



Electrocautery only for hyoid bone removal in pediatric thyroglossal duct cyst excision

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AIM: Surgical excision of hyoid bone is the mainstay of thyroglossal duct cyst removal, to prevent recurrences. Bone excision by cut - bone forceps may prove inaccurate and somewhat dangerous. Therefore, use of alternative methods has been advocated.

MATERIAL AND METHODS: The proposal of the study is to cut the body of the hyoid bone with the only electric scalpel. Surgical casenotes of 57 pediatric patients operated by our Institution with modified Sistrunk technique and complete dissection of the entire body of hyoid bone and its removal at the cartilage junction with lateral horn with monopolar cauterization were reviewed.

RESULTS: The population of our study had a mean age of 59.86 ± 29.57 months; 6/57 patients (10.5%) were under 2 years of age. Mean follow up was 55.04 ± 29.08 months ranging 2 to 115 months. In any patients post-operative bleeding was observed. Mean surgical time was 57.02 ± 11.77 minutes ranging from 35 to 125 minutes; 6 cases required postoperative drain. In 3 patients an immediate local edema was observed and in another one a partial wound dehiscence occurred, no late complications were observed. Cyst-recurrence requiring re-do surgery occurred in 5 patients (8.8%).

CONCLUSIONS: The complete hyoid bone section with electric scalpel only ensures the ideal access to the posterior hyoid space and allows a greater and more symmetrical access to the proximal portion of thyroglossal duct in children with still negligible complication and recurrence rate.

KEY WORDS: Modified Sistrunk technique, Sistrunk procedure, Thyroglossal duct cyst

Introduction

Excision surgery for Thyroglossal duct cyst (TDC) is quite straightforward: it essentially rests on the modified Sistrunk procedure which includes complete cyst resection along with central part of the hyoid bone together with superior¹⁻³ and inferior⁴ thyroglossal duct rem-

nants. The latter part of the procedure is deemed necessary to reduce the risk of recurrence and has received much attention in literature. In this respect the vast majority of Authors uses the cut bone forceps to resect the hyoid bone even in pediatric patients. However, the use of cut bone forceps does not guarantee complete excision of the central part of the hyoid bone, in addition, despite most papers have been published using this technique⁵⁻⁸, forceps insertion is a blind and potentially dangerous manouvre especially in small patients. On these findings, excision of hyoid bone by electrocautery may prove as a valid alternative to achieve complete resection of central portion of hyoid bone, minimizing blood loss and avoiding blind manouvers. To our knowledge, there are only scant reports in literature addressing this alternative procedure to resect hyoid bone in TDC⁹.

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Materials and Methods

The institutional Bambino Gesù Children's Hospital scientific board approved this study.

In the period ranging from May 2009 to May 2019, 345 cases of primary TDC were seen at Our Institution, 57 cases of which were operated on with this technique by a single surgeon. Written surgical and media consent was provided by all operated patients. Surgery was indicated for recurrent infections and/or significant increase in cyst size. In all 57 patients the excision of the central part of hyoid bone, traditionally made by cut bone forceps, was performed by electrocautery only.

Monopolar electrocautery was used not only to remove soft tissue attachments to the hyoid bone in order to skeletonized it⁶ but also to split the central portion from its lateral part (Fig. 1). Casenotes of operated patients were subsequently reviewed and attention was directed to local complications and recurrences. Follow up ranged from 115 to 2 months with an average of $55,04 \pm 29,08$ months.

RESULTS

The 57 patients out of 345 operated on over the considered period form the object of the study. All the said 57 patients were operated by single surgeon. The population of our study had a mean age of $59,86 \pm 29,57$ months, ranging from 6 to 134 months. There were 34 males and 23 females. Mean surgical time was $57,02 \pm 11,77$ minutes ranging from 35 to 125 minutes. 18/57 (31,58%) patients reported recurrent infections prior to surgery while in the remaining 39 (68,42%) surgery was performed because of significant increase in size over time. In 51/57 patients (89,47%) post operative drainage

