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Thyroglossal tract cysts, sinuses, and fistula

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THYROGLOSSAL CYSTS, SINUSES AND FISTULA

THE PRESENT CONCEPT OF LESIONS OF THE THYROGLOSSAL TRACT

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THYROGLOSSAL CYSTS, SINUSES AND FISTULAS

A. Introduction:

The treatment of lesions of the thyroglossal duct has not changed appreciably in the last thirty-five years. Sistrunk's technique of removal is still the basis of treatment. In recent years this form of treatment has been supplemented by the use of general intratracheal anesthesia, the placement of the anesthesiologist's finger in the mouth over the foramen cecum to facilitate the surgeons dissection, and the use of antibiotics postoperatively.

The purpose of this paper is to refresh upon the profession that lesions of the thyroglossal tract are common when review of lesions of the neck are considered. These lesions, if large and disfiguring, should be treated by surgical excision.

My interest in this subject has been great, because I was afflicted by this ailment for twenty-seven years. It was necessary to have four operations plus numerous incisions for drainage to obtain complete cure.

Mother first noticed a small lump on my neck inferior to the right ear when I was only eighteen months of age. Operations were undertaken at ages two and four, both of which were unsuccessful.

At age twelve, another operation was unsuccessful, this time at the Mayo Clinic. One year ago, at the age of twenty-seven, at the Mayo Clinic, a successful operation resulted in complete cure.

The signs and symptoms in my case consisted of a small, non-

painful mass located two cms. to the right of the midline at the level of the thyroid cartilage. The mass would move upward on swallowing, at times would make swallowing difficult, and was very annoying because of it's persistent discharge.

In recent years following every upper respiratory infection the cyst would become infected, make swallowing painful, and after incision would leave a persistent draining sinus.

The procedure to be followed in this paper will be a review of the historical data, case reviews and follow-up of cases from the University of Nebraska Hospital and Childrens Memorial Hospital in Omaha, Nebraska, and the review of published material.

B. Definition of Terms:

1. Thyroglossal - Pertaining to the thyroid and tongue.
2. Duct - A tube or channel, especially one for conveying the secretions of a gland. A small enclosed channel conducting any fluid, as the cochlear duct.
3. Cyst - A sac with a distinct wall, containing fluid or other material. It may be normal or a pathologic structure.
4. Thyroglossal cyst - Cystic distension of the remants of the thyroglossal duct, filled with secretions of lining epithelium.
5. Fistula - A narrow tube or canal formed by incomplete closure, as an abscess, wound, disease process or (congenitally) a part. Usually transmits some fluid, either pus or the

secretions or contents of such organs, viscus, or body cavity.

6. Sinus - A hollow or cavity; a recess or pocket. A suppurating tract. A cavity within the bone.
7. Thyroglossal duct cyst - A retention cyst which has it's origin in a patent or unabsorbed portion of the vestigial thyroglossal tract.
8. Thyroglossal duct sinus - An intermittently or continuously draining channel from such a cyst, the buried end of which stops blindly in the tissues. Such a sinus results from the spontaneous rupture or incision of a thyroglossal cyst.
9. Thyroglossal duct fistula - A sinus tract which runs interruptedly from the skin surface into the mouth by way of the foramen cecum."[1]

C. Historical Data:

"1. Rathke 1825 - The first accurate embryological discription of arches and clefts in three week embryos of a pig as compared with a shark.
2. Von Baer 1827 - Describes four branchial clefts in the human embryo.
3. Von Ascherson 1832 - Discussed the origin of fistulas from the branchial apparatus.
4. Von Cusset 1877 - Made a record of various pathologic conditions of the neck independent of the branchial

apparatus.

5. His 1881 - Studied human embryos and applied the reconstruction method.

6. Wenglowski 1912 - His studies established the present concepts of the formation of the thyroid gland."[18]

7. Sistrunk 1920 - Developed the technique of removal of the thyroglossal duct.

8. Spencer 1914 - Reported the resection of the center of the hyoid bone for the cure of a thyroglossal fistula.

D. Incidence:

The incidence of lesions of the thyroglossal tract is small when one considers the percentage of patients admitted to hospitals and clinics in the United States. These lesions are not common, but one hesitates to call them rare when all pathologic lesions of the neck are considered.

The Mayo Clinic reports in 86,000 consecutive patients only thirty-one thyroglossal cysts were found. Eighteen of these were males and thirteen were females. The cysts appeared at all ages from birth to fifty-three years, the majority being noted in patients between the ages of twenty and twenty-five years.

The Lahey Clinic up to 1948, reports they have operated 289 patients with thyroglossal cysts and sinuses , 19% of whom had previously had incision and drainage and 25 % had had incomplete removal with recurrence of the cyst before the patients came to the clinic. The cysts occured in children and even babies

and 33% occured in children ten years of age or younger. These cysts may be found at any age; the oldest patient in this group was seventy-five years. There were 121 males and 168 females.

Lesions of the thyroglossal tract may appear at any age but are most common in the first three decades of life. Marshall had 53.2% in the first two decades, Ward reports 60% in the first decade. Gross reported that 29% of the cysts were present at birth and that 76% were noted before the sixth year. Nachlas states that the largest group of cysts appear before the patient is ten years of age.

Several authors state that thyroglossal cysts are more common than are branchial cysts. Some authors say that the lesions are more common in males before twenty than in females while others say they are more common in females.

E. Embryology:

There has existed among embryologists several opinions on how the thyroid gland develops in man. The main question seems to be: Does the thyroid develop from a single median primordium or from three primordium, (lateral and 1 median)?

