



A novel surgical management of hypopharyngeal branchial anomalies



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ABSTRACT

Objective: To review our experience treating hypopharyngeal branchial anomalies utilizing an open transcervical approach that: (1) includes recurrent laryngeal nerve (RLN) monitoring and identification if needed; (2) resection of tract if present; and (3) a superiorly based sternothyroid muscle flap for closure.

Methods: A retrospective chart review was performed to identify all patients at a tertiary level children's hospital with branchial anomalies from 2005 to 2014. The clinical presentation, evaluation, treatment and outcome were analyzed for those patients with hypopharyngeal branchial anomalies.

Results: Forty-seven patients who underwent excision of branchial anomalies with a known origin were identified. Thirteen patients had hypopharyngeal branchial anomalies. Six of these patients were treated by the authors of this study and are the focus of this analysis. All six underwent an open transcervical procedure with a sternothyroid muscle flap closure of a piriform sinus opening over a nine year period. Definitive surgery included a microlaryngoscopy and an open transcervical approach to close a fistula between the piriform sinus and neck with recurrent laryngeal nerve monitoring or dissection. A superiorly based sternothyroid muscle flap was used to close the sinus opening. There were no recurrences, recurrent laryngeal nerve injuries or other complications from these procedures.

Conclusions: This study supports complete surgical extirpation of the fistula tract using an open cervical approach, recurrent laryngeal nerve monitoring or identification, and rotational muscle flap closure to treat patients with hypopharyngeal branchial anomalies.

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1. Introduction

Branchial anomalies (BAs) are frequently encountered by Otolaryngologists, encompassing as much as 17% of pediatric neck masses [1]. Of all branchial anomalies, those arising from the second pouch are most common at over 90%, while hypopharyngeal (third or fourth) branchial pouch anomalies are rare [2–4].

Despite their lower rate of occurrence, hypopharyngeal branchial anomalies are important causes of neck abscesses and airway obstruction. A recent review reported over five hundred cases of type 4 branchial arch anomalies, a much higher number than previously suspected [4]. This anomaly has been confused with esophageal perforation, thyroid cancer, and other conditions [5–7], which, according to Nicoucar et al., has contributed to a delay in diagnosis of these lesions [4].

The optimal surgical approach to these anomalies has not been established. Some authors have advocated complete excision of the

anomaly via an anterior neck incision including hemithyroidectomy [8,9]. Others have recommended complete excision with hemithyroidectomy only if the tract involves the thyroid [4], or endoscopic cauterization of the piriform sinus fistula [9–12]. Nicoucar et al. have recommended endoscopic cauterization for patients eight years of age or younger and an open neck approach with partial thyroidectomy for those over eight years of age [4]. They cited a high rate of recurrent laryngeal nerve injuries in patients younger than eight years of age.

Here, we present a review of all patients with branchial anomalies encountered over a nine year period at our institution, and discuss our approach to management of patients with hypopharyngeal branchial anomalies. Specifically we discuss the use of recurrent laryngeal nerve monitoring, avoidance of hemithyroidectomy, and the use of a sternothyroid rotation flap for hypopharyngeal closure.

2. Materials and methods

A retrospective chart review was performed for patients with all types of branchial anomalies (BA) from January 2005 to May 2014

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at a tertiary-care pediatric hospital. Institutional review board approval was obtained from the University of Utah (IRB# 45048). A patient database was generated using ICD-9 codes for branchial anomalies. Information including patient demographics, presentation, management, operating surgeon, outcome, complications, follow-up, and recurrences were collected. We defined a hypopharyngeal branchial sinus as a tract starting in the base or apex of the piriform sinus and exiting through the cricothyroid membrane [4,13]. We did not identify any tracts exiting the thyrohyoid membrane which is commonly associated with type 3 branchial sinuses.

2.1. Surgical technique

Electromyography (EMG) electrode monitoring of the recurrent laryngeal nerve (RLN) was obtained with either electrodes in the vocal fold or an EMG endotracheal tube (Medtronic Corporation). A standard thyroidectomy incision was used in the midline just inferior to the cricoid cartilage. Routine subplatysmal flaps were raised superiorly and inferiorly for exposure. The midline raphe of the strap musculature was identified and divided to the level of the thyroid isthmus and trachea. The sternothyroid muscle was then identified and elevated over the thyroid fascia and thoroughly dissected superiorly to allow exposure of the superior pole of the thyroid. If necessary for exposure, the superior pole vessels to the thyroid were ligated when they obscured visualization of a cyst or sinus tract. The inferior constrictor muscle was then identified. Once this was completed a second surgeon exposed the piriform sinus and placed a probe in the tract to facilitate identification of its entry into the neck. Working along the anterior aspect of the larynx from the transcervical approach to avoid the posterior course of the RLN, blunt dissection was performed to expose the fistula. This approach obviated the need for identification of the RLN in most cases. We did not identify any cyst or sinus tract in any of our cases; for that reason, closure of the fistula became the priority for this procedure. The sternothyroid muscle was isolated and transected inferiorly (Fig. 1). This superiorly based sternothyroid muscle flap was then rotated into the fistula and tacked into position with absorbable suture (Fig. 2). Fibrin sealant such as Tisseal[®] (Baxter) or Eviseal[®] (Ethicon) was then placed in the wound bed, and the wound was closed in layers.

