



## Minimally Invasive Endoscopic Surgical Repair of Recurrent Complete Third Branchial Fistula in a Nine Year Old Girl

**Sanjeev Mohanty, M. Gopinath**

Department of ENT, Head and Neck Surgery, Sri Ramachandra University, Porur, Chennai- 600116, India.

### Abstract:

Congenital anomalies of the branchial arches are well known with fistulas presenting in the head and neck region. A proper diagnosis of this uncommon entity is mandatory for a successful surgical repair in the first attempt itself. In this case report, we profile a patient who was subjected to multiple surgeries only to result in subsequent breakdowns and resurfacing of symptoms. An innovative attempt was made with the use of endoscopes and minimally invasive surgical methods to repair this recurrent fistula and followed up with a repeat fistulogram which showed a complete closure of the tract without any co-morbidity.

**Key words:** Fistula, Endoscopy, Pyriform Sinus, Neck, Humans.

### Introduction

A complete congenital fistula of the 3<sup>rd</sup> branchial apparatus is a rare clinical occurrence. The branchial arches and its anomalies have been well described and held accountable for many of the symptomatology in the head and neck region, especially in children. They may present with recurrent infections in the neck, supra-tonsillar fossa and the pyriform sinuses. There are various modalities of surgical treatment which includes the standard step ladder excision of extensive fistulas and the innovations in minimally invasive surgical repair methods. In a patient presenting with unsuccessful surgical attempts to repair, a careful treatment planning is required to prevent any further leaks. This patient was subjected to an innovative minimally invasive surgical method to

strip the tract completely and carefully address the internal opening to set aside any chance of recurrence in future.

### Case Report

A nine year old child presented to the ENT clinic, with history of discharging sinuses on and off, on the left side of neck of 6 years duration. Although she was comfortable with taking solid food, a very significant history of fluid leak was present during an act of swallowing fluids through the opening. She had undergone unsuccessful surgical repair for the same ailment three times in the past. Intermittently, she exhibited signs of inflammation along with discharge at the same site. On examination, the

**Corresponding Author:** Dr. Sanjeev Mohanty

Email: drsanjeevmohanty@gmail.com

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external opening of the fistulous tract was detected at the junction of the middle and lower third of the anterior border of the sternocleidomastoid muscle on the left side [Fig.1].

On giving a test feed, fluid leaked out of the same site only during the act of swallowing. She was subjected to radiological investigations after an unremarkable hematological laboratory values. Fistulogram was performed after cannulating the external opening and injecting contrast material. The entire fistulous tract was delineated and the dye was seen entering the hypopharynx at the medial wall of the left pyriform sinus [Fig.2,3]. A clinical diagnosis of left recurrent complete branchial fistula was made.

Exploration and excision of the fistulous tract was planned under general anaesthesia. A combined approach was undertaken, with an external and endoscopic access to reach out to the tract from inside and outside simultaneously. A transverse elliptical incision was made and the external opening was delineated by careful dissection of the tract from the surrounding tissues [Fig.4].



**Fig.1:** Picture showing the external opening at the lower end of sternocleidomastoid.

Using a minimally invasive video assisted endoscopic approach, the internal opening was visualized on the medial wall of the left pyriform fossa [Fig.5]. With the additional help of the suspension laryngoscopy and use of microlaryngeal instruments 3.0 vicryl was railroaded and needled through the internal opening and the tract was marsupialised completely. The entire fistulous tract was excised. Histopathological examination of the excised clinical specimen revealed pseudo-stratified ciliated columnar epithelium lined structure with lymphoid follicles in keeping with the diagnosis of branchial fistula.

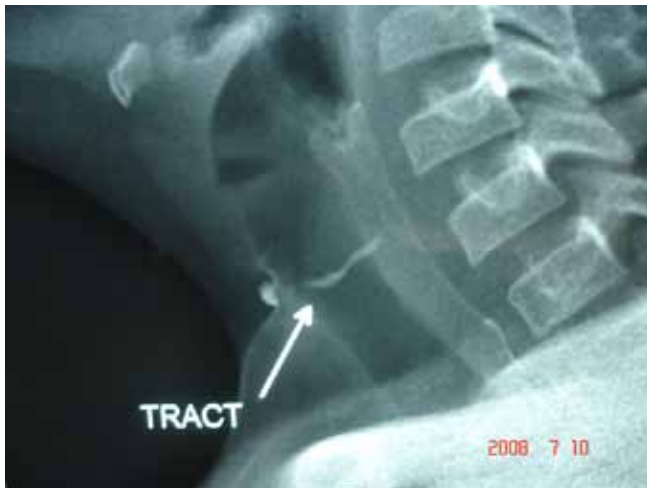
After a brief stay in hospital, she was discharged in a very stable condition without any co-morbidity. A check fistulogram done 4 weeks post operatively showed no evidence of any leak from the operated site.

