


Children's Hospital LOS ANGELES | USC University of Southern California

Mastering Thyroglossal Duct Surgery

Jeffrey A Koempel MD, MBA

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2.5 year old boy - neck mass appears 10 days after developing a 'pneumonia'



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Excision Neck Mass (June 2016)




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Lesson #1

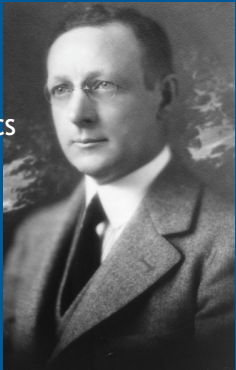
do **NOT** perform a simple cystectomy



3

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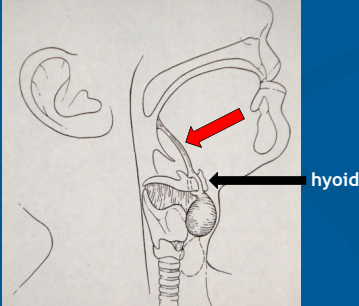
Walter Ellis Sistrunk MD, FACS (1880 - 1933)



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What was Sistrunk's contribution to thyroglossal duct surgery?



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392 Dr. H. Schlange, Ueber die Fistula colli coegenta.

Fällen das Zungenbein in der Mitte gespalten, oder noch besser eine ca. 1 Ctm. breites Stück aus der Mitte reseziert. Erst wenn man jetzt die beiden Theile des getrennten Knochen mit kleinen scharfen Haken kräftig auseinanderzieht, gewinnt man nach ausreichender Spaltung der Weichtheile den klaren Einblick in die Tiefe, der zur gründlichen Exstirpation der Fistel notwendig ist. Dies Verfahren hat sich aus als so nützlich erwiesen, dass ich es empfehlen möchte, zumal schädliche Nebenwirkungen von der Operation bisher nicht beobachtet wurden.

Hans Schlange (Berlin, 1893)

Über die Fistula colli cogenta
Arch Klin Chir
46:390 - 392

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The Laryngoscope
©2019 The American Laryngological, Rhinological and Otolaryngical Society, Inc.

Sistrunk Centennial: Evolution of a Classic Operation

Glenn Isaacson, MD, FAAP

Objectives/Hypothesis: To trace the evolution of the Sistrunk procedure.

Study Design: Historical review.

Methods: We reviewed historical materials in the English, French, and German literature including journal articles, book chapters, genealogical sources, and obituaries to identify the emerging concepts leading to the Sistrunk operation. These included references to the embryology of the thyroid and of the branchial apparatus as well as incremental advances in the surgical management of midline congenital cervical cysts and fistulas. PubMed, the Google Internet search engine, Archiving.org, and Google Translate were primary investigational tools.

Results: Understanding of human embryology evolved rapidly in the mid and late 1800s. Discovery of the thyroglossal duct and its role in thyroid development led to improvements in existing surgery for thyroglossal duct remnants. Sistrunk was aware of the anatomy and histopathology of these remnants and used this knowledge to refine existing surgical approaches.

Conclusions: The elements of thyroglossal duct remnant surgery existed for decades before Sistrunk popularized his modified approach to dissection of the suprathyroid portion of the tract. His innovation and his clear description of the operation made it accessible to surgeons around the world.

Key Words: Branchial anomalies, congenital malformation, embryology, medical history, Sistrunk procedure, thyroglossal duct cyst.

Level of Evidence: NA

Laryngoscope, 9999:1-3, 2019

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Annals of Surgery (1920)

THE SURGICAL TREATMENT OF CYSTS OF THE THYROGLOSSAL TRACT

By WALTER ELLIS SISTRUNK, M.D.
OF ROCHESTER, MINN.