"The thyroid gland primordium begins in the floor of the pharynx at the tuberculum impar, early in the fourth week of embryonic life. It begins as a short canal-like diverticulum, which fuses to form an epithelial cyclinder without a lumen, and this structure separates from the pharynx and grows downward into the neck, anterior to the region of the hyoid bone, whose development

occurs later. The thyroid gland develops in the depth, but the remainder of the thyroglossal tract regresses.

The hyoid bone begins to develop at about the beginning of the fifth week, and lies in close apposition with the thyroglossal tract. As the hyoid bone grows forward, the inelastic thyroid tissue is compressed and obliterated at the point of contact, and the tract is divided into suprahyoid and infrahyoid segments. A later continued hyoid growth, forward and slightly downward, produces a convexity in the bone in the sagittal plane, and by this growth the upper end of the lower segment of the thyroglossal tract is again divided, a small portion tending to remain on the anterior hyoid surface, the next small segment disappearing under the pressure of the lower bone ridge, and the top of the lowest segment being carried far back almost behind the bone, owing to its close attachment to the lower border of the hyoid, which now curves backward. In this manner the foundation is laid for the appearance in post-natal life of thyroid tissue:

1. In the region between the root of the tongue and the hyoid bone.
2. Upon the hyoid bone.
3. Below and almost behind the hyoid bone, in closest relation to it, as well as lower in the midline of the neck.

The thyroglossal tract and the hyoid bone are developed before the muscles and fascia attached to the bone appear. The thyroid tissue and the associated tissue elements from the floor of the

pharynx are thus in very intimate connection with the bone."[20]

"Meyer stated that the beginning of the branchial apparatus takes place in the second half of the first month of embryonic life, and in the course of the second month it completely disappears. The branchial apparatus extends forward, upward and orally. The pharyngeal apparatus extends posteriorly downward and below the mouth. The arches tend to grow closer in embryonic life, until the cleft disappears, and the epithelium is displaced outward by the mesenchymal growth or by adhesions and obliteration.

The 1st arch forms the lateral portion of the upper lip and maxilla, the lower lip and mandible, and the body of the tongue. The 2nd makes up the body of the hyoid bone, stylohyoid ligament and muscle, the anterior portion of the base of the tongue, and the arcus palatoglossus. The 3rd forms the greater cornu of the hyoid bone, the posterior portion of the base of the tongue, and arcus pharyngopalatius. The 4th, 5th, and 6th go to form the soft parts of the neck around the hyoid.

The 1st cleft forms the external auditory canal; 2nd the tonsillar fossa; 3rd the thymus; and the 4th the lateral lobes of the thyroid.

He believes that the branchial apparatus belongs to the head and not the neck, and that any congenital pathologic condition referable to the branchial apparatus in humans must rest along the mandible adjacent to the hyoid bone and the cornu of

the hyoid bone. Nothing, in his opinion, below the lower level of the hyoid bone has any genetic relation to the branchial apparatus and all congenital anomalies caused by incomplete retrogression of the branchial apparatus must be located in the region around or above the lower border of the hyoid. Any congenital anomaly below this level is in definite relationship with the pharyngothymic duct and must be classified as a lateral cyst or fistula originating from this duct."[22]

"The lateral thyroid develops from the epithelial pocket in the floor of the 4th pharyngeal pouch. The lobes grow downward and inward and become a firm unit with the median lobe. They take on typical thyroid structure histologically, and lose the lumen which is present in the anlage. They completely separate from the pharyngeal wall. Theoretically the lumen or segments of it might persist, but in 150 autopsies Wenglowski did not find it in a single case."

"Marine states that the most common abnormality of the human thyroid is the presence of the pyramidal process. Following Streckersin, who has shown that this anomaly is most frequent in districts of endemic goiter, it is stated that the presence of a distinct pyramidal process and persistent thyroglossal tract indicated increased functional need for thyroid tissue at the period of embryonic life when this tract should undergo absorption."[33]

After reviewing the statements of many embryologists concerning the origin of the thyroid gland; most authors believe the gland

arises from a median diverticulum from the pharynx. The lesions connected with the thyroglossal duct are due to a failure of this structure to atrophy and become a solid non-functioning mass during the second month of embryonic life.

F. Classification of Sites and Types of lesions:

Lesions of the thyroglossal tract may appear at any level from the foramen cecum to the suprasternal notch, and corresponding sinuses may make there exit anywhere from the chin at the floor of the mouth to the suprasternal notch. It is rarely, however, that they appear above the hyoid. The majority of sinuses open below the hyoid and considerably higher than the suprasternal notch. The cysts are usually in the midline and may vary in size from a pea to a lemon. Some authors believe that 99% of all lesions of the tract are located in the midline of the neck.

Bailey classifies these sites. (75 cases).

1. Beneath the foramen cecum. (3)
2. In the floor of the mouth protruding beneath the chin. (6)
3. Suprahyoid. (12)
4. Subhyoid. (37)
5. On the thyroid cartilage, or membrane. (23)
6. At the level of the cricoid. (7)
7. In the suprasternal notch. (4)

Andrews classifies them according to types of opening:

1. Cysts with no internal or external opening.
2. Cysts and fistulas opening internally.

3. Cysts and fistulas opening externally.

4. Fistulas with internal and external openings.

Other classification:

1. As to position.

2. Origin.

3. Contents.

4. Type of lining epithelium.

G. Pathological Anatomy:

Butlin believes it is a misnomer to call these lesions thyroglossal duct in origin, but believes they should be called lesions of the thyroglossal tract because it forms no functioning structure. Failure in atrophy of portions of the thyroglossal duct results in accessary thyroids, cysts or even fistulas occuring in the adult.

The contents of the cysts are generally of a mucoid character, but in long-standing cases they may contain necrotic material and cholesterin crystals. When infection is present the contents are purulent and if the cyst is of long-standing it's wall is thickened by repeated inflammatory changes.

