Complications Associated With the Sistrunk Procedure

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Objective: To assess the type and rate of complications in the postoperative period of pediatric patients undergoing the Sistrunk procedure. Study Design: A retrospective review of patients with a diagnosis of thyroglossal duct cyst who had not had corrective surgery previously. An attempt to standardize the study was made as follows: all patients had surgery under the direction of one surgeon, using the Sistrunk procedure with minor modifications from its original description. Complications were divided into major and minor categories. Methods: Charts were reviewed for age, sex, preoperative assessment, and postoperative follow-up. Complications were recorded. A postoperative telephone survey was conducted. Results: A minor complication rate of 29% was observed. There were no recurrences or major complications. Conclusions: The Sistrunk procedure remains the operation of choice for removal of the thyroglossal duct cyst. When the surgery is properly performed, with attention to key surgical landmarks, the risk of major complication is minimal. Complications that do occur are minor and wound related. Key Words: Thyroglossal duct cyst, Sistrunk procedure.


INTRODUCTION

The thyroglossal duct cyst (TDC) is one of the most common congenital mass lesions located in the cervical region. It has long been recognized that the Sistrunk procedure is the most efficacious method of surgical extrication of this malformation. It has become the procedure of choice because of the low rate of recurrence.1–3 Although many studies have substantiated this claim, there has been a paucity of reports in the literature reviewing the complications associated with this surgical procedure.

The purpose of this study is to retrospectively review our experience with the Sistrunk procedure and its associated surgical complications. All patients included in this study had a diagnosis of TDC, but none had previously undergone corrective surgery for this malformation. All patients subsequently underwent the Sistrunk procedure, and specific surgical techniques were employed that have been refined over the years by the senior author (J.M.). It is hoped that these results will serve as a standard which can be used to predict and measure postoperative complications, thus providing both a benchmark for the surgeon and guidelines that may be useful in discussing with family members both the Sistrunk procedure and its potential risks. In addition, we propose the use of the thyrohyoid membrane as a surgical landmark to determine the depth of the dissection and enable identification of the posterior aspect of the hyoid.

MATERIALS AND METHODS

This study consisted of a retrospective analysis of charts from 1991 to 1995 (inclusive). The following qualifications were met for inclusion in this study: patients were less than 18 years of age, patients had the diagnosis of TDC, and patients had no history of surgical treatment (i.e., Sistrunk procedure) of TDC.

In our review, an attempt was made to standardize the results by ensuring that all patients had surgery under direction of the senior author. Thirty-five pediatric patients with a diagnosis of TDC met inclusion criteria. (None of the children had previously been treated surgically with a Sistrunk procedure.) Diagnosis was made first by clinical examination and confirmed with a diagnostic imaging study. The procedure of choice was ultrasound. In using this technique, we identify the TDC, as well as a normal thyroid gland (Figs. 1 and 2).

In addition to the surgical guidelines proposed by Sistrunk, the following intraoperative tenets were observed: identification of the thyroid cartilage and thyrohyoid membrane and identification of the four surfaces of the hyoid bone with particular attention paid to its posterior aspect.

In our approach to TDC, we make the classic transverse incision at the approximate level of the hyoid bone. If there is a draining fistula, an ellipse of skin is included with the specimen. Superior and inferior myocutaneous flaps are developed deep to platysma, exposing the cyst. The sternohyoid muscles can be readily recognized lateral to and enveloping the lesion. With minimal dissection their insertion onto the hyoid bone can be identified. The TDC is mobilized in a cephalad direction includ-
ing, if necessary, a cuff of normal musculature. In so doing, the anterosuperior surface of the thyroid cartilage is exposed, defining the depth of the dissection. The notch of the thyroid cartilage and the thyrohyoid membrane is recognized. Dissection continues superiorly along the membrane to the hyoid bone. The inferior and superior margins of the hyoid are identified and skeletonized lateral to the cyst and tract. During this process the anterior surface of the hyoid is readily apparent. Using the thyroid cartilage and thyrohyoid membrane to demarcate the depth of the dissection, the posterior surface of the hyoid is defined. The hyoid bone can be lifted either with a tracheal hook or with a hemostat and transected with confidence at the level of the lesser cornu (Fig. 3).