3. Results

Between January 1st 2005 and May 2014, 83 patients underwent surgical excision of BAs. Thirty-six patients underwent excision of an unspecified type of BA. Most were cysts or external sinuses located at the anterior edge of the sternocleidomastoid muscle without an apparent deeper tract. These patients were excluded from further review, leaving 47 of known type. Thirteen were (28%) hypopharyngeal BAs.

Table 1 summarizes the clinical and surgical characteristics of patients with hypopharyngeal BAs. Five females and 8 males were treated. Age of presentation ranged from 7 days to 16 years. Mean time from presentation to surgery was 190 days (range 9–1596 days). All were left sided lesions. Four pediatric otolaryngologists and one head and neck surgeon treated these patients. The following results focus primarily on the six patients treated by the authors of this study.

Five out of six patients presented with a neck abscess. One of these patients also presented with airway obstruction from the abscess. Five of six patients underwent an incision and drainage prior to definitive excision. One was treated with a course of oral antibiotics without an incision and drainage procedure prior to extirpative surgery.

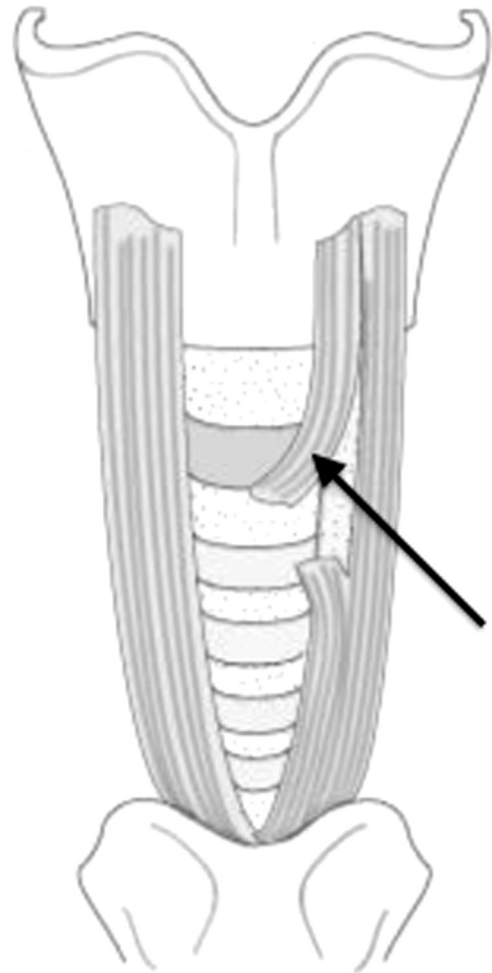


Fig. 1. Demonstrates the isolation of the sternothyroid muscle flap. Note the flap is superiorly based (arrow).

Early in our experience, the first two patients underwent a hemithyroidectomy. None of the subsequent patients underwent this procedure. As we became more experienced with identifying the fistula between the piriform sinus and neck, we did not need to identify the RLN. However, nerve monitoring continued to be used as a precaution. All patients underwent a rotational sternothyroid muscle flap to close the fistulous opening in the piriform sinus. Mean follow-up for these 6 patients was 678 days (range 59–1326 days). There were no recurrences or complications including RLN injury or hypothyroidism among this group.

In contrast, seven patients not treated by the authors did not undergo a rotational flap closure. All underwent resection of an apparent tract or cyst. Five underwent a hemithyroidectomy. Two of the five patients (patients 12 and 13) who underwent a hemithyroidectomy developed hypothyroidism. One of these patients currently requires thyroid replacement therapy. The other child has been referred to pediatric endocrinology. Three patients had a recurrence requiring another transcervical attempt at resection of a tract or cyst.

4. Case presentation

A nine year-old boy presented to the pediatric otolaryngology clinic with a 12-day history of a neck mass following an episode of streptococcal pharyngitis (patient 9—see Table 1). He was previously treated with amoxicillin. A neck CT demonstrated a left-sided 1.2 × 2.3 cm sized heterogeneous, ill-defined lesion

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