The caudal portion of the duct may persist as the pyramidal thyroid lobe. Between the foramen cecum and the hyoid bone, a portion of duct may remain and develop into a sublingual cyst. That portion of the duct behind and below the hyoid bone sometimes develops into a subhyoid cyst with later rupture forming a thyroglossal sinus. The duct may remain open from the mouth to the skin forming a thyroglossal fistula.

The relationship of the thyroglossal tract to the hyoid bone is of considerable surgical importance, and there is much divergence of opinion on this subject. Frazer holds that the tract passes in front of the hyoid bone. F.G. Parson believes the thyroglossal tract occupies a tiny canal within the hyoid bone. William Wright believes the thyroglossal tract should pass behind the hyoid or through it. The most generally accepted theory is that of Sir Arthur Keith who stated that the hyoid bone develops in the course of and interrupts the continuity of the thyroglossal tract. The thyroglossal tract is firmly adherent to the hyoid bone and it is this adherence or involvement of the hyoid bone that makes it necessary to remove the central portion of the hyoid bone to prevent recurrence of the condition. Ewing and Fraser believe that the thyroglossal tract passes down in front of the hyoid bone but is adherent to it.

The cysts vary in size from 2mm. to 7cm. in diameter. They are filled with either a watery serous or thick purulent material depending on the amount of infection. Occasionally a blood tinged fluid is present. They are smooth, translucent, thin-walled cysts and are seldom multilocular. The cyst wall in one case was 5mm. thick, but as a rule the wall is very thin and easily broken.

The cysts are originally lined with ciliated columnar epithelium, but as the pressure within the cyst is built up, the epithelium undergoes metaplasia to low cuboidal or squamous epithelium. Almost invariably there is chronic inflammation around

the cyst. Occasionally typical thyroid tissue is found in the walls of the cyst. One case has been reported as showing malignant degeneration of the duct remnant, with a pathologic report of epidermoid carcinoma grade three.

It is possible for lesions of the thyroglossal tract to occur not only in the tongue but to the right or left of the midline. Bailey states that the thyroid cartilage is like the prow of a ship on which cysts can not remain. In approximately one percent of all the lesions recorded the cyst will be found either to the right or to the left of the midline.

Epithelial tissue is found anywhere along the track, either alone or in association with thyroglossal cysts or sinuses. When surgery is recommended it is necessary to remove all remants of this vestigial tissue.

The presence of cysts depends upon:

1. Rate of secretion of the epithelial lining.
2. Spontaneous drainage through the foramen cecum.
3. Occurrence of infection in the sac.

Most authors believe that thyroglossal fistulas and sinuses are never congenital. Bailey in a review of thirty-two cases found only two fistulas present at birth. Sinuses develop from spontaneous rupture or incision of an abscess resulting from inflammation arising in the cyst. They may remain open for a time and then gradually reaccumulate fluid; this repetition of filling and emptying is characteristic of these lesion.

Thyroglossal tract fistulas should not be confused with any other sinus tract or fistula. The opening of a branchial fistula or sinus tract is on the side of the neck and not just to the right or left of the midline. Either fistulas tract may communicate with the oral cavity. A thyroglossal tract fistula communicates with the oral cavity at the foramen cecum. A branchial cleft fistula communicates with the oral cavity at Rosenmueller's pouch in the lateral pharyngeal wall.

At puberty, especially in females, the thyroid gland becomes temporarily more active and vascular, at this time there may be the appearance of a mass along the thyroglossal tract. It is important to remember that removal of tumors of the tract at this time may cause myxedema if the tumor represents the only functioning thyroid tissue.

Anatomy is important in the final location of the lesions. If the tract comes anterior to the hyoid, the cyst is found just under the skin and the platysma muscle; if the tract passes through the hyoid, the lesion lies between the enveloping and pre-tracheal fascia; and if the tract passes posterior to the hyoid, the lesions are deep to the pretracheal fascia. The lesions occasionally descend as low as the sternal notch but are always found lying in the median line or very close to it.

The most frequent remnant, from the persistent thyroglossal tract, is the pyramidal lobe which is said to be present in 40% of the cases. It extends upward from the isthmus of the thyroid, or

from one of the lateral lobes, usually the left, towards the hyoid bone. Rarely it is double, or it may bifurcate towards its lower attachment.

The lesions which result from the thyroglossal tract are:

1. Thyroglossal cysts.
2. Thyroglossal sinuses.
3. Thyroglossal fistulas.
4. Solid tumors (benign).

H. Signs and Symptoms:

The clinical picture of a thyroglossal cyst is that of a painless, soft, fluctuatory, semifixed mass occurring in the midline of the neck and which moves upward on swallowing. The lesions are intimately attached to the hyoid bone and the foramen cecum, they always move upward on deglutition or extension of the tongue. Many times the tract which runs from the cyst to the hyoid may be palpated.

The symptoms associated with cystic lesions of the tract depend upon the location of the swelling, the structures subjected to pressure, and infection. Difficulties in phonation, deglutition and respiration may be present singly or in combination. In many cases the only complaint is that of a small mass in the midline of the neck which is disfiguring.

Persistent portions of the thyroglossal tract may remain quiescent for years and announce their presence either by some acute inflammatory process with symptoms similar to those caused

by an acute infection or by a small swelling that increases steadily in size, the rate of increase varying, however, within wide limits. Often the patient when first seen by the physician presents a sinus, but this has in most cases been preceded by a cystic swelling, which has either ruptured spontaneously, or has become infected and opened under a mistaken diagnosis. Many times the sinus will heal for a short time and the drainage will collect in a pocket which finally ruptures, permitting a return of the sinus. It is because of drainage and inconvenience, more that the discomfort, that the patient consults a physician.

Other than the disturbances that are dependent upon the size and location of the lesions, the most constant symptom is hemorrhage into the mouth, due to a rupture of the veins that almost invariable cover these lesions.