After the hyoid is transected, dissection continues superiorly toward the foramen caecum; the tract and a generous cuff of tongue musculature are included with the specimen. A double-gloved finger is inserted into the oral cavity and is used to identify the area of the foramen caecum. The specimen is cross-clamped and divided just deep to the lingual mucosa. The surgical stump is oversewn with a figure-of-eight stitch of 3-0 Prolene. It is not necessary to enter the oral cavity. Hemostasis is secured, and the wound thoroughly irrigated. A ¼-inch Penrose drain is placed in the wound and secured with a transcutaneous stitch tied over a

Fig. 1. Ultrasound image of thyroglossal duct cyst (TDC) (arrow) as seen in cross-section.

Fig. 2. Ultrasound image of normal thyroid gland in the axial plane. The arrows indicate the lobes of the thyroid.

Fig. 3. The four surfaces of the hyoid. Identification of the posterior surface ensures complete transection of the bone.

Fig. 4. Illustration in the sagittal plane of drain placement. The drain is secured with a transcutaneous stitch and tied over a batten.
batten, ensuring that the drain remains secured in the depths of the wound to provide maximum egress of any fluid collection. The drain exits the wound in the midline through the original incision and is removed the next day (Fig. 4). To allow the drainage of any excess secretions, no tie-over stitch is placed. The wound is dressed with fluffs that are held in place with Surgilast tubular elastic dressing retainer (Glenwood Co., Tenafly, NJ). This serves to tamponade the wound and avoids a compressive dressing around the neck.

RESULTS

The results of this review of 35 pediatric patients who received a Sistrunk procedure for TDC are summarized in Table I. Sixty percent of our patients were boys, and 40% were girls, with an average age of 4 years. In most patients (83%) the diagnosis was made by means of ultrasonic imaging procedures that included identification of the TDC, as well as identification of the thyroid gland. A small number of patients were referred from outside institutions with a diagnostic imaging study consisting of either a computed tomography (CT) scan or a thyroid scan. All of the pathological specimens were consistent with the diagnosis of TDC when examined microscopically.

Complications were identified and divided into major and minor categories (Table II). Using the techniques described, no major complications resulting from the surgical intervention were identified. Ten patients (29%) had minor complications, including postoperative seroma in six patients, stitch abscess in three, and a local wound infection in one. There were no recurrences of TDC.

At our institution, all patients were followed at varying intervals for 6 weeks. At 6 weeks, they were considered surgically healed, and if they were without morbidity, they were instructed to continue follow-up care with their primary care physician. The referring physician, as well as the patient's family, was instructed to contact our offices if there were any complications or there was evidence of recurrence. As of March 1999, 42% of the patients were still able to be contacted by telephone and reported no recurrence or complication.

DISCUSSION

Thyroglossal duct cysts are the most common malformations found in the neck and account for 70% of congenital cervical abnormalities. Although they can occur at any age, most are detected in the first two decades of life, making them primarily a pediatric problem. TDCs usually appear as midline cervical masses that lie either directly above the hyoid bone or just below it. However, their location may vary; approximately one-third of TDCs may present as submental or low-level cervical masses. Less than 1% are located off the midline.

Thyroglossal duct cysts result from an aberrant embryological process or condition of the thyroid gland. During the fourth week of fetal development, epithelium located in the floor of the pharynx (in an area that later becomes the foramen caecum of the tongue) invaginates to form a tubular structure known as the thyroglossal duct. The duct then extends in a finger-like fashion to a terminus in the lower midline neck, where its distal end becomes bilobed and further differentiates into the thyroid gland. Thyroid development is completed at the eighth week of gestation, and between the eighth and tenth weeks the thyroglossal duct involutes. A TDC can occur if viable epithelium of the thyroglossal duct persists anywhere along the duct's natural course (foramen caecum to thyroid).

