyngeal opening and typically presents in early childhood with intermittent mucoid or purulent discharge from a punctum along the lower third of the anterior border of sternocleidomastoid. Complete surgical excision of the tract to its pharyngeal origin is the definitive treatment and is essential to prevent recurrence.

Case Presentation

History

A 12-year-old boy presented with a five-year history of a right-sided neck fistula. He additionally reported mild odynophagia at presentation. There was no active discharge from the fistulous opening at the time of examination. There was no reported history of recurrent neck infections, fever, or difficulty breathing documented at presentation.

Examination

General examination: the patient was alert and well-nourished, with a self-reported pain score of 2/10. Local examination of the neck revealed a fistulous opening along the lower third of the neck on the right side, with no active discharge at the time of review. Systemic examination — cardiovascular, respiratory, central nervous, and abdominal — was unremarkable.

Investigations

Flexible videolaryngoscopy was performed to assess the airway and rule out a pharyngeal-end communication with laryngopharyngeal pathology. It showed a normal epiglottis, vallecula, arytenoids, and interarytenoid folds; the vocal cords were normal and mobile; the posterior pharyngeal wall was clear; there was no pooling of saliva in the pyriform sinuses; and the airway was assessed as adequate.

Contrast MRI of the neck with MR angiogram was also obtained. It demonstrated a T2/STIR-hyperintense linear fistulous tract on the right side of the neck, approximately 5 cm in length and 3.2 mm in width, with no associated diffusion restriction and no secondary branching. The cranial (internal) end opened into the right lateral pharyngeal mucosal space at the level of C3 vertebra, and the tract coursed inferolaterally, passing deep to the

right submandibular gland and anterior to the carotid space vessels, between the sternocleidomastoid muscle and platysma, to a cutaneous opening at the C7 vertebral level. The skull base, nasopharynx, visceral/retropharyngeal/parapharyngeal spaces, salivary glands, tongue, floor of mouth, larynx, vocal cords, thyroid, paranasal sinuses, and cervical spine were all reported as normal, with no significantly enlarged cervical lymph nodes. MR angiogram showed normal bilateral carotid and vertebral arteries and jugular veins. The imaging impression was a right Type IV branchial cleft fistula.

Diagnosis

A diagnosis of right congenital branchial fistula was made, and pre-operative MRI confirmed this as a Type IV branchial cleft fistula — a complete tract extending from a pharyngeal mucosal opening at the C3 level to a cutaneous opening at C7, coursing deep to the submandibular gland and anterior to the carotid space. This is consistent with the intraoperative findings, in which the tract was traced coursing medial to the carotid sheath and below the right submandibular gland to its termination at the pharyngeal mucosa.

Treatment

Pre-operative Preparation

Nil per oral (NPO) after midnight

Patient preparation for general anaesthesia

IV fluids: 1 pint normal saline at 50 mL/hour

Inj. Cefotaxime (Taxim) 1 g IV — single administration time dose (ATD) Inj. Pantoprazole 40 mg

Anaesthesia

The patient was taken up for elective surgery under general anaesthesia. Standard ASA monitors (ECG, non-invasive blood pressure, SpO₂, end-tidal CO₂) were applied and baseline vitals were stable. Preoxygenation was performed with 100% oxygen for 3 minutes. Premedication comprised IV midazolam 1 mg, glycopyrrolate 0.2 mg, fentanyl 50 mcg, and dexamethasone 3 mg. Induction was with propofol 60 mg IV and atracurium 15 mg IV as the muscle relaxant (with a further 5 mg intraoperative top-up). The airway was secured with a size 5.5 flexometallic endotracheal tube, confirmed by bilateral equal air

entry, capnography, and five-point auscultation, and fixed at 19 cm. Anaesthesia was maintained with sevoflurane 2% in an oxygen:air ratio of 2:2, with additional intraoperative analgesia of IV paracetamol

500 mg. The patient remained haemodynamically stable throughout, with an estimated blood loss of 20–30 mL, no urinary catheterisation, 500 mL of IV fluids administered, and no blood products required. At the end of the procedure, neuromuscular blockade was reversed with neostigmine 1.5 mg and glycopyrrolate 0.2 mg IV, and the patient was extubated awake, oriented, following commands, and breathing adequately. There were no intraoperative anaesthetic complications.