I. Complication:

Incomplete removal of the thyroglossal tract is usually followed by recurrence of a cyst, sinus, or fistula. Recurrences are usually attributed to-not making correct diagnosis, and by not doing an adequate operation.

Complications may arise because of extensive scarring and infection as a result of previous surgery. Hazards in technique which must be realized are those of damage to the great vessels, and to the spinal accessory and glossopharyngeal nerves. Damage to these structures may lead to Horner's syndrome, hemorrhage, difficulties in phonation, difficulties in deglutition, and in dyspnea.

Myxedema must always be considered as a possibility; this depends upon whether the lingual goiter represents the development of accessory thyroid tissue in the course of the thyroglossal tract, or whether it represents the entire undescended thyroid remnant. With this possibility of myxedema in mind, it is wise to do careful pre-operative metabolic studies.

J. Review of twenty-one cases from University and Childrens Hospital.

1. J. P., white female, age 6 3/4 years. In the hospital seven days. Diagnosis: Thyroglossal duct sinus tract. Operation: Excision of thyroglossal sinus tract. Sistrunk. Chief Complaint: Pain on turning the neck and on swallowing. Present Illness: The patient was two years old when swelling was noted on the anterior aspect of the neck. The L. M. D. lanced this mass and it drained for 1-2 days. It filled up and was opened one month later and again drained, it drained spontaneously again one month later. It was asymptomatic except for some draining associated with colds until about six weeks ago when the patient complained of sudden severe pain in the neck when she would turn her head suddenly or while eating.

Physical Examination: A midline small scar with a crusted area just above the thyroid cartilage was noted which moves with the thyroid cartilage on swallowing.

Pathologic Report: Thyroglossal tract sinus.

Follow-up: No further trouble. Excellent result.

2. P. G., white male, age one month. In hospital 18 days. Diagnosis: Thyroglossal cyst, midline of neck, with communication involving the anterior 1/3 of the tongue. Operation: Excision of the cyst of the neck with packing extending into the tongue. Sistrunk procedure.

Chief Complaint: A swelling under the mandible and a swelling of the anterior portion of the tongue since birth.

Present Illness: The masses have become progressively larger in size and at the present time the size of the tongue interferes considerably with feeding. The masses have doubled in size in the last 3-4 days.

Physical Examination: There is a large cystic mass approximately 5 x 5 cms. in diameter occupying the entire submental region and lying in the midline. The anterior 1/3 of the tongue is occupied by a cystic mass approximately 2 cms. in diameter and is red.

X-ray Examination: The neck and oropharynx have a large cystic mass involving the base of the tongue. Interpreted as probably a thyroglossal cyst.

Pathologic Report: Thyroglossal tract cyst.

Follow-up: Excellent results. No further swelling of the tongue.

3. E. P., white male, age 2 years. In the hospital 4 days. Diagnosis: Thyroglossal duct cyst and sinus. Operation: Excision of thyroglossal duct cyst and sinus tract. Sistrunk.

Chief Complaint: A small subcutaneous nodule in the upper anterior midline of the neck.

Present Illness: The mass has changed in size at times almost disappearing, and at other times will enlarge and drain spontaneously through a small sinus tract in the overlying skin.
Physical Examination: There is a 1 cm., non-tender, subcutaneous nodule directly over the upper midportion of the thyroid cartilage. The skin over the nodule was slightly excoriated, but there was no draining sinus.
Pathologic Report: Thyroglossal tract cyst.
Follow-up: None.

4. D.B., white male, age 7 years. In the hospital 5 days.
Diagnosis: Thyroglossal duct sinus. Operation: Excision. Sistrunk procedure.
Chief Complaint: Draining sinus, since 5 years of age.
Present Illness: This seven year old white male contracted whooping cough at 14 months of age which lasted about three weeks, after which time a red lump appeared low in his neck. This lump would periodically enlarge, and then shrink down. Two years ago this lump swelled up again, and started to drain a pus-like material. It has done this intermittently since it's onset.
Physical Examination: Located in the midline of the anterior neck region, just above the suprasternal notch there is a reddened area of skin, in the center of which is a yellow necrotic appearing drainage.
Pathologic Report: Thyroglossal tract sinus.
Follow-up: No further trouble.

5. T.K., white male, age 7 years. In the hospital 2 days.
Diagnosis: Thyroglossal cyst. Operation: Excision. Sistrunk.
Chief Complaint: Lump in the throat of 1 year duration.
Present Illness: The lump in the throat has been increasing in size steadily, but slowly, and the patient states that it is located at the level of the Adam's apple.
Physical Examination: There is a small lesion approximately 3 cms. in it's greatest diameter located in the midline above the thyroid gland and cartilage which feels cystic and moves with deglutition.
Pathologic Report: Thyroglossal tract cyst and sinus.
Follow-up: None.

6. L.D., white male, age 4 years. In the hospital 4 days.
Diagnosis: Thyroglossal duct cyst. Operation: Excision. Sistrunk.
Chief Complaint: Cyst of the neck. Eight months duration.
Present Illness: About eight months ago, a small lump appeared in the midline of the neck just above the thyroid cartilage. This has gradually increased in size until now "it feels like a marble." There is no history of pain or discomfort, change of color, or change in consistency.
Physical Examination: There is a small mass of cystic consistency in the midline above the thyroid cartilage.
Pathologic Report: Squamous epithelium, inclusion cyst.
Follow-up: Excellent results.

7. G.S., white male, age 6 years. In the hospital 9 days.
Diagnosis: Thyroglossal cyst. Operation: Removal. Sistrunk.

Chief Complaint: Swelling of the neck of 10 days duration.

Present Illness: The swelling is located in the midline anteriorly. This mass has been non-tender and non-discolored, but seems to be slowly enlarging.