During the thyroglossal duct's descent, it passes close to the hyoid bone, which is concomitantly undergoing an anterior fusion. Thus the thyroglossal duct assumes an intimate anatomical association with this structure. In previous studies of surgical specimens of TDCs, the tract of the TDC has been noted to be ventral and almost adherent to the hyoid bone in most cases. In approximately 30% of cases the tract has been found posterior to the hyoid. It has never been reported to lie within the bone itself. This fact has important implications in the treatment of this disorder.
In our attempt to do so, we have segregated complications into major and minor varieties. The major complications, for the most part, can be ascribed to surgical mishaps such as inattention to key anatomical landmarks, inadequate hemostasis, and absent wound drainage. Minor complications are primarily wound related.

Inadvertent entry into the airway can be avoided by intraoperatively identifying the notch of the thyroid cartilage and the thyrohyoid membrane. This maneuver not only allows the surgeon to avoid an erroneous transection of these structures, but it also provides a surgical conduit to identify the hyoid bone. If the thyroid cartilage is violated, surgical repair with concomitant tracheotomy is required. If entry into the airway is minor (e.g., tracheal puncture), placement of a drain to prevent subcutaneous emphysema and allowing the wound to heal by secondary intention may be all that is necessary.

Intraoperative hemorrhage or hypoglossal nerve injury, or both, is highly unlikely, but conceivable, if the hyoid is divided too laterally or if subsequent dissection is too aggressive in a superior lateral direction. This type of neurovascular injury would be the consequence of disrupting the contents of Lesser’s triangle. This triangle is a subanatomical unit of the submandibular triangle and is bounded by the tendon of the digastric and the hypoglossal nerve. Within this triangle, lying deep to the mylohyoid muscle, traverse the lingual artery and vein (Fig. 5). Injury to these structures can be avoided by transecting the hyoid at the level of the lesser cornu and by maintaining subsequent dissection medial to the anterior belly of the digastric, confined to the submental triangle of the neck.

Hypothyroidism can be avoided, or at least anticipated, by means of preoperative imaging. The procedure of choice is ultrasound. Ultrasonic evaluation is advantageous because it is a rapid procedure that does not require sedation, avoids radiation exposure, and is cost-effective. In using this technique, we identify the TDC, as well as a normal thyroid gland. Identification of the thyroid gland precludes the possibility of excision of solitary ectopic thyroid tissue. Thyroid function tests are not requested if the patient is clinically euthyroid and has no history of thyroid dysfunction.

Although we reported no recurrences, because of the known multiplicity of tracts in the suprahyoid region, this can be expected to occur. It has been the experience of the senior author, as well as others, in performing revision surgery for recurrent TDC, that the condition occurred secondary to incomplete resection of the hyoid bone. This is usually the consequence of the operating surgeon inadequately mobilizing the hyoid bone and not identifying its posterior surface. An attempt to transect the hyoid under these conditions frequently results in a fracture of its anterior surface, or “filleting” of the hyoid, rather than complete division (Fig. 6). This can be avoided by meticulously identifying the posterior margin of the hyoid, ensuring its complete transection.

Although a minor complication rate of 29% seems high, in clinical practice these problems are relatively insignificant because they represent minimal morbidity that is easily treated in an outpatient setting. The cases of seroma could probably have been avoided had we main-
tained the wound’s drainage for more than 24 hours. However, our rationale for placing and securing a drain in this time period is not to prevent seroma, but rather, to avoid development of hematoma that could compromise the airway. Maintenance of a drain for more than this interval would have necessitated discharging patients with a drain in place. This prospect is not attractive to parents and could have precipitated other complications secondary to trauma or infection, or both. None of the patients who experienced seroma had airway problems or reported dysphagia or infection. The seromas did not require drainage and resolved by passive resorption.

CONCLUSION
The Sistrunk procedure is the operation of choice in the treatment of TDC because, historically, it has been associated with low rates of recurrence. When the procedure is carried out with the particular nuances we have described, there is minimal risk of major complications. Complications that do occur are minor and are wound related.

BIBLIOGRAPHY

Fig. 6. Surgical specimen from a recurrent lesion after a second Sistrunk procedure was performed. The arrows indicate the retained posterior rim of the hyoid bone (top) and the residual sinus tract of TDC (bottom).