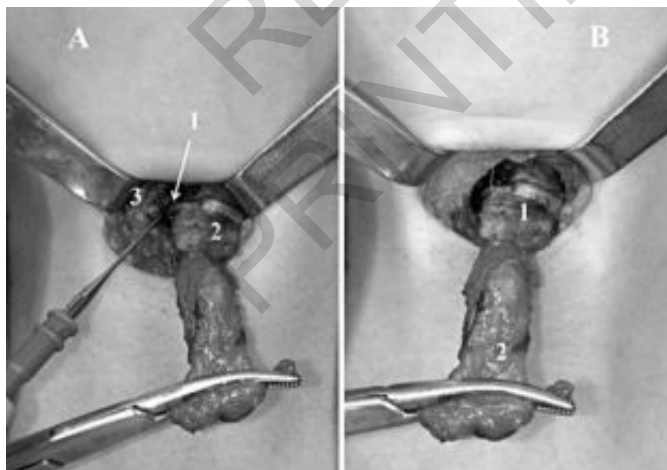


Fig. 1: A) Section by monopolar electrocautery of the growth cartilage (1) to separate de body (2) from the right lateral horn (3) of the hyoid bone; B) Complete split of the body (1) from the lateral horns. (2) Thyroglossal duct.

was not necessary and patients were discharged the first day after surgery; in 6 (10,5%) a drain was necessary for the first 24 hours, and patients were discharged on postoperative day II. Of these 6 patients, 3 presented preoperative infection and showed easily bleeding tissue during surgery; in one patient the cyst was located near the thyroid gland and required a second skin incision to remove the hyoid bone.

Minor complications were seen in 4 patients (7,02%) consisting in mild postoperative edema in 3, promptly resolved with common anti-inflammatory drugs given at fixed times to prevent and also treat pain in association with¹⁰ oral antibiotics and a partial dehiscence of the wound in the fourth one. There were five recurrences (8,77%) that required re-operation: in all cases, the cyst recurrence were in hyoid region. During re-do surgery a proximal patent ductus toward the blind foramen at the base of the tongue was removed: the recurrence was apparently in relation to a proximal residue of thyroglossal duct. No further recurrences were observed after re-do surgery in the considered follow up period.

Discussions

Surgical treatment of TDC is long established: the vast majority currently agree that Sistrunk modified approach is still the gold standard. In brief, such approach consists in removing the cyst, detaching and removing the middle from the lateral third of hyoid bone and sectioning the thyroglossal duct (below the hyoid bone and above it toward the foramen caecum)^{1,2,6,11-13}. TDC affects adults and children with differences in clinical presentation and outcome of surgery. In particular, adults suffer more frequent pain, dysphagia, dysphonia, dyspnea, odynophagia and fistula formation as shown by Zerilli M and Martinelli V.^{14,15} Pediatric patients, instead, usually show mass or infection^{11,12}. The important anatomical differences between adult and pediatric cases is the presence, in children, of growth cartilage between the body and the lateral horns of the hyoid bone, as evidenced in paper of Ryu et al⁹. Given this difference, complete resection of the hyoid bone can be achieved with a safer approach, by monopolar electrocautery on growth cartilages instead using cut bone forceps (Moure or Liston forceps) as described in the original Sistrunk technique⁸. Interestingly, despite numerous reports about TDC surgery, pediatric series are scant: the most important are those of Thompson et al¹³, Perkins et al¹⁶ and Geller et al², who reported 261, 231 and 128 pediatric cases respectively. These Authors give several details about surgical technique with special attention to recurrences: however, none of them give details about the hyoid bone excision technique. In 2010 Maddalozzo et al, analyzing 60 cases of pediatric TDC, pointed out that it is important to include in Sistrunk procedure identification of posterior hyoid space (the

space limited caudally by the inferior rim of hyoid, cranially by the superior rim of the hyoid and thyro-hyoid membrane, ventrally by the posterior surface of the hyoid, and dorsally by the thyrohyoid membrane) in order to evacuate abnormal tissue from this area, minimizing the risk of recurrences¹⁷. To reach this area the hyoid must be transected medially to the tendon of the digastrics muscle, wider respect to the original Sistrunk technique in which recommendation is to remove only one -quarter inch of the hyoid bone (approximately 6 mm)². This indication is suggested also by Koempel et al in 2014: using a ruler and the laryngeal prominence as a marker for the midline, the hyoid bone cut has to be performed at 1-1,5 cm at left and at right from its central point through the entire thickness bone or cartilage¹⁸. In this respect, there is nearly general agreement that the hyoid bone is better removed by using cut bone forceps. However, as previously mentioned, such forceps does not guarantee complete excision and may also lead to bone bleeding.