Physical Examination: There is a mass in the midline which is firm and discrete about 4 cm. in diameter. It is not attached to the skin and moves with deglutition.

Pathologic Report: Thyroglossal cyst and sinus tract, showing secondary chronic inflammation.

Follow-up: None.

8. K.P., female white, age 9 years. In the hospital 10 days. Diagnosis: Thyroglossal cyst. Operation: Excision. Sistrunk.

Chief Complaint: Draining sinus on neck, $1\frac{1}{2}$ years duration.

Present Illness: The cyst was removed two years ago by the L.M.D. Following the operation drainage from a small sinus developed within a few days and has continued to drain since then. The discharge consists of a yellowish thick fluid.

Physical Examination: There is a small draining sinus in the midline just superior to the thyroid cartilage.

Pathologic Report: Thyroglossal tract showing chronic inflammation and granulation scar tissue formation.

Follow-up: Asymptomatic since the surgery.

9. L.B., white male, age 1 year. In the hospital 5 days. Diagnosis: Thyroglossal duct (patent). Operation: Excision. Sistrunk.

Chief Complaint: Cyst in the neck since birth.

Present Illness: The patient had no trouble until two months ago when the child began to have pain while talking. The cyst develops into a "blister" breaks, drains a greenish thick material followed by a small amount of bleeding, heals over, and in 2-3 days ruptures again.

Physical Examination: An open area about $\frac{1}{2}$ cm. in diameter which is slightly indurated and crusted over, but at this time has no drainage. In the mid portion of the neck anteriorly approximately 2 cm. above the suprasternal notch there is a small indurated area approximately 1 cm. in diameter which is erythematous and a thin watery exudate could be seen coming from the central portion of this wound. On swallowing there is a definite elevation of this excoriated area. On palpation of the neck a definite cord could be felt leading from this excoriated area up to the base of the tongue.

Pathologic Report: Thyroglossal tract sinus.

Follow-up: None.

10. R.W., white male, age 12 years. In the hospital 5 days. Diagnosis: Thyroglossal sinus. Operation: Excision. Sistrunk. Chief Complaint: Draining sinus in the neck since age four. Present Illness: When this boy was 4 years old he developed a swelling in the midline of the neck. This swelling came to a head and ruptured spontaneously, since then it has continued to drain a whitish-yellowish pus.

Physical Examination: There is a small draining sinus over the level of the thyroid cartilage to the left of the midline. The skin is scarred and slightly fixed to the underlying tissues.

Pathologic Report: Thyroglossal tract sinus.

Follow-up: None.

11. J. H., white male, age 17 months. In the hospital 5 days. Diagnosis: Recurrent thyroglossal tract sinus. Operation: Excision of tract. Sistrunk.

Chief Complaint: Small cyst in the midline of the neck. Fourteen months duration.

Present Illness: The mass proceded to enlarge until about 7 months of age. At this time, the cyst came to a head and broke spontaneously, draining a clear, sticky, slimy-like material. Drainage has been present about every other day since the onset.

Physical Examination: There is a small dark red area about 1 x 1 cm. in the midline at the level of the thyroid cartilage which has a pinpoint size hole exuding thin purulent material.

Pathologic Report: Thyroglossal tract sinus.

Follow-up: Recurrence.

Chief Complaint: Draining from old wound in the neck of $10\frac{1}{2}$ months duration.

Present Illness: Ten and a half months after surgery it was noted that there was drainage of a chessy white material from the old surgical wound.

Physical Examination: Draining sinus over old scar in the neck.

Operation: Sistrunk.

Pathological Report: Thyroglossal tract sinus.

Follow-up: No recurrence after second procedure.

12. M. D., white female, age 9 years. In the hospital 4 days. Diagnosis: Thyroglossal cyst. Operation: Removal. Incision at right lateral cervical area overlying cyst. Cyst identified and dissected free. Duct found leading medialward into the central portion of the body of the hyoid bone. Cyst, duct, and central portion of hyoid bone removed.

Chief Complaint: Cyst of the neck.

Physical Examination: Branchial cyst on right side.

Pathologic Report: Impossible to make an etiological diagnosis.

Follow-up: Has been asymptomatic since surgery.

13. J. W., white male, age 5 years. In the hospital 5 days. Diagnosis: Thyroglossal cyst. Operation: Removal. Sistrunk.

Chief Complaint: Cyst of the neck. 4 years duration.

Present Illness: A cyst was noted in the midline just above the thyroid cartilage four years ago. He was operated at the age of $2\frac{1}{2}$ years; this was not successful. Six weeks after the operation the area began to drain, and drained intermittently since then.

Pathologic Report: Thyroglossal tract sinus.

Follow-up: None.

14. L. A., white male, age 3 years. In the hospital 4 days. Diagnosis: Thyroglossal cyst. Operation: Removal.

Chief Complaint: Cyst of the neck of 3 months duration.

Present Illness: Three months ago a mass was palpated under the chin. This seemed to become more marked following measles. The patient has had no symptoms or complaints referrable to the mass.

Physical Examination: There is a non-tender 2 x 3 cm. mass in the midline of the submental triangle.

Operation: Removal of the cyst to the hyoid bone.

Pathologic Report: Thyroglossal cyst.

Follow-up: No recurrence of the cyst.

15. R.B., white male, age 4 years. In the hospital 7 days. Diagnosis: Thyroglossal cyst. Operation: Excision. Sistrunk.

Chief Complaint: Mass in the neck of one years duration.

Present Illness: About one year ago the parents noted a small swelling under the chin. This mass has not increased in size and has not been asymptomatic.

Physical Examination: There is a soft slightly fluctuant mass approximately 1.5 cm. in it's greatest diameter in the midline of the neck just above the thyroid cartilage.

