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Research Article

Long Time Outcome of Surgical Bipolar with Z-Plasty Lengthening and Postoperative with or without Place Cast for Congenital Muscular Torticollis

Nguyen Ngoc Hung[1]*, Hoang Hai Duc[2], Le Tuan Anh[2] and Dao Dang Linh[3]

[1]A. Professor, Surgical Department, Hong Phat General Hospital, Hanoi City, Vietnam

[2]Pediatric Orthopaedic Department, National Hospital for Pediatrics, Ha Noi City, Vietnam

[3]Orthopedic Institute, 108 Hospital, Ha Noi City, Vietnam

***Corresponding Author:** Nguyen Ngoc Hung, A. Professor, Surgical Department, Hong Phat General Hospital, Hanoi City, Vietnam.

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Abstract

Objective: Comparing results between postoperative congenital muscular torticollis (CMT) with or without place cast, and the effectiveness of surgical bipolar muscle for congenital muscular torticollis.

Methods: This study was a retrospective study of 73 cases with sternocleidomastoid muscle from October 1994 to December 2005. Patients have divided two Variant. Postoperative variant 1 without place cast and variant with place cast. The degree of neck tilt and range of motion of the neck, flexion and limitation of rotation were recorded. The ultrasound, measure cervico-mandibular angle (CMA). Children had performed operation by bipolar Z-plasty. Post-operation, with or without immobilization. Operative results were according to assess by the score of Cheng.

Results: Seventy three patients have operated congenital muscular torticollis. Male: 31; female: 42. Right: 27; left: 46. Age at operation means 4.3698 years (± 1.6791). Age at time of last examination: 27.43836 (± 3.109065), length of follow-up (year): 23.1232 (± 2.9765). Fascial asymmetric at follow-up: No: 64; slight: 07; mild: 02. Last result: Excellent: 61; good: 10; acceptable final result (Excellent + good): variant 1 (35+5) 97.60%/variant 2 (26+5) 96.90% (P-value = 0.0218565). Improvement of limitation of rotation in variant 1/variant 2: 63.9%/52.7% (P value = 0.0856030); improvement of angle of head tilt in variant 1/variant 2: 86.6%/66.3% (P value = 0.146634). In this study, we divide two variant, compared with and without use place cast. Post-operation, the patients had bipolar Z-plasty to show the column of sternomastoid muscle, there isn't immobilization are reduce surgical time and cost.

Conclusion: The diagnostic and evaluation of congenital muscular torticollis requires a systematic team approach with members from fields of radiology, physiotherapy, craniofacial surgery, orthopaedics, neuro- surgery and ophthalmology. Technical bipolar Z-plasty with good results and there isn't immobilization.

Keywords: *Congenital Muscular Torticollis; Sternocleidomastoid Muscles; Translational Deformity; Facial Asymmetry*

INTRODUCTION

Congenital muscular dystrophy (CMT) is a common musculoskeletal malformation in newborns, with a reported incidence of 0.084 - 3.92% [1]. The main characteristic clinical feature is thickening and shortening of the sternocleidomastoid muscle (SCM), leading to head tilt and limited head rotation. Some infants with CMT have a cough reflex when turning their head to the affected side. Asymmetry of the skull or plagiocephaly may occur when CMT is left untreated for a long time. Furthermore, facial asymmetry and scoliosis may also develop and become more severe as the patient grows older [2].

Traditional birth injury theory holds that the SCM muscle is torn at birth. However, the actual cause remains uncertain. Other suggestions are intrauterine malposition, the ischemic hypothesis, the intrauterine or perinatal compartment syndrome theory, and the genetic hypothesis [3]. Considering these diverse theories, CMT is best viewed as a group of clinical manifestations characterized by neck deformity, primarily related to shortening of the SCM muscle due to a variety of prenatal or perinatal causes. Concomitant hip dysplasia in 5 - 10% of patients with CMT [4] may be considered a cause of intrauterine malposition. However, research on the prenatal causes of CMT is limited. In addition, CMT is also seen in patients who have had a cesarean section; these patients had neck magnetic resonance imaging (MRI) findings of CMT commonly seen in patients with vaginal birth.