Very early in fetal life the thyroid gland develops at the base of the tongue and, before the cartilage of the hyoid bone in the midline of the neck to its normal position, this tract through which the thyroid descends not in fetal life, although it occasionally fails to obliterate isolated areas of thyroid tissue (aberrant develop along its course. It seems quite likely that a tract lying above the hyoid bone often retains its and opens directly into the mouth through the base of the tongue. A persistence of this portion development of cysts along this tract which in children but are first noticed a number of years later; it is probable that any secretion which

Surgery, Gynecology & Obstetrics (1928)

FROM THE DIVISION OF SURGERY, MAYO CLINIC

TECHNIQUE OF REMOVAL OF CYSTS AND SINUSES OF THE THYROGLOSSAL DUCT

By WALTER E. SISTRUNK, M.D., J.A.C.S., ROCHESTER, MINNESOTA

NO organ anteroposteriorly for the removal of cysts or sinus tracts of the thyroglossal duct, a surgeon should thoroughly understand the mode of development of such cysts and possess accurate knowledge of the anatomy of the base of the tongue and surrounding structures. Early in fetal life, before the hyoid bone descends below the thyroid bone, the suprahyoid and infrahyoid muscles become separated and lie beneath the raphe, joining the suprahyoid muscle and the thyroid cartilage. They occasionally descend as low as the normal thyroid but are always found lying in the median line on the very close to it, their differing from branchial cysts or sinus tracts which are always found anteriorly. It should be particularly borne in mind that the suprahyoid muscle, a very long muscle, is not being made available. This cyst directed the hand bone with this bone

JACS Journal of the American College of Surgeons

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Classic Sistrunk Procedure

Annals of Surgery (1920)

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Modified Sistrunk Procedure

Surgery Gynecology & Obstetrics (1928)

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Excision Thyroglossal Duct (September 2016)



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How successful was this procedure?

SISTRUNK, TECHNIQUE OF THYROGLOSSAL DUCT SURGERY 229

FROM THE DIVISION OF SURGERY, MAYO CLINIC
TECHNIQUE OF REMOVAL OF CYSTS AND SINUSES OF THE THYROGLOSSAL DUCT

By WALTER E. SISTRUNK, M.D., F.A.C.S., ROSEN

Surgery Gynecology & Obstetrics (1928)

“following such an operation... practically 100 percent of patients are cured”

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What is the recurrence rate after a Sistrunk?

Risk of recurrence in children operated for thyroglossal duct cysts: A systematic review

16 series with 1,233 cases (1980 - 2012)

Francesca Galluzzi*, Lorenzo Pigonaro*, Renato Maria Galini*, Benjamin Hartley*, Werner Garavito**

*Department of Otorhinolaryngology, Department of Surgery and Interdisciplinary Medicine, University of Milano-Brescia, Brescia, Italy
**Department of Otorhinolaryngology, Fondazione Ospedale Maggiore Policlinico, IRCCS, Mangiagalli e Regina Elena, Milano, Italy
***Department of Pediatric Otorhinolaryngology, Great Ormond Street Hospital, London, UK

Received 20 August 2012; revised 1 October 2012; accepted 10 October 2012

recurrence rate [95% confidence interval]

Overall 10.7% [9.1 - 12.6]