Pathologic Report: Thyroglossal cyst.

Follow-up: Excellent results.

16. L.H., white male, age 2 years. In the hospital 26 days. Diagnosis: Thyroglossal tract, persistent. Operation. Excision. Sistrunk.

Chief Complaint: Lump in the throat 6 hours duration.

Present Illness: The patient after swallowing a marble gagged, but did not vomit. He had no mass six hours previously.

Physical Examination: A mass about the size of a small marble is felt in the anterior midline about at the level of the cricoid cartilage; it is hard and moveable mass under the skin.
X-ray Examination: There is an oval soft tissue mass between the anterior border of the hyoid just beneath the skin surface in the midline.
Pathologic Report: Thyroglossal cyst.
Follow-up: None.

17. D. R., white male, age 15 years. In the hospital 8 days. Diagnosis: Thyroglossal cyst. Operation: Excision. Sistrunk. Chief Complaint: Swelling and drainage from the neck for 10 years. Present Illness: The patient was 5 years old when there was noted an enlargement and a drainage in the neck. Since then it has become enlarged periodically and at times clears up completely. Physical Examination: There is a 1-2 cm. Granulomatous mass in the midline just above the larynx.
Pathological Report: Thyroglossal cyst.
Follow-up: None.

18. B. P., white male, age 3 years. In the hospital 15 days. Diagnosis: Thyroglossal cyst. Operation: Removal. Sistrunk. Chief Complaint: Growth in the neck of 5 months duration. Present Illness: Five months ago a small growth was first noticed in the midline over the Adam's apple. It has increased in size very little if at all. It is about the size of a marble and feels firm to hard in consistency.

Physical Examination: There is a small moveable firm subcutaneous mass (2 cm. x 2 cm.) in the midline of the submandibular space.

Pathologic Report: Thyroglossal cyst.

Follow-up: None.

19. R.H., white female, age 29 years. In the hospital 13 days. Diagnosis: Thyroglossal cyst. Operation: Excision. Sistrunk.

Chief Complaint: Swelling in the midline of the lower neck. The lesion drains. Duration of 12 years worse in the last five years.

Present Illness: During the past year the mass has swollen 3-4 times and then discharges it's material. It has been incised three times.

Physical Examination: There is a red purplish area 0.5 x 0.5 cm. in the midline of the neck just above the sternal notch. There is no discharge at this time.

Pathologic Report: Thyroglossal cyst and sinus.

Follow-up: No difficulty at the six months post-operative examination.

20. L.S., white male, age 23 years. Diagnosis: Thyroglossal cyst, infected. Operation: Incision and drainage of the cyst.

Chief Complaint: A gradual enlarging swelling in the floor of the mouth of three months duration.

Present Illness: The patient complains of a mass which has increased in size gradually and has interfered with speech and swallowing. The swelling has been firm and non-tender. The mass was incised by the L.M.D. and a half a glass of yellow watery material obtained.

Physical Examination: There is a large submandibular midline mass that is firm, non-tender, smooth in outline, and appears cystic on palpation. The buccal floor is elevated ½-1 cm. in the sublingual area bilaterally.

X-ray Examination: There is marked swelling of the soft tissues in the submandibular region. The swelling appears to compress the pharyngeal airway with what appears to be nearly complete obstruction.

Operation: A vertical midline incision was made just beneath the mandible. The cyst was reached approximately 2 cm. from the skin surface. It contained approximately 20 cc. of thick yellow barium like material. This was scraped with a sponge. The cyst was packed with iodoform gause and one penrose drain.

Pathologic Report: Thyroglossal cyst, infected.

Follow-up: None.

21. W. R., white male, age 7 years. In the hospital 7 days. Diagnosis: Thyroglossal cyst. Operation: Excision of thyroglossal tract sinus and cyst, infected.

Chief Complaint: Mass in the anterior neck.

Present Illness: In February 1954 there was a sudden development of mass which his mother stated developed approximately in 1½ hours. This gradually subsided in size. In April, following the mumps the patient developed fever and on April 20th the mass again returned, this time somewhat larger than before, and was inflamed. A small white area was incised and drained.

Physical Examination: A $1\frac{1}{2}$ cm. red papule at the upper pole of the thyroid cartilage in the midline fixed to the underlying structures which moves with deglutition is noted. No mass is palpated.

Operation: Sistrunk procedure.

Pathologic Report: Thyroglossal cyst and tract.

Follow-up: No malignant change, recurrecnce or impairment of deglutition.

K. Summary of charts Reviewed:

1. Age of patients: 18 patients were below 10 years of age.
2. Sex: Males 16. Females 5.
3. Age of Onset: Twenty of the patients were under 10 years of age. Two lesions were present at birth.
4. Previous Operations:
   a. Attempts at excision. (5).
   b. Incision with drainage. (2).
5. Infection of the tract. (7).
6. History of recent or present upper respiratory infection. (3).
7. Mass in the neck. (8).
8. Difficulty in swallowing. (5).
9. Redness of the skin. (3).
10. Hoarseness. None.
11. Fever. (1).

12. Difficulty in talking: (2).

13. Cyst as the presenting complaint: (18).

14. Sinus as the presenting complaint: (9).

15. Fistula as the presenting complaint: None.

16. Surgical Excision: (19).

17. Hyoid bone removed: (18).

18. Average days in the hospital: (7.9 days).

19. Movement of tract on swallowing: (6).

20. Drainage from sinus as presenting complaint: (8).

21. Follow-up: (11).

22. Recurrences: (2).

23. Difficulty in swallowing following surgery: None.

24. Carcinomatous change: None.

25. Pathologic diagnosis: Nineteen were reported as lesions of the thyroglossal tract.

L. Diagnosis:

Errors in the diagnosis of these lesions will be less frequent or possibly eliminated if every mass situated in the midline of the neck, no matter how small or how large be considered a thyroglossal tract lesion until proven otherwise. These lesions can occur at any age and can be found at any position from the base of the tongue to the suprasternal notch.