## Discussion

The branchial apparatus comprises of six arches with the mesoderm as its core, separated by clefts and pouches on the ectoderm and endodermal sides, respectively [1]. Maldevelopment of the



**Fig.2:** Fistulogram sagittal view showing the tract.



**Fig.3:** Fistulogram coronal view showing the tract.

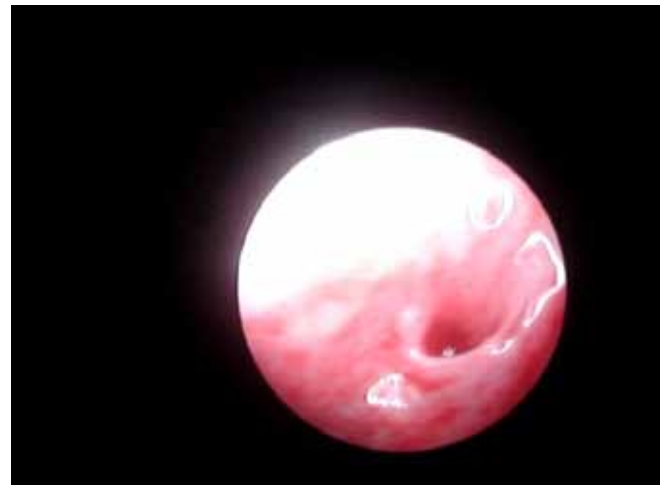
branchial apparatus leads to anomalies that occur in the form of cysts, sinus or fistulas. These anomalies may originate from the first to fourth cleft/ pouch, with the commonest arising from the second cleft/ pouch (95%) [2].

Our patient had a true fistula with both internal and external openings. A branchial fistula is thought to form when the mesenchyme that separates the cleft and pouch involutes, thus uniting them [3]. Therefore, the fistula would be caudal to the structures derived from the corresponding arch and dorsal to the structures from the following arch.

Third branchial arch anomalies are rare. Anatomically, these fistulas have an external opening in the mid or lower part of the neck along the anterior border of the sternocleidomastoid muscle. They have a demonstrable connection with the left pyriform sinus. A third branchial fistula would course between the third and fourth arch structure. In theory, the course starts externally from the skin opening at the upper third of the sternocleidomastoid muscle, through the subplatysmal plane near (not through!) the superior pole of the thyroid gland, and then ascends along the carotid sheath posterior to the internal carotid artery, under the glossopharyngeal



**Fig.4:** Fistula tract being excised externally.



**Fig.5:** Endoscopic view of internal opening in pyriform sinus.

nerve (third arch derivative) and superficial to the hypoglossal nerve (fourth arch derivative). It then pierces the thyrohyoid membrane, which lies superior to the thyroid cartilage (fourth arch derivative) and passes above the superior part of the pyriform fossa [1].

It has been reported that the typical course of a fistulous tract is not observed in cases of a large mass or concomitant cyst [4]. Jaka and Singh *et al*

reported a complete third branchial fistula that followed the famously described tract that passes posterior to the common and internal carotid artery, but they did not mention the involvement of the thyroid gland [5]. The course of these fistulas is not always typical. Edmonds *et al.* have recommended the use of direct laryngoscopy and transillumination of the tract with a rigid telescope [6]. Treatment is to excise the tract completely. Complete excision of the fistula prevents any recurrence. The recurrence rate of branchial anomaly is 3% for a primary lesion and as high as 22% for lesions with previous infection and surgery [7]. It should be borne in mind that aberrant presentations may exist when re operating on chronic branchial fistulas.

## Conclusion

Congenital branchial fistulas are infrequently encountered in clinical otolaryngological practice. However, a complete fistula of the third branchial arch is relatively rare. This particular case is unique in its presentation as multiple surgeries were attempted to repair the defect without addressing the internal opening in the pyriform sinus. This incomplete excision probably led to recurrence. The depth of the internal opening in the pyriform sinus made it more challenging per operatively. The use of microlaryngeal instruments along with the assistance of video endoscopes helped immensely in sealing the tract completely.

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