Congenital torticollis (CMT) is a benign condition, but if left untreated, results in progressive shortening of the affected sternocleidomastoid (SCM) muscle and surrounding soft tissues of the neck [5]. This "neck strain" deformity occurs due to the unique anatomy of the SCM, for example, right-sided contractures cause the neck to tilt to the same side and rotate the chin to the opposite side.

When diagnosed early, CMT can be treated conservatively, rarely requiring surgery. In children older than 1 year, corrective surgery provides both cosmetic and functional benefits, with best results achieved between the ages of 1 and 4 [6].

Age at surgery is the most important factor affecting the above complications of drug-resistant CMT. According to previous studies, the best results are obtained when patients undergo surgery between the ages of 1 and 4 years [7]. However, for various reasons, some CMT patients do not undergo surgical release even though they meet the clinical criteria. Omitted CMT is stated for patients who do not undergo surgical treatment within appropriate time [8]. There is also considerable debate regarding the effectiveness and necessity of invasive surgical release in patients with neglected CMT aged 5 years and older [9].

According to previous studies, surgical correction of neglected CMT can provide cosmetic and functional improvement, and reduce pain associated with neglected CMT [10]. The effect of surgical release is significant even in patients with neglected CMT aged 15 years or older [10]. However, there is still a lack of understanding regarding both the effectiveness of release surgery for spinal deformities in neglected CMT patients and the correlation between the effectiveness of release surgery and age at the time of surgery.

The main characteristic clinical feature is thickening and shortening of the sternocleidomastoid muscle (SCM), leading to head tilt and limited head rotation. Some infants with CMT have a cough reflex when turning their head to the affected side [11]. Asymmetry of the skull or plagiocephaly may occur when CMT is left untreated for a long time. Furthermore, facial asymmetry and scoliosis may also develop and become more severe as the patient grows older [2]. The latest follow-up follows the Cheng and Tang system with modifications [12] or modified Ling method [13] to achieve the final results.

Immediately after surgery, the patient will be in a head-neck-shoulder cast for 3 to 6 weeks. Then it is replaced with a neck-shoulder brace for 6 months. Recently, some authors believe that there is no need to wear a cast or brace after surgery. However, the CMT surgical literature does not mention this issue.

Purpose of the Study

The purpose of this study are surgical approach the bipolar Z-Plasty lengthening, and to analyze the results of CMT treatment in children with surgery was to improve aesthetics and function, comparing with and without place cast postoperatively.

MATERIAL and METHODS

A retrospective study was conducted to evaluate the results of surgical treatment from October 1994 to December 2005, 89 patients underwent surgery for CMT. Patients are invited to be examined and evaluated after surgery. However, for various reasons, 16 patients were not evaluated for final results. Therefore, there are 73 patients left in the study. The patients had been diagnosed and Operated at the National Hospital for Pediatric. Patients were evaluated by physical examination, radiographs, and medical records. The operations were performed by a single surgeon (Author).

The study was approved by our Institute's Ethics Review Committee and was conducted in accordance with the tenets of the Declaration of Helsinki.

The patients were divided into two variants. In variant 1 (post-operative patients without tube placement) there are 41 patients and variant 2 (post-operative patients with tube placement) there are 32 patients.

Clinical diagnosis

Mean age at the time of surgery V1: 4.5 years (± 1.7134) years and V2: 4.07142 years (± 1.4123). There are 30 men and 43 women. Right CTM in 27 cases and left CTM in 46 cases (Table 2 and 3).

Preoperative evaluation included the child's age at presentation, the presence of neck swelling in the newborn, the parties involved, and the child's gender. The degree of neck tilt, neck-like flexion, neck range of motion (ROM), and rotational limits were recorded (Figure 1). Evaluate clinical diagnosis and diagnostic imaging at the final examination.

Image analysation

Preoperative clinical images showed that the child had congenital muscular dystrophy affecting the right sternocleidomastoid muscle (Figure 1).