The cysts are usually found in the midline but may occur either to the right of the midline or to the left at any level of the neck. They are intimately attached to the hyoid bone and move

upward on deglutition.

To supplement a careful history and physical for diagnosis, the use of the laboratory facilities is important. Theses aids are needle biopsy, aspiration of cysts, and x-ray examination.

Problems of diagnosis and treatment apply especially to thyroglossal cysts in that so many patients with these lesions are sent to the surgeon after incomplete removal, or often after merely incision with drainage or following irradiation treatment which has served to make the ultimate removal of the lesions a somewhat more difficult technical procedure.

M. Differential Diagnosis:

The recognition of cysts and sinuses of the thyroglossal tract should be easy for it always occurs in the midline between the symphysis mentis and the thyroid cartilage. The lesions must be differentiated from ectopic thyroid tissue, enlarged submental glands, inclusion dermoids which are also found in the median line. The differential must also include lingual dermoids, submental cysts, and the true cervical fistula which is of branchiogenic origin and is always situated lateral to the midline along the anterior border of the sterno-cleido-mastoid muscle.

1. Dermoids occur in the neck as in other parts of the midline of the body and are recognized by the character of their contents.

2. Sebaceous cysts are found in the skin and are never found deeply situated beneath the hyoid bone.

3. Median cervical sinuses occur singly and appear at any time after birth up to adult age and they never close permanently.

4. Submental cysts occur in the anterior part of the floor of the mouth and can be seen as a bluish cyst under the floor at the anterior part of the tongue and it does not move on swallowing.

5. Adenitis either single or tuberculous, occuring in the midline of the neck, is rare indeed, and is associated with other tender glands. Movement on swallowing does not take place.

6. A pyramidal lobe is attached to the thyroid near the isthmus. It practically never enlarges unless it is associated with a goiter and it is not fluctuant.

7. Branchiogenic cysts or sinuses are located lateral to the midline along the anterior border of the sternomastoid muscle.

N. Prognosis:

"Surgical extirpation of a cyst of the thyroglossal tract, or as is more often the case, a sinus of the thyroglossal duct, is either a complete success or an absolute failure. There is no compromise in the estimation of results; few, if any, other operations of election have such an arbitrary prognosis."[85]

Since the radical removal of a patent thyroglossal tract is so simple and safe an operation, and since the possibility of a

cure by other means is so extremely doubtful, it is both wise and rational to resort to a complete removal of these lesions as soon as they cause symptoms. The Sistrunk type of operation is advocated as the procedure of choice and offers a 100% chance of cure.

"No active treatment was advised in approximately 45% of a representative series of cases. If the cysts are small, not disfiguring, and show no palpable signs of growth, the patient should be made acquainted with the nature of the lesion, and no treatment should be instituted."[1]

It should be pointed out that no disability follows removal of the center of the hyoid bone. Within 48 hours the patient is able to protrude the tongue normally and to swallow without pain. X-ray examination following removal of the center of the bone one year previous has shown the hyoid bone intact.

"From 1920 until 1940, at the Mayo Clinic, there were 266 operations with 4 recurrences. Recurrences for the most part can be attributed to the presence of extensive scarring and various degrees of infection as a result of previous surgery. We feel that one of the recurrences in our series could possibly have been avoided and that recurrence in general can be avoided if the radical operation is postponed until the presence of acute infection has subsided. In cases in which there is considerable surrounding inflammation, it is usually best to make a simple incision and then several weeks after the inflammation has subsided completely perform the radicle operation. Certainly, a

thyroglossal cysts should not be incised unless inflammation is present for an unopened cyst makes the operation technically less difficult. When incision and drainage is performed, it should be undertaken only with the understanding that later radical excision will be necessary for cure."[66]

O. Prophylaxsis:

The lesions are considered to be congenital in origin and thus are impossible to prevent. It is necessary to diagnose and treat cysts properly, in order, to prevent the common complication of recurrence.

P. Treatment:

Thyroglossal lesions have been treated in many ways:

1. Sclerosing fluids.
2. Cautery.
3. Simple incision and drainage.
4. Enucleation of the cysts.
5. Irradiation.
6. Sistrunk's technique of excision.

Surgery is usually done in lesions of the thyroglossal tract because of reasons of cosmetic disfigurement, a persistent draining sinus, or because of it's being a site of chronic inflammation. Incision with drainage should be done only in the presence of an acute infection, and with the understanding that later radical excision will be necessary for cure.

Effective therapy demands that every vestige of the thyroglossal

tract be removed. This can best be accomplished by excising the cyst, resecting the central segment of the hyoid bone, and coring out the suprahyoid segment of the thyroglossal tract up to but not including the foramen cecum.

Cautery, sclerosing fluids, electric currents, irradiation, and simple incision are mentioned in treatment only to be condemned. The removal of the portion of the hyoid and the injection of methylene blue to demarcate the ducts are questions that are controversial. It is believed by most authors that injection of dye soils the tissues and instead of facilitating dissection hinders it. It is thought by most surgeons that removal of a portion of the hyoid is essential but if the cyst does not have a tract going into or through the bone or a tract above the hyoid it is not necessary.

Sistrunk discribed the original operation in 1920.