Primary cases 10.8% [8.7 - 13.3] range: 0 - 19%

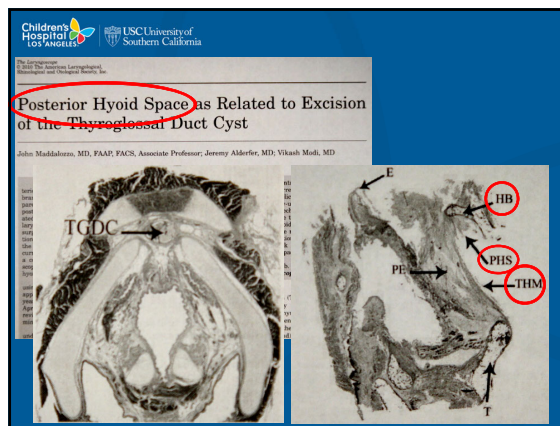
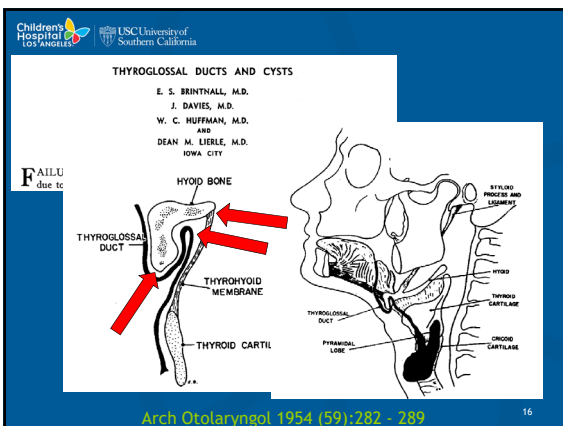
Revision cases 20.0% [12.2 - 30.8] range: 0 - 29%

J Ped Surg 2013 (48):222 - 227

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3 critical areas in thyroglossal duct surgery

1. cyst/sinus
2. hyoid bone/cartilage
3. suprahyoid



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Lesson #2

always **COMPLETELY** remove the center hyoid

Hyoid bone

Hyoid bone

Larynx

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How often is the hyoid intact after 1st procedure?

International Journal of Pediatric Otorhinolaryngology 113 (2019) 131–135

Prevalence of an intact hyoid bone at revision excision of a thyroglossal duct remnant

Jonathan Huang^a, Beth Osterbauer^{a,*}, Jeffrey Koempel^b

^aUniversity of Southern California, Division of Otolaryngology, 1161 Zouhal Ave, Los Angeles, CA 90089, United States

^bChildren's Hospital Los Angeles, Division of Otolaryngology - Head and Neck Surgery, 4650 Sunset Blvd, Malibu 90406, Los Angeles, CA 90024, United States

75% (33/44) pediatric patients

(1997 - 2015)

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How often is the hyoid intact after 1st procedure?

Mickel and Calcaterra (1983): 24 of 28 (86%)

Howard and Lund (1986): 14 of 17 (82%)

Ahmed and Hartley (2011): 16 of 23 (70%)

Arch Otolaryngol 1983 (109):34 - 6

Ann R Coll Surg Engl 1986 (68):137 - 8

Clinical Otolaryngology 2011 (36):252 - 279

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Why is the suprahyoid area so challenging?

- ✧ no obvious landmark(s)
- ✧ presence of multiple, microscopic ducts
- ✧ the tract often branches or 'arborizes'
- ✧ most often, the tract is not obvious

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Ann Otol Rhinol Laryngol (1968)77:139-145

THYROGLOSSAL CYSTS AND TRACTS

A HISTOLOGICAL AND HISTOCHEMICAL STUDY

JACOB SADE, M.D., F.A.C.S. AND GABRIEL BOFEN, M.D. APULIA, ISRAEL

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do routinely excise tissue superior to the hyoid

J Pediatr Surg 1999 Nov;34(11):1589-92

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How often do we find microscopic disease superior to the hyoid bone?

- 74% (25/34) TGDC specimens
- 100% (N=6) revision TGDC specimens

The Incidence of Microscopic Thyroglossal Duct Tissue Superior to the Hyoid Bone

Erick Garcia, BS, Beth Oberbauer, MPH, David Parham, MD, Jeffrey Koenig, MD, MBA

Objective: Despite the success of the Sistrunk procedure, persistence of a thyroglossal duct cyst (TGDC), sinus, or remnant following resection remains a clinical problem. This is most likely due to the presence of microscopic disease that was not removed at the time of surgery. The purpose of this study is to determine the incidence of microscopic disease superior to the hyoid bone in children who have had either a primary or revision procedure for a TGDC.

Methods: A prospective review of pathology specimens was conducted of all consecutive patients undergoing TGDC excision by pediatric endocrinologists at the Children's Hospital Los Angeles beginning March 2014 through July 2017 in both primary and revision procedures.