Figure 1: *Patient with right CMT.*

Preoperative ultrasound, CMT was diagnosed when the thickness of the SCM muscle was more than 2 mm on the affected side (Figure 2).

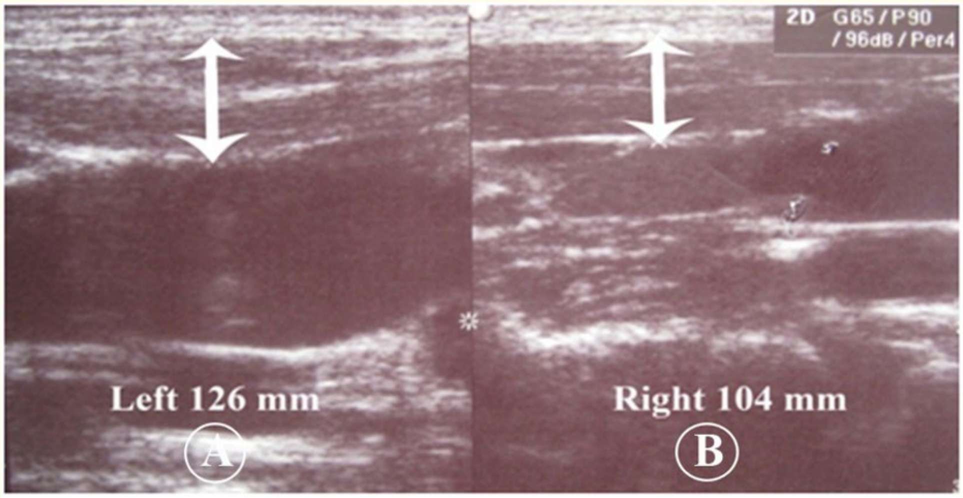

Figure 2: *Ultrasound left CMT; Patient with left CMT: (A) Left SCM is thicker than (B) Right.*

Patients excluded from the study were those with neurodevelopmental disorders such as cerebral palsy, abnormal head and neck positions related to ocular causes, intellectual disability, and other conditions. such as inflammation or infection of the neck or structural abnormalities of the cervical spine.

Median follow-up was 31.658 years (Variant 1) and 31.00 years (Variant 2). At the most recent follow-up, the patients evaluated neck motion (flexion, lateral rotation), craniofacial asymmetry, head tilt, scarring, aesthetic and functional satisfaction as well as side band formation.

The authors proposed the cervical-mandibular angle (CMA) as a quantitative assessment of head tilt from simple radiographs (AP images of the cervical spine) (Figure 3).

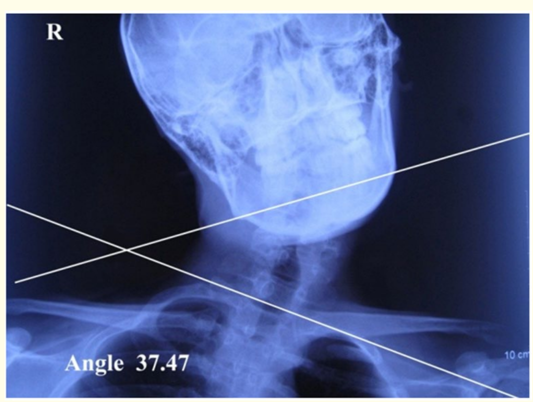

Figure 3: *Cervico-mandibular angle (CMA) is measured between the line of the lower border of the C7 upper vertebral body and the line connecting the lower borders of both mandibles.*

Tilt your head

The angle forms two lines: The first passes through the nose and the second passes through both upper edges of the shoulders. Using a goniometer, this angle was measured (Figure 4).

Figure 4: *Measure head tilt.*

Rotation

In the photo, rotation was measured using a plumb line attached to the center of the chin while the head was rotated along the central vertical axis on a horizontal platform in front of the neck (Figure 5).