To our knowledge Ryu et al was the first to point out that a non-fused cartilage portion between the body and the horn of hyoid can be easily dissected and divided in patients without mature ossification⁹. Therefore, this Author suggests the use of monopolar electrocautery instead of cut-bone forceps. This report, which deals partly with pediatric and partly with adult patients, prompted us to review our cases. As previously mentioned our series consists of 57 children operated on at a pediatric institution (with this technique) by a single surgeon. To our knowledge this is the largest TDC pediatric series operated on by using monopolar electrocautery for hyoid bone division. We analyzed infection prior to surgery, drain placement, complication rate and recurrence. Complications associated with TDC surgery are rare. Most complications are minor and carry minimal morbidity as local infection, seroma, hematoma and wound dehiscence^{2,3,18,19}. In reviews of the published literature the overall reported risk of recurrences following surgical treatment of TDC is approximately 7.3-11%^{2,11,16,19,20}. In our series minor complications were seen in only four cases (7.02%) presenting 3 mild postoperative edema requiring common antiinflammatory drugs and oral antibiotics and 1 partial wound dehiscence. Recurrences were five (8,8%) requiring re-operation 2 to 5 months after primary surgery. It must be noted that complication and recurrence rate was similar to other series of TDC in which is used the cutbone forceps^{6,8}. So far we can affirm that the use of electrocautery does not increase complications and recurrences. In other words, since incomplete excision of hyoid bone is deemed responsible for recurrences²¹, this alternative approach seems to prove at least as effective as the cut-bone forceps. As previously mentioned, surgical time varied from 35 to 125 minutes with an average of 57.02 ± 11.77 minutes. Duration of surgery in TDC removal has received little mention in literature^{21,22} but our sur-

gical time appears to be not at variance with the few data reported. Therefore, although the electrocautery require a meticulous dissection, it may be used without significantly altering surgery and anesthesia time. This proves particularly important in small children who are a significant part of our series. This report has some limitations: at first, this is a retrospective study, secondly, we do not have a control group in which cutbone forceps was used to compare for statistical inference. However, even without statistical inference, we believe that a pediatric series of 57 patients is large enough to draw some conclusions. It is likely that a multicentric study might help clarifying that the use of electrocautery will definitely prove far superior in the treatment of TDC without additional complications and recurrences.

Conclusions

The modified Sistrunk technique still remains the procedure of choice for TDC treatment. However, section of the central part of the hyoid bone is the crucial part of the procedure since its incomplete excision is deemed responsible for the vast majority of recurrences. In this respect, use of monopolar electrocautery, is a safe procedure ensuring the ideal access to the posterior hyoid space thereby allowing for a greater and more simmetrical access to the proximal portion of thyroglossal duct. Meticulous use required of electrocautery does not appear to affect surgical time neither are complication and recurrent rates higher than those reported with conventional excision methods. In order to assess if this approach can be adopted on a routine basis, a larger number of pediatric patients and a randomized study will probably be required.

Riassunto

L'escissione chirurgica del corpo dell'osso ioide rappresenta un passaggio fondamentale in corso di intervento per cisti mediana del collo al fine di ridurre il tasso di recidiva. L'incisione dell'osso tramite pinza ossivora di Liston può risultare incompleta e, in alcuni casi, pericolosa; a tal fine, sono stati quindi messi a punto metodi alternativi.

L'obiettivo dello studio è di valutare l'efficacia in termini di recidive e complicanze chirurgiche dell'asportazione del corpo dell'osso ioide tramite il solo utilizzo della diatermia monopolare. Sono stati revisionati i dati relativi a 57 pazienti di età pediatrica operati consecutivamente presso il nostro Ospedale con tecnica di Sistrunk modificata: la dissezione del corpo dell'osso ioide è stata realizzata mediante diatermia monopolare anche a livello della cartilagine di accrescimento tra il corpo ed i corni laterali dell'osso ioide

La popolazione in esame presentava un'età media di 59.86 +/- 29.57 mesi; 6 pazienti su 57 (10.5%) avevano

un'età inferiore a 2 anni. Il follow-up medio è stato di 55.04 ± 29.08 mesi (range 2-115 mesi). In nessun paziente è stato evidenziato sanguinamento post-operatorio. Il tempo chirurgico medio è stato di 57.02 ± 11.77 minuti (range 35-125 minuti); in 6 casi è stato posizionato drenaggio. Tre pazienti hanno mostrato immediato edema post-operatorio ed uno una parziale deiscenza della ferita chirurgica; non sono state osservate complicanze post-operatorie tardive. In 5 casi (8.8%) è stato necessario un re-intervento per recidiva. La completa escissione del corpo dell'osso ioide tramite diatermia monopolare assicura una visuale completa dello spazio retroioideo e consente un accesso migliore e più simmetrico alla porzione prossimale del dotto tireoglossale in età pediatrica, con un tasso trascurabile di complicanze e recidive.