> "A transverse incision, about two inches in length, is made across the neck at about the level of the hyoid bone and the skin and platysma muscles are reflected. The cyst will be found lying beneath the raphe connecting the sternohyoid muscles. It is dissected free from the surrounding tissues up to the hyoid bone. At this point the tract usually passes through the hyoid bone, although it is sometimes found passing above or below it. We then separate the muscles attached to the center of the hyoid and remove a portion of the bone about $\frac{1}{4}$ of an inch in length; then,

without any attempt to isolate the duct, we core through the tissues from this point directly to the foramen caecum, removing with the duct the tissues surrounding it for a distance of about 1/8 of an inch on every side. In order to do this, it is necessary to know very accurately the direction that must be followed in order to reach the foramen cecum. This line corresponds to one drawn at an angle of 45 degrees backward and upward through the intersection of lines drawn horizontal and perpendicular to the superior central portion of the hyoid. The dissection removes with the duct a portion of the hyoid bone, a portion of the raphe joining the mylohyoid muscle, a portion of each geniohyoglossus muscle, and the foramen cecum. The opening into the mouth is closed and several sutures are used to draw the geniohyoglossus muscles together. The tissues surrounding the cut ends of the hyoid bone are then brought together with chromic catgut sutures in such a manner as to approximate the edges of the bone. A small rubber tissue drain is introduced down to this point and the skin closed around it."[29]

Sistrunk's technique has been the basis for treatment of these lesions with several recent modifications:

1. General Intratracheal Anesthesia.
2. The assistants finger over the foramen cecum.
3. The use of antibiotic post-operatively.

"There are two indications for incision and drainage instead of excision.

1. In the acute infections with fluctuation, drainage should be done and the patient brought back several weeks later after the acute flare-up subsides, for excision.
2. If the patient is too old, under six years of age, is sick or refuses to have excision; incision and drainage may be done to relieve the swelling."[35]

It should be remembered that all skin incisions should follow natural creases in the neck to give good cosmetic results. Sagittal scars of the neck are apt to spread and become unsightly, whereas with a transverse type of incision a much neater line of union results.

"If a thyroglossal cyst is small, if disfigurement is minimal and if inflammation has not occurred, surgical therapy may be omitted or deferred. If the cyst is large it should be removed in or- to improve the cosmetic appearance and to lessen the danger of the superimposed infection that is apt to follow. All thyroglossal duct sinuses should be surgically removed because they are a source of recurring inflammatory disease."[65]

"The removal of the duct lying above the hyoid bone may be more easily accomplished if the tongue is pulled upward after a segment of the hyoid bone has been removed and a finger is introduced into the mouth in such a manner as to push the foramen cecum upward and forward toward the hyoid bone. The foramen cecum may

be located through following the two rows of circumvallate papillae which lie on each side of the tongue; these join in the median line just anterior to the foramen cecum. By pushing the foramen cecum forward the distance between it and the hyoid bone is considerably shortened and the finger acts as an excellent guide to prevent entrance to the pharynx during the dissection.

Q. Summary:

A thyroglossal cyst is a retention cyst which arises in a patent portion of the vestigial thyroglossal tract and occurs anywhere in the midline along it's pathway from the base of the tongue to the region between the hyoid bone and the thyroid gland. Clinically, the site of the cyst is far more common below the level of the hyoid bone and is usually located in the midline of the neck. Frequently the cyst ruptures through the skin spontaneously or is incised, either sinuses or fistulas can be formed from such rupture. A fistula drains into the mouth while a sinus drains through the skin.

Knowledge of the origin and development of the thyroid gland simplifies the understanding of the surgical treatment of these lesion. The principal, if not the only, primordium of the thyroid gland arises as an evagination or outpocketing in the ventral wall of the primitive pharynx between the first and second pharyngeal pouches. This position is marked in adult life by the foramen cecum at the base of the tongue behind the apex of the "V" shaped row of the circumvallate papillae. The primitive thyroid structure

descends in the midline through tissue which later becomes the hyoid bone. The hyoid bone develops either simultaneously with, or later than, the descent of the thyroid gland, the thyroglossal tract may vary in it's relationship to the hyoid bone. The tract lined by epithelium produced by this descent normally disappears between the 5th and 8th week of fetal life, but occasionally fails to become obliterated. This failure of obliteration of either a portion of, or of the entire, thyroglossal tract subsquently may lead to the formation of a thyroglossal tract cyst, sinus, or rarely a fistula.

Clinically the cyst is a painless, soft, fluctuatory, semi-fixed mass occurring in the midline of the neck and moves upward on swallowing. If a sinus opening is present there is either a continuous or intermittent drainage of a clear or milky solution. Because the lesions are intimately attached to the hyoid bone and the foramen cecum, these tumors always move upward on deglutition or extension of the tongue. Sometimes the tract, which runs from the cyst to the hyoid may be palpated.

In the majority of cases it is recommended to treat lesions of the thyroglossal tract by radicle surgical procedures. Tiny lesions, less than 5-6 mm., have been known to lie dormant for many years and give no trouble; it hardly seems worth while to subject these patients to surgical procedures.

Sistrunk's operation is still the basis for treating these lesions. The modern use of general intratracheal anesthesia,

better exposure of the field by the use of the assistants finger over the foramen cecum, and the use of post-operative antibiotics has decreased the morbidity of this procedure. The removal of a portion of the hyoid bone does not lead to troubles in deglutition, dyspnea, or disfigurement.

In the cases reviewed in this paper it is interesting to note that only two cysts were present at birth, no malignancies were reported, only one recurrence was noted after surgical removal, and there were no reports of impairment of deglutition following surgery.

R. Conclusion:

Proper treatment consists of evaluating the patient individually. If the lesions are small, not disfiguring, and the patient is symptom free it is adviseable not to submit the patient to surgery; however, if the symptoms are constant, radical surgery should be done. Incision and drainage, if not followed later by radical excision, is to be condemned because it will lead later to sinus and fistula formation.

Sistrunk's concepts of cure of lesions of the thyroglossal tract were as valid in 1920 as they are in 1956. He believed that complete cure of lesions of the thyroglossal tract can only be approached by radical surgical excision.

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