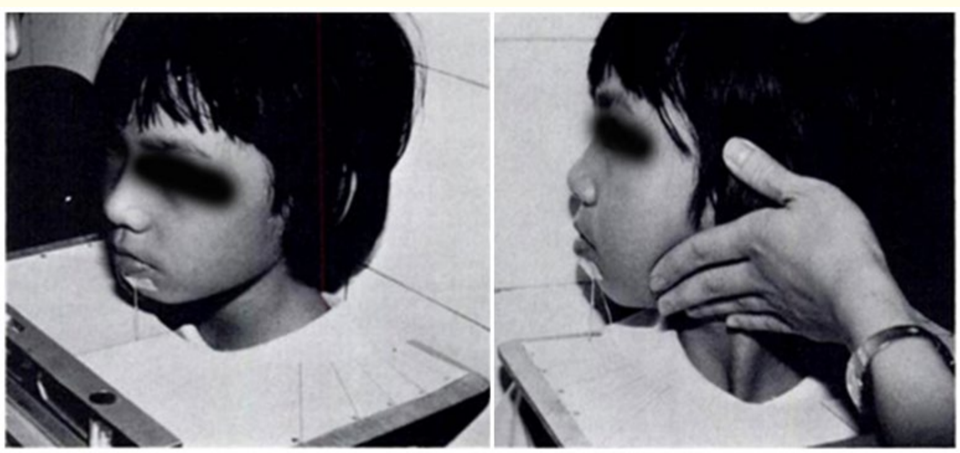

Figure 5: *Measure head rotation.*

Surgical techniques

Bipolar tenotomy with Z-plasty

All children underwent soft tissue surgery under general anesthesia with precise neck positioning to allow intraoperative neck manipulation to assess the completeness of surgical release. The endotracheal tube is well fixed to avoid slipping out when moving the neck.

An intrascapular pad is placed to elevate the upper chest and the neck extension is supported on a pad. The upper body was immobilized and the ipsilateral arm was immobilized with a micropore tape for shoulder compression. Made to make the affected SCM more prominent and easier to operate.

In severe cases, tight bands of muscle or fascia are palpated and the surgical assistant supporting the head and neck to perform rotations and translations during surgery is difficult and unsuccessful. Perform a bipolar resection and create an additional incision in the upper extremity. The proximal incision is made behind the ear and the attached muscle is divided horizontally just distal to the mastoid head (Figure 6 and 7). The clavicular portion of the muscle is then transected and a Z-plasty is performed over the sternal attachment to preserve the normal V-shaped contour of the sternocleidomastoid muscle at the neckline (Figure 6). The desired level of correction is achieved by manipulating the head and neck during the release.

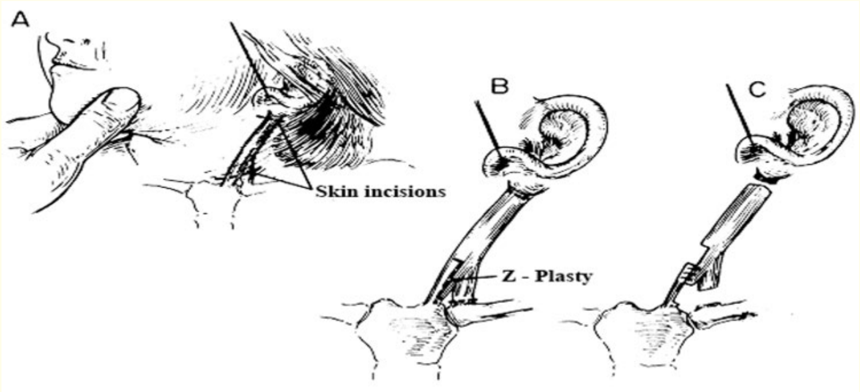

Figure 6A-6C: *Ferkel FD's A modified surgical approach. The z-plasty operation for torticollis. A: The location of the skin incisions. B: The clavicular and mastoid attachments of the sternocleidomastoid muscle are cut and a z-plasty is performed on the sternal origin. C: The completed operation is shown. Note that the medial portion of the sternal attachment is preserved.*