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References

1. Kepertis C, Anastasiadis K, Lambropoulos V, et al.: *Diagnostic and surgical approach of thyroglossal duct cyst in children: Ten years data review*. J Clin Diagn Res, 2015; 9(12):PC13-5.
2. Geller KA, Cohen D, Koempel JA: *Thyroglossal duct cyst and sinuses: A 20-year Los Angeles experience and lessons learned*. Int J Pediatr Otorhinolaryngol, 2014; 78(2): 264.
3. Hussain K, Henney S, Tzifa K: *A ten-year experience of thyroglossal duct cyst surgery in children*. Eur Arch Otorhinolaryngol, 2013; 270(11): 2959-961.
4. Boglino CI, Inserra A, Silvano A, et al.: *Surgery of thyroglossal duct in childhood*. Minerva Chir, 1993; 48(8):393-402.
5. Isaacson G: *Central neck dissection for infected or recurrent thyroglossal duct cysts. Operative techniques in otolaryngology*. Head and neck surgery, 2001; 12 (4):235-38.
6. Goldsztein H, Khan A, Pereira KD: *Thyroglossal duct cyst excision. The Sistrunk procedure. Operative Techniques in Otolaryngology*. Head and Neck Surgery, 2009; 20 (4): 256-59.
7. Wagner G, Medina JE: *Excision of thyroglossal duct cyst: The Sistrunk procedure. Operative Techniques in Otolaryngology*, 2004; 15:220-32.
8. Righini CA, Hitter A, Reyt, et al.: *Presentations and management of thyroglossal duct cyst in children versus adults: A review of 106 cases*. Oral Surg Oral Med Oral Pathol Oral Radiol Endod, 2011; 111(2): e1-6.
13. Thompson LD, Herrera HB, Lau SK: *A clinicopathologic series of 685 thyroglossal duct remnant cysts*. Head Neck Pathol, 2016; 10(4): 465-74.
14. Zerilli M, Scarpini M, Bisogno ML, et al.: *The surgical treatment of thyroglossal duct cysts and fistulae*. Ann Ital Chir, 1993; 64(6):659-63.
15. Martinelli V, Picardi N, Forte A, Martinelli V, et al.: *Congenital malformations of the neck. Clinical case report* Ann Ital Chir, 1979; 51(1):1-11.
16. Perkins JA, Inglis AF, Sie KC: *Recurrent thyroglossal duct cysts: a 23-year experience and a new method for management*. Ann Otol Rhinol Laryngol, 2006; 115(11): 850-56.
17. Maddalozzo J, Alderfer J, Modi V: *Posterior hyoid space as related to excision of the thyroglossal duct cyst*. Laryngoscope, 2010; 120(9): 1773-78.
18. Koempel JA: *Thyroglossal duct remnant surgery: A reliable, reproducible approach to the suprahyoid region*. Int J Pediatr Otorhinolaryngol, 2014; 78(11): 1877-882.
19. Gioacchini FM, Alicandri-Ciuffelli M, Kaleci S, et al.: *Clinical presentation and treatment outcomes of thyroglossal duct cysts: A systematic review*. Int J Oral Maxillofac Surg, 2015; 44(1): 119-26.
20. Galluzzi F, Pignataro L, Gaini RM, et al.: *Risk of recurrence in children operated for thyroglossal duct cysts: A systematic review*. J Pediatr Surg, 2013; 48(1): 222-27.
21. Huang J, Osterbauer B, Koempel J: *Prevalence of an intact hyoid bone at revision excision of a thyroglossal duct remnant*. Int J Pediatr Otorhinolaryngol, 2018; 113:131-33.
22. Pastore V, Bartoli F: *Extended" Sistrunk procedure in the treatment of recurrent thyroglossal duct cysts: A 10-year experience*. Int J Pediatr Otorhinolaryngol, 2014; 78(9): 1534-536.
23. Al-Thani H, El-Menyar A, Sulaiti MA, et al.: *Presentation, management, and outcome of thyroglossal duct cysts in adult and pediatric populations: A 14-year single center experience*. Oman Med J, 2016;