Results: Microscopic disease was present superior to the hyoid bone in 25 of the 34 (74%) specimens and in 100% (6) of the specimens that a revision procedure.

Conclusions: The majority of patients who have a TGDC will have microscopic disease superior to the hyoid bone. In order to minimize the incidence of persistence following a primary procedure, tissue superior to the hyoid bone should be removed routinely even if the goal disease is noted at the time of surgery. When performing a revision procedure, special attention should be given to the suprathyoid area as a likely site of persistent disease.

Key Words: primary, recurrent neck mass, thyroglossal duct cyst, Sistrunk procedure.

Level of Evidence: 2

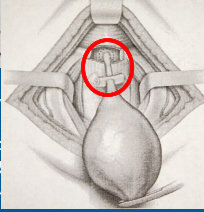
Earlgoosope, 1291-1215-1217, 2019

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Thyroglossal Results of Ra

PAUL M. BROWN, M.D.



'Those who have had the opportunity on the thyroglossal tract... will recall the occasional instance in which the tract above the hyoid does not persist as a well defined cord.'

For this reason, the surgeon is often tempted to stop the dissection once the hyoid bone has been reached. The temptation is especially strong if the exposure has been less than perfect.'

Am J Surg 1961 (102):494-501

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The Clinical Relevance of Certain Observations on the Histology of the Thyroglossal Tract

By Pierre Soucy and John Penning
Ottawa, Ontario, Canada

In 8 cases, a tract was said to be seen at surgery, but its presence was confirmed in only 4 instances

J Ped Surg 1984 (19)5:506 - 509

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Annals of Surgery (1920)

THE SURGICAL TREATMENT OF CYSTS OF THE THYROGLOSSAL TRACT

By WALTER KOLB BARNARD, M.D.
of Boston, Mass.

Very early in fetal life the thyroid gland develops at the base of the tongue and, before the cartilage of the hyoid bone has formed, descends in the midline of the neck to its normal position. The epithelium lining this tract through which the thyroid descends normally disappears early in fetal life, although it occasionally fails to obliterate and in such instances isolated areas of thyroid tissue (aberrant thyroids) or cysts may develop along its course. It seems quite likely that the portion of the tract lying above the hyoid bone often retains its epithelium and patency and opens directly into the mouth through the foramen caecum near the base of the tongue. A persistence of this portion of the duct explains the development of cysts along this tract which do not appear in young children but are first noticed a number of years after birth. In such instances it is probable that any secretion which developed from the

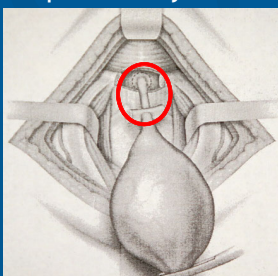
'We... remove a (1/4 inch) portion of the (hyoid) bone... then, without any attempt to isolate the duct, we core through the tissues from this point directly to the foramen caecum.'

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Lesson #4

do NOT attempt to identify a tract above hyoid

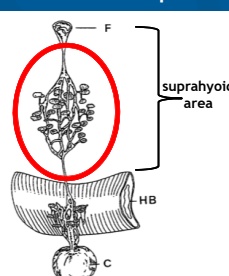


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Lesson #3

always remove tissue superior to the hyoid



suprathyoid area

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How much tissue should you remove in the suprahyoid area?

sinus hyoid cyst

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SISTRUNK: TECHNIQUE OF THYROGLOSSAL DUCT SURGERY 109
 FROM THE DIVISION OF SURGERY, MAYO CLINIC
 TECHNIQUE OF REMOVAL OF CYSTS AND SINUSES OF THE THYROGLOSSAL DUCT
 BY WALTER E. SISTRUNK, M.D., F.A.C.S., F.R.C.S., F.R.C.P., F.R.C.S.(Ed.)

'... without any attempt to isolate the duct (above the hyoid bone), the duct and the tissues surrounding it for a distance of about 3 mm on all sides are cored out through the muscles of the tongue... to the foramen caecum.'