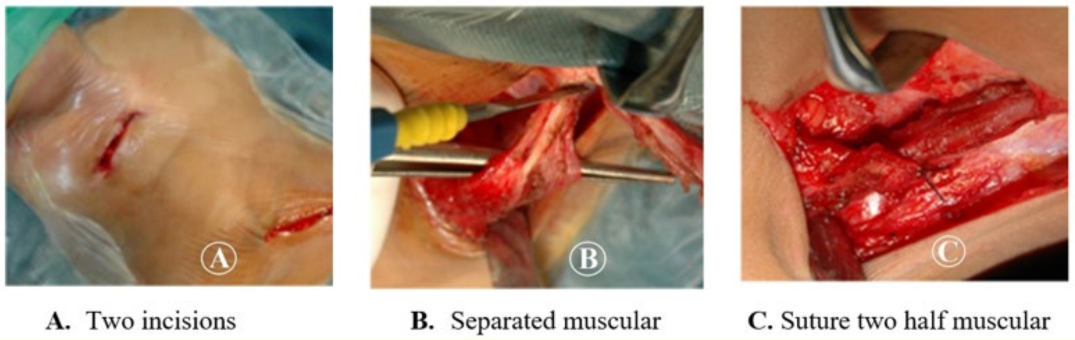

Figure 7A-7C: *Surgical bipolar tenotomy.*

Sometimes, before closure, it is necessary to further release the narrowed width near the medial end of the sternal notch. The skin incision is never as shallow as the clavicle, because in our previous experience, some scars there have extended to a cosmetically unacceptable level. The subcutaneous tissue and musculature of the neck are separated, exposing the clavicular and sternal attachments of the sternocleidomastoid muscle. The anterior and external jugular veins as well as the carotid and cortical vessels were carefully avoided during the dissection.

After complete division of the sternocleidomastoid muscle, the patient's head is moved from side to side to check the degree of release. The wound was closed in layers using subcutaneous 4/0 vicryl, without drainage.

Postoperatively, patients were immobilized in the correct surgical position with or without a Paris cast for 7 days (Figure 8) and replaced with an adjustable torticollis brace for an average of 8 weeks. Rehabilitation should be performed immediately after surgery. The latest follow-up follows modified Ling method [13] to achieve the final results.

Figure 8: *Appearance during early post-operative period with torticollis place cast.*

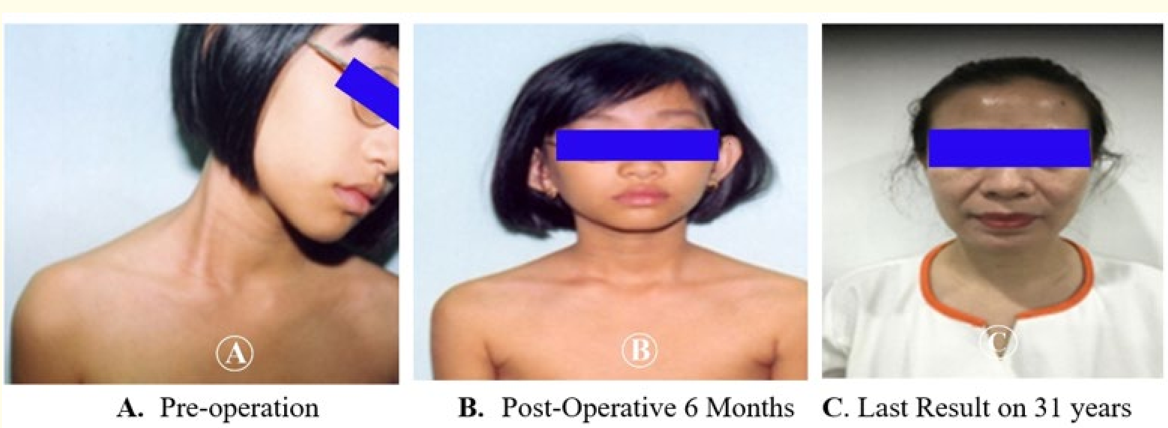

Figure 9A-9C: *Patient had uses casting neck-shoulder (number 12 - Variant 2).*

A. Pre-operation B. Post-Operative 6 Months C. Show two incisions D. Clearly see the column of sternomastoid muscle E. No rotation restrictions F. Last Result on 29 years

Figure 10A-10F: *Patient didn't use casting neck-shoulder (number 29 - Variant 1).*

Statistical analysis

The data were analyzed with Epi Info 6.04 software public domain statistical software for epidemiology, developed by Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, USA, http://wwwn.cdc.gov/epiinfo/html/prevVersion.htm. We performed the χ^2 test for percentage and the t-student test for mean comparison between the preoperative and postoperative Variants. P-values ≤ 0.05 were regarded as statistically significant. All readings were provided as average values together with the appropriate standard deviation.