Operative Procedure

Under general anaesthesia, the patient was positioned supine with the head extended and turned to the left. An elliptical incision was made around the external opening of the right branchial fistula in the lower third of the neck. The fistulous tract was dissected in the subplatysmal plane up to the level of the hyoid bone. A second, transverse "step-ladder" incision was then made at the level of the hyoid to allow

further proximal dissection. The tract was traced coursing medial to the carotid sheath and below the right submandibular gland. It was ligated flush with the pharyngeal mucosa and divided. Haemostasis was secured throughout. A 10F Romovac drain was placed in the wound and fixed externally. The wound was closed in layers using 3-0 Vicryl for the deep layer and 3-0 Ethilon for the skin. Instrument and sponge counts were verified as correct, and there were no intraoperative surgical complications. The excised fistulous tract was sent for histopathological examination, labelled as the right branchial fistula specimen.

Operative Team and Timing

Parameter	Anaesthesia	Surgery
Start time	08:30 / 09:00 (as recorded)	09:00 / 09:30 (as recorded)
End time	11:10	11:00

Duration	~2 h 10 min (anaesthesia time)	~1.5–2 h (operative time)
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- Principal surgeon: PROFESSOR DR.RAJESH S Assistant surgeon1: DR.KAWUSHIK KUMAR P Assistant surgeon2:DR.NITHISH R K Anaesthetist:DR.GIRIMURUGAN
- Scrub nurse: MANJUSHA
- Procedure classification: Major, elective, open approach
- Histopathology

The excised specimen (HPE No. HL 3109/26) was submitted for routine histopathological examination, labelled as excision of the right branchial fistula performed under general anaesthesia.

Gross description: A grey-brown tubular soft tissue fragment measuring 4 cm was received. The external surface was congested; the cut surface was grey-white with a few haemorrhagic spots. All tissue was embedded in two blocks.

Microscopic description: Sections show a cyst wall lined by stratified squamous epithelium, with underlying lymphoid follicles and germinal centres, mucinous glands, and skeletal muscle bundles. No cellular atypia was noted.

Frozen section (intra-operative): Right branchial fistula.

Final diagnosis: Excision of right branchial fistula — features of a branchial cleft cyst.

The histopathological findings — a squamous-lined cyst wall with subepithelial lymphoid follicles and germinal centres, together with mucinous glands and skeletal muscle within the tract — are characteristic of a branchial cleft anomaly and confirm the clinical and intraoperative diagnosis. No evidence of malignancy or atypia was identified.

Outcome and Follow-up

Immediately postoperatively, the patient was haemodynamically stable. Postoperative orders included nil per oral until further advice, IV normal saline at 50 mL/hour, Inj. Cefotaxime 1 g IV twice daily, Inj. Paracetamol (Neomol) 500 mg in 50 mL IV twice daily, Inj. Ondansetron (Emeset) 2 mg IV as required for nausea, Inj. Pantoprazole 20 mg IV once daily, and monitoring of pulse, temperature, respiratory rate, and intake/output. In the post-anaesthesia care unit, the patient maintained SpO₂ of 100% on 4 L/min supplemental oxygen, with a Visual Analogue Scale (VAS) pain score of 2/10, no postoperative nausea or vomiting, and no immediate postoperative complications. [Further ward-level post-

operative day course, drain output/removal, and discharge details to be added once available.]

DISCUSSION

Second branchial cleft anomalies arise from incomplete obliteration of the cervical sinus of His and account for the majority of branchial anomalies encountered in children. A complete fistula, with both a cutaneous punctum along the anterior border of sternocleidomastoid and a pharyngeal-end opening, is less common than an isolated sinus or cyst and, as in this patient, often presents in later childhood with a longstanding external opening rather than acute infection. Bailey's classification remains the most widely used framework: Type II tracts, which run superficial to the carotid sheath deep to the submandibular gland, are the most frequent, while Type III and IV tracts — which pass between or medial to the great vessels toward the pharyngeal mucosa or tonsillar fossa — are progressively rarer and carry a higher risk of injury to the carotid vessels, hypoglossal, and glossopharyngeal nerves during dissection.

Complete surgical excision of the tract to its pharyngeal origin, as performed here via a step-ladder incision technique, is the standard of care and is required to minimise the risk of recurrence, which is otherwise reported in a meaningful proportion of incompletely excised tracts. Pre-operative videolaryngoscopy or endoscopy, as used in this case, helps confirm airway adequacy and exclude a pyriform sinus tract or other laryngopharyngeal communication, while cross-sectional imaging — here, MRI with MR angiography — delineates the full course of a higher (Type III/IV) tract relative to the carotid sheath and pharyngeal wall, which is particularly valuable for surgical planning given the greater risk of injury to the carotid vessels and adjacent cranial nerves with deeper tracts.