Surg Gynecol Obstet 1928 (46):109-112

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SISTRUNK: TECHNIQUE OF THYROGLOSSAL DUCT SURGERY

'bear in mind the direction of the duct...
 ... an angle of 45 degrees backward and downward toward the foramen caecum'

Surg Gynecol Obstet 1928 (46):109-112

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Ideal approach to the suprahyoid area

- ✦ no attempt to isolate the duct
- ✦ no need to measure width of tissue to be resected
- ✦ no angles to be measured
- ✦ margins of resection would be clearly delineated

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hyoid sinus tract

identify the smooth, glistening layer

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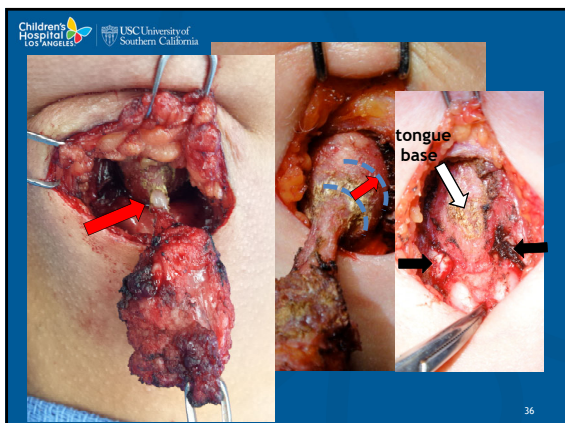
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Identification of the smooth, glistening layer

hyoid

- ✦ no attempt to isolate the duct
- ✦ no width or angle to measure
- ✦ anterior and lateral margins of resection in the suprahyoid region are clearly defined

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Clinical outcomes of modified Sistrunk procedure

	Group 1 N=159	Group 2 N=112	p-value	95% CI
Age in years, mean (SD, range)	6.3 (3.8, 1.3 - 17.3)	6.0 (3.6, 1 - 17.3)	0.6	5.7, 6.6
Primary surgery, n (%)	67 (42)	50 (45)	0.7	N/A
Revision surgery, n (%)	21 (13)	13 (12)	0.7	N/A
Length of follow up in months, mean (SD, range)	5.6 (14.5, <1 - 108)	7.8 (12.6, <1 - 76)	0.2	4.9, 8.2
Recurrence, n (%)	8 (5)	0 (0)	0.02	N/A

Group 1 (control): Sistrunk procedure **without** suprahyoid dissection
 Group 2: Sistrunk procedure **with** suprahyoid dissection

Koempel (2019), unpublished data

Lesson #5

International Journal of Pediatric Otorhinolaryngology

Thyroglossal duct remnant surgery: A reliable, reproducible approach to the suprahyoid region

Jeffrey A. Koempel

identify and use the smooth, glistening layer (fascia between the geniohyoid and genioglossus) to mark the anterior and lateral margins of resection in the suprahyoid area

International J Ped Otorhinolaryngology (2014) Nov; 78(11):1877-82





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Lessons learned

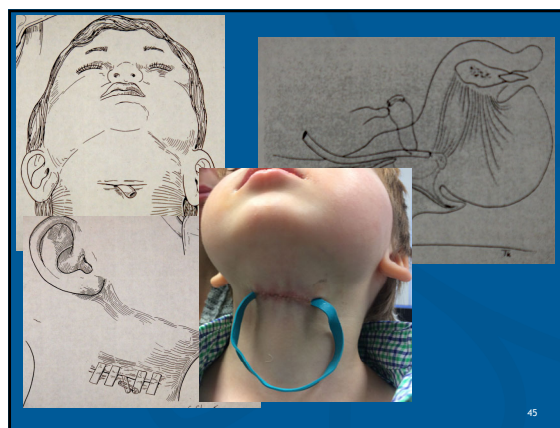
- ❖ do **NOT** perform a simple cystectomy
- ❖ always **COMPLETELY** remove the center hyoid
- ❖ do **NOT** attempt to identify a tract above hyoid
- ❖ **always** remove tissue superior to the hyoid
- ❖ identify and use the smooth, glistening layer (fascia between the geniohyoid and genioglossus) to mark the anterior and lateral margins of resection in the suprahyoid area