RESULT

There were 73 patients dividing two variant, variant 1: 41 and variant 2: 32 patients. Post-operative results at latest follow-up, the patients were evaluated according to Cheng., *et al*. (Modified Ling Method [13]) (Table 1).

Results	Fascial Asymmetry	Neck Movements	Head Tilt	Scar	Loss of Sternomastoid column	Lateral Bands/Recurrent Torticollis
Excellent	No	Full	None	Fine	No	No
Good	Slight	Limitation of rotation ≤ 10°	Slight	Slight separation	If present not easily detectable	On clinically inconspicuous lateral bands are present
Fair	Mild	Limitation of rotation ≤ 25°	Mild	Moderate but cosmetically acceptable, tethering to deeper structures	Clinically obvious but cosmetically acceptable	Lateral bands more obvious clinically but Do not impair appearance
Poor	Moderate to severe	Limitation of rotation > 25°	Moderate to severe	Wide, is figuring and cosmetically unacceptable, tethering to deeper structures	Cosmetically unacceptable	Muscles rejoined with recurrent torticollis

Table 1: *Criteria for classification of results (Modified Ling method [13]).*

Case	Sex	Side	Age at Operation (year)	Fascial asymmetric at follow-up	Age at time of last examination (year)	Length of follow-up (year)	Result
1	F	R	2	Slight	30	28	Good
2	F	R	3	No	30	27	Excellent
3	M	R	5	No	30	25	Excellent
4	F	L	4	No	26	22	Excellent
5	M	L	6	No	29	23	Excellent
6	M	R	4	No	26	22	Excellent
7	M	L	2	No	23	21	Excellent
8	F	R	4	No	24	20	Excellent
9	F	L	5	No	25	20	Excellent
10	M	L	3	No	26	23	Excellent
11	F	L	6	Slight	31	25	Good
12	M	R	7	No	25	18	Excellent
13	M	R	2	No	22	20	Excellent
14	M	L	4	No	20	16	Excellent
15	M	L	6	No	25	19	Excellent
16	M	L	3	No	27	24	Excellent
17	F	L	7	Slight	33	26	Good
18	M	R	5	No	28	23	Excellent
19	F	L	7	No	27	20	Excellent
20	M	R	6	No	32	26	Excellent
21	M	L	2	No	26	24	Excellent
22	F	L	4	Mild	30	26	Fair
23	M	R	3	No	25	22	Excellent
24	M	R	8	No	34	26	Excellent
25	F	L	5	No	31	26	Excellent
26	F	L	4	No	28	24	Excellent
27	M	L	6	Slight	32	26	Good
28	F	L	2	No	23	20	Excellent
29*	F	R	7	No	30	23	Excellent
30	M	L	3	No	28	25	Excellent
31	F	L	4	No	32	28	Excellent
32	M	R	5	No	34	29	Excellent
33	M	R	5	No	31	26	Excellent
34	M	L	2	No	24	22	Excellent
35	M	L	4	No	23	19	Excellent
36	M	L	6	No	28	22	Excellent
37	M	R	8	No	26	18	Excellent
38	M	L	4	No	24	20	Excellent

39	F	L	3	Slight	26	23	Good
40	M	R	4	No	30	26	Excellent
41	M	L	6	No	31	25	Excellent
Mean	1.73345		4.5368	3.4888	27.862	23.121	Excellent
SD					3.108		

Table 2: *Patient's data haven't use casting neck-shoulder.*

M: Male; F: Female. R: R: Right; L: Left.

