ABC
Proper diagnosis and appropriate surgical management depend on thorough understanding of embryology and anatomy, and high index of suspicion. The initial surgery is crucial since the recurrence rate after incomplete surgical excision can be as high as 22%.4,5

Objective of this report was to report a case of third branchial cleft cyst of in a 12-year-old boy.

**CASE REPORT**

A 12-year-old boy presented with a mass in the left upper neck appearing repeatedly. There was a history of chronic recurrent fever and cough from childhood coinciding with appearance of swelling. There were no constitutional symptoms like evening rise of temperature, night sweats, weight loss or history of TB in the family.

Examination revealed a well built, well-nourished boy with a cystic swelling on the left side of the hyoid bone (Figure 1). The swelling had vague margins and was deep to the strap muscles of the neck.

The lateral border of the swelling was abutting the anterior border of the Sternocleidomastoid. Thyroid was in its Normal place and there were no other masses. USG Neck revealed Loculated thick walled cyst from SCM to lateral part of Pharynx (Figure 2). Mantoux- no erythema, no induration, TB PCR- Negative, Gene Xpert- no MTB detected, plain radiograph chest- NAD, serum ADA- 21.3 IU/L. An attempt to FNAC was also done which was non-contributory.

Figure 3: CECT axial section - lesion extending from sternocleidomastoid to pyriform fossa medially between internal and external carotid arteries.

Figure 4: CECT Coronal section - Deviation of pharynx to the right.

CECT Scan showed hypotense cystic lesions with poorly enhancing walls extending from the level of carotid bifurcation to pyriform fossa and sternocleidomastoid to lateral pharyngeal wall. There were no calcifications (Figure 3 and 4).

Figure 5: Arrow showing superior laryngeal nerve.
Histopathology showed a cyst filled with mucous and cholesterol crystals and lined with squamous epithelium (fig G, H). Branchial Cyst was confirmed due to relation to Sternocleidomastoid, Superior Laryngeal Nerve and Pyriform Fossa and HPE findings of squamous epithelium and cholesterol crystals on histopathology.

DISCUSSION

Specific adult structures are derived from each branchial arch and its related cleft and pouch (Table1). The first branchial cleft is the only pair to contribute directly to adult structures; it persists as the epithelium of the external acoustic meatus. The other branchial clefts are obliterated together with the cervical sinus of His as the neck develops.

From each mesodermal branchial arch, specific osseous, cartilaginous, and vascular structures arise. Each contributes a specific cranial nerve. The vestigial remnant theory states that if any portion of a branchial cleft, pouch or cervical sinus of His fails to obliterate during embryogenesis, it can result in a sinus, fistula or cyst.\textsuperscript{6,7} Cysts secondary to 3\textsuperscript{rd} and 4\textsuperscript{th} clefts are extremely rare. Most often they are missed as cold abscesses and are treated inappropriately. 2\textsuperscript{nd} branchial cleft anomalies most commonly present as cysts followed by sinuses and fistulae. Most are present in the submandibular space but they can occur anywhere along the course of the 2\textsuperscript{nd} branchial arch tract which extends from the skin overlying the supraclavicular fossa, between the internal and external carotid arteries, to enter the pharynx at the level of the tonsillar fossa.\textsuperscript{8}

Third branchial cleft cysts are extremely rare.\textsuperscript{9} Most cases of third branchial cleft cysts are diagnosed in childhood and show a marked preference for the left side.\textsuperscript{10} Branchial cleft cysts are characteristically related to the structures belonging to that branchial arch, usually anterior to structures belonging to the cranial arch and posterior to structures arising from the caudal arch. Thus, the third branchial cleft cyst also presents as a cyst related to the anterior body of SCM, starting from the level of the hyoid bone can reach upto the pyriform fossa. Because of its relation to the superior laryngeal nerve, it is pushed medially and upwards and unlike 2\textsuperscript{nd} branchial cyst, the 3\textsuperscript{rd} branchial cyst is anterior to internal carotid artery. Both the branchial cysts present with somewhat similar symptoms and signs like a cyst related to the sternomastoid muscle. The clinical differential diagnosis may be difficult.

In the index case too, the child was having recurrent upper respiratory infections and fever. This was concomitantly associated with the neck swelling which was mistaken for cold abscess and was investigated extensively. The child in the index case too had all the tests related to TB negative: Mantoux - no erythema, no induration, TB PCR- Negative, Gene Xpert- no MTB detected, Plain Radiograph Chest- NAD, Serum ADA-

![Figure 6: Intraoperative picture showing extension upto medial wall of pharynx.](image)

![Figure 7: HPE - squamous epithelial lining of cyst.](image)

![Figure 8: HPE - cholesterol crystals.](image)
21.3 IU/L. An attempt to FNAC was also done which was non-contributory. CECT scan showed the relationship of the cyst to the internal carotid artery, elevation and medial displacement of upper lobe of left thyroid, and cyst almost reaching up to thyrohyoid membrane (pyriform fossa).

**Table 1: Branchial arch derivatives.**

<table>
<thead>
<tr>
<th>Arch/nerve</th>
<th>Skeletal</th>
<th>Ligaments</th>
<th>Muscles</th>
<th>Pouch</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Malleus Incus</td>
<td>Anterior ligament of malleus Sphenomandibular ligament</td>
<td>Muscles of mastication Tensor tympani Tensor palati Mylohyoid Anterior belly of digastric</td>
<td>Auditory tube Tympalic cavity</td>
</tr>
<tr>
<td>Second</td>
<td>Stapes Styloid process Hyoid bone- lesser horn, upper half of body</td>
<td>Stylohyoid ligament</td>
<td>Muscles of facial expression Stapedius Stylohyoid Posterior belly of digastric</td>
<td>Lining (crypts) of palatine tonsils.</td>
</tr>
<tr>
<td>Third</td>
<td>Hyoid bone- greater horn, lower half of body</td>
<td>-</td>
<td>Stylopharyngeus</td>
<td>Inferior parathyroid gland Thymus</td>
</tr>
<tr>
<td>Fourth</td>
<td>Cartilages of larynx</td>
<td>-</td>
<td>All muscles of larynx All muscles of pharynx (except stylopharyngeus) All muscles of soft palate(except tensor palati)</td>
<td>Superior parathyroid gland C-cells of thyroid</td>
</tr>
<tr>
<td>Sixth</td>
<td>-</td>
<td>-</td>
<td>Sternoceleidomastoid Trapezius</td>
<td>-</td>
</tr>
</tbody>
</table>

Confirmation of third arch branchial cyst is usually with operative findings. The index case had classical anatomic relationship with structures arising from 3rd branchial arch. Thus, confirming the origin of the cyst from the third arch.

Branchial cysts are confirmed by squamous lining on histology and cholesterol crystals in the contents. (FigG) and (FigH), clearly show squamous lining of the cyst and magnified view of cholesterol crystals. Post-operative period was uneventful.

**CONCLUSION**

Branchial cyst arising from third branchial cleft is being reported.

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**REFERENCES**