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Jeffrey A Koempel MD, MBA



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International Journal of Pediatric Otorhinolaryngology 27 (2016) 1094-5

Contents lists available at ScienceDirect

International Journal of Pediatric Otorhinolaryngology

journal homepage: www.elsevier.com/locate/ijp

To drain or not to drain following a Sistrunk procedure: A dual institutional experience

Jennifer A. Brooks^{a,*}, Michael J. Cunningham^b, Jeffrey A. Koempel^c, Kosuke Kawai^d, Jonathan K. Huang^e, Rachel E. Weitzman^f, Beth Osterbauer^g, Amy L. Hughes^h

^aDepartment of Otolaryngology & Communication Disorders, Boston Children's Hospital, Department of Otolaryngology, Harvard Medical School, 300 Longwood Ave, Boston, MA 02115, USA

^bDivision of Otolaryngology, Children's Hospital Los Angeles, Department of Otolaryngology - Head & Neck Surgery, University of Southern California, 4650 Sunset Avenue, Los Angeles, CA 90027, USA

295 surgical cases (2007 - 2016); 234 (79%) with a drain

With a drain: 12%

Without a drain: 9.8%

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Lore's Atlas of Head and Neck Surgery

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Recurrence Rates

			# pts
Isaacson (1999)	Philadelphia	4%	--
Koltai (2003)	Cleveland	5%	21
Manning (2005)	Seattle	7.9%	203
Hirshoren (2009)	Jerusalem	2%	160
Maddalozzo (2010)	Chicago	1.7%	60
CHLA (2011)	Los Angeles	6.6%	137

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Recurrence Rates

			# pts
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CHLA (2011) - Ped Oto only		4%	123
CHLA (2011) - Ped Surgery only		2.3%	13

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Recurrent Thyroglossal Duct Cysts: A 23-Year Experience and a New Method for Management

Jonathan A. Perkins, DO; Andrew F. Inglis, MD; Kathleen C. Y. Sie, MD; Scott C. Manning, MD

Fellowship-trained ped surgery	5.2%	3/58
Fellowship-trained ped oto	5.3%	6/113
Fellowship-trained ped plastic surgery	33%	1/3
Non-ped fellowship-trained	20.7%	6/29

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Thyroglossal Duct Cysts and Sinuses: Results of Radical (Sistrunk) Operation

PAUL M. BROWN, M.D. and EDWARD S. JUDD, M.D., Rochester, Minnesota

'Those who have had the opportunity of operating on the thyroglossal tract... will recall the occasional instance in which the tract above the hyoid bone does not persist as a well defined structure.

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Am J Surg 1961 (102):494-501

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THE APPLIED ANATOMY OF THYROGLOSSAL TRACT REMNANTS.*

PETER D. M. ELIAS, F.R.C.S., and A. W. PETER VAN NOSTRAND, M.D., Toronto, Ontario, Canada.

'the tract descends to the anterior surface of the hyoid bone... then hooks round the sharp inferior border of the bone to lie in the concavity on its posterior surface'

Laryngoscope 1970 (87):765 - 70

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THE SURGICAL TREATMENT OF CYSTS OF THE THYROGLOSSAL TRACT

By WALTER REUBEN SISTRUNK, M.D., of Rochester, Minn.

'We... remove a (1/4 inch) portion of the (hyoid) bone... then, without any attempt to isolate the duct, we core through the tissues from this point directly to the foramen caecum.'

'Then, without any attempt to isolate the duct (above the hyoid bone), the duct and the tissues surrounding it for a distance of about 3 mm on all sides are cored out through the muscles of the tongue... to the foramen caecum.'

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