Male: 19; Female: 22. Right: 15; Left: 26. Age at operation mean 4.5 years (± 1.7134). Fascial asymmetric at follow-up: No: 35; Slight: 05; Mild: 01. Age at time of last examination: 27.862 (± 3.4888), Length of follow- up (year): 23.121 (± 3.108). Last result: Excellent: 35; Good: 05; Fair: 01.

Case	Sex	Side	Age at Operation (year)	Fascial asymmetric at follow-up	Age at time of last examination (year)	Length of follow-up (year)	Result
1	F	R	4	No	31	27	Good
2	M	R	3	No	27	24	Excellent
3	M	R	5	No	26	19	Excellent
4	F	L	4	No	30	26	Excellent
5	M	L	4	No	29	25	Excellent
6	M	R	4	No	30	26	Excellent
7	M	L	2	No	24	22	Excellent
8	M	R	4	No	25	24	Excellent
9	F	L	5	No	29	24	Excellent
10	M	L	3	No	28	25	Excellent
11	F	L	5	Slight	30	25	Good
12*	M	R	7	No	28	21	Excellent
13	M	R	2	No	29	27	Excellent
14	M	L	4	No	26	22	Excellent
15	F	L	6	No	24	18	Excellent
16	M	L	3	No	31	28	Excellent
17	F	L	3	Slight	26	23	Good
18	M	R	5	No	24	19	Excellent
19	M	L	7	No	29	22	Excellent
20	F	R	6	No	28	22	Excellent
21	F	L	2	No	28	26	Excellent
22	F	L	4	Mild	23	19	Fair
23	M	R	5	No	26	21	Excellent
24	M	R	4	No	23	19	Excellent
25	M	L	5	No	24	19	Excellent
26	M	L	4	No	29	25	Excellent

27	M	L	3	No	24	21	Good
28	F	L	2	No	26	24	Excellent
29	M	R	6	No	24	22	Excellent
30	M	L	2	No	30	28	Good
31	F	L	8	No	31	23	Excellent
32	M	L	2	No	26	24	Excellent
Mean	1.608633		4.14625	2.848	27.125	23.125	
SD					2.848		

Table 3: *Patient's data have placed casting neck-shoulder.*

M: Male; F: Female. R: R: Right; L: Left.

Male: 11; Female: 21. Right: 12; Left: 20. Age at operation mean 4.07142 years (± 1.4123). Fascial asymmetric at follow-up: No: 29; Slight: 02; Mild: 01. Age at time of last examination: 35.5312 (± 4.119), Length of follow-up (year): 31.000 (± 4.3920). Last result: Excellent: 26; Good: 05; Fair: 01.

Overview: Last age examination 27.43836 (± 3.109065); Length of follow up: 23.1232 (± 2.9765). Last result accepted (Excellent + Good): Variant 1 (35+5) 97.60%/Variant 2 (26+5) 96.90%. P-valuate 0.0218565.

	Mean angle of limitation of lateral bending			Mean angle of limitation of rotation			Mean angle of head tilt (ACM angle)		
	Preop	**Last Result**	**Differences**	**Preop**	**Last Result**	**Differences**	**Preop**	**Last Result**	**Differences**
Variant 1	14.6	0.6	14.0	7.3	2.5	4.8	14.6	1.8	12.8
Variant 2	21.2	7.4	13.8	7.5	3.4	4.1	24.3	8.1	16.2
P-Valuate	0.043415			0.0856030			0.146634		

Table 4: *Improvement of range of motion (ROM) in pre-operation and last result.*

Improvement of limitation of lateral bending in variant 1/variant 2: 95.2%/63.2% (P value = 0.043415); Improvement of limitation of rotation in variant 1/variant 2: 63.9%/52.7% (P value = 0.0856030); Improvement of angle of head tilt in variant 1/variant 2: 86.6%/66.3% (P value = 0.146634).

Complications

- Losses of sternocleidomastoid column: 0.
- Bleeding or bruising: 2.
- Fracture of clavicle: No.
- VasculoNerver Injury: No.