The uneventful intraoperative course, minimal blood loss, and stable immediate postoperative recovery in this case are consistent with outcomes generally reported for elective excision of branchial fistulae in children, provided the tract is completely excised in a single, well-planned procedure.

CONCLUSION

This case illustrates the classical presentation and successful open surgical management of a congenital branchial fistula in a child, achieved through careful tract dissection to its pharyngeal termination. Complete excision remains the cornerstone of treatment, and pre-operative airway assessment is a useful adjunct in surgical planning, particularly where the depth or classification of the tract is uncertain.

Intraoperative and Specimen Photographs

The following photographs were taken during the procedure and are included for surgical-education purposes. Patient identifiers are not visible in any image.



Figure 1. Intraoperative view of the fistulous tract dissected and held with forceps, prior to ligation.



Figure 2. The tract further mobilised, showing its course toward the deeper neck structures.



Figure 3. Close-up view of the ligated tract at the point of division.



Figure 4. Excised branchial fistula specimen alongside a ruler for scale, submitted for histopathological examination.



Figure 5. The cutaneous fistulous opening marked and probed prior to the elliptical incision around it.

REFERENCES

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Note: Bracketed items above mark fields not present in the source documentation supplied (e.g., ward-level post-operative course, discharge date). Please complete these before submission.

Appendix A: MRI Neck with MR Angiogram — Full Report

Clinical indication / Findings: A T2/STIR hyperintense linear fistulous tract is noted in the right side of the neck, measuring approximately 5 cm in length and 3.2 mm in width. The cranial end of the fistulous tract shows an internal opening at the right lateral aspect of the pharyngeal mucosal space at the level of the C3 vertebra, and courses inferolaterally, passing deep to the right submandibular gland, anterior to the carotid space vessels, and between the right sternocleidomastoid muscle and platysma. The caudal end of the fistulous tract extends to the skin surface, forming a cutaneous opening at the C7 vertebral level. No diffusion restriction is seen within the tract. No evidence of secondary branching or an additional fistulous tract.

Skull base and nasopharynx: Normal.

Visceral, retropharyngeal and parapharyngeal spaces: Normal. **Parotid glands, submandibular glands and sublingual space:** Normal. **Tongue and floor of mouth:** Normal.

Valleculae, epiglottis, aryepiglottic folds and pyriform fossa: Normal. **Larynx, upper trachea and vocal cords:** Normal.

Thyroid: Grossly normal in all sequences.

Paranasal sinuses: Normal.

Cervical lymph nodes: No significantly enlarged cervical nodes seen. **Carotid arteries and jugular veins:** Bilaterally normal.

Cervical spine: Normal vertebral morphology and marrow signal. Alignment maintained. No significant discosteophyte protrusion. Spinal cord, epidural space and paravertebral region normal.

MR angiogram (neck): Bilateral common carotid arteries, their bulbs, internal carotid and proximal external carotid arteries appear normal. Bilateral vertebral arteries and their origins from the subclavian arteries appear normal.

Impression: Right Type IV branchial cleft fistula, as described.

Appendix B: Histopathology Report — Full Report

Specimen type: Routine HPE **HPE number:** HL 3109/26

Specimen nature: Excision of right side branchial fistula under GA

Gross description: Received container labelled as branchial fistula. Received a grey-brown tubular soft tissue fragment measuring 4 cm. External surface congested. Cut surface grey-white with a few haemorrhagic spots noted.

Bits given: All embedded in 2 blocks

Microscopic description: Section shows cyst wall lined by stratified squamous epithelium with underlying lymphoid follicles with germinal centres, mucinous glands and skeletal muscle bundles. No atypia noted.

Frozen section (intra-operative): Right branchial fistula.

Final diagnosis: Excision of right branchial fistula — features of branchial cleft cyst.

Interpretation: The histopathological examination of the excised right-sided specimen confirms the clinical diagnosis of a branchial cleft anomaly. Microscopic analysis reveals a cyst wall lined by stratified squamous epithelium associated with characteristic subepithelial lymphoid follicles and germinal centres, consistent with a branchial cleft cyst. The presence of mucinous glands and skeletal muscle bundles within the tubular fragment further supports the structural developmental nature of this lesion. There is no evidence of cellular atypia or malignancy in the sampled tissue. These findings correlate with the patient's primary diagnosis of a congenital structural developmental anomaly of the neck and provide a definitive pathological explanation for the associated pain and fistula formation.