DISCUSSION

The term torticollis is derived from the Latin tortus, meaning "twisted", and collum, meaning "neck". Tubby in 1912 first defined it as "a deformity of congenital or acquired origin, characterized by head-to-shoulder tilt, neck torsion, and facial misalignment [14]. Congenital torticollis (CMT) is a painless condition caused by unilateral shortening of the sternocleidomastoid muscle (SCM) that typically occurs in young children. It is seen in 0.3 - 1.9% of all live births. Due to the effective shortening of the SCM on the involved side, there is ipsilateral head tilt and facial and chin rotation to the contralateral side.

Sternocleidomastoid contracture torticollis is a widely recognized entity, but there appears to be little consensus regarding cause, treatment, or even terminology. The deformity is largely cosmetic and the treatment results are very satisfactory. The greatest concern lies in the cause of this condition, especially the sternum tumor. The pathogenesis remains uncertain but appears unique, with no known clinical or histological parallel in any other disease process. The goals of this article are to clarify the relationship of sternal tumors to torticollis, present some observations about these two conditions, and discuss treatment outcomes.

Some authors have reported an involvement of the right side predominating over the left side by approximately 15% in patients with congenital muscular dystrophy [15]. Neither sex is reported to be affected more often than the other. Soft tissue swelling over the sternocleidomastoid muscle is noticed during the first weeks of life in approximately 20% of patients with congenital myotonic torticollis. The swelling may then gradually progress to contracture of the sternocleidomastoid muscle. However, spontaneous remission rates before one year of age have been reported to be as high as 90%. Histologically, the muscle is replaced by fibrous tissue that is increasingly dense and lacking in cells. This is also known as uterine fibroids [16].

Congenital mechanical torticollis must be distinguished from torticollis due to congenital bone deformities of the cervical spine, torticollis due to acute rheumatoid arthritis on other inflammatory conditions around the neck, and torticollis due to vestibular dysfunction or eye disease [17] and spasmodic torticollis.

The cause of congenital torticollis remains unclear. Birth trauma accompanied by hematoma and myositis of the sternocleidomastoid muscle or embolism has been described, but a direct relationship with the histological changes of congenital torticollis has not been proven. The frequent occurrence of congenital muscular dystrophy after complicated pregnancy or childbirth [18] is associated with abnormal uterine position and birth trauma. Genetics appear to play a role in the etiology of congenital torticollis; however, no exact genetic transmission route has been identified.

Some associations between congenital torticollis and congenital hip disorders, facial asymmetry, and congenital clubfoot have been reported.

The lowest recurrence rate of congenital mechanical torticollis has been reported after bilateral open release [19], which is the technique we prefer.

Etiology and pathogenesis

Many theories have been proposed, but the actual cause of CMT remains uncertain. Various causes associated with CMT include intrauterine coagulation or vascularization, fibrosis due to peripartum bleeding, compartment syndrome, primary myelopathy of SCM, and birth trauma [20].

Anecdotally, the birth trauma theory has been widely proposed. This theory posits that the SCM muscle is torn at birth, leading to hematoma formation and fibrous contractures. However, experimental tearing of the SCM muscle did not result in muscle shortening or mass formation, which is commonly seen in CMT. One study reported six cases with a family history of CMT, of which three were siblings. Five cases of CMT were reported in a Turkish family, including siblings, in 1997 [3] with one report describing cases of CMT in a Korean sibling [21]. These reports suggest that genetic causes may play a role in the development of CMT. These reports suggest that genetic causes may play a role in the development of CMT. It has been proposed that CMT may underlie intrauterine or perinatal compartment syndrome, based on the injection of contrast material into the SCM. Another hypothesis could be that CMT is caused by malposition in the uterus and insufficient space. His theory is supported by the fact that 5 - 10% of CMT children have coexisting hip dysplasia and 6.5% have other musculoskeletal defects such as Equinovarus [5]. The ischemic hypothesis, which states that venous occlusion due to malposition in the uterus produces hypoxic ischemia in the SCM muscle, has not been clearly demonstrated. The selective occurrence of CMT in the SCM muscle among many other neck muscles remains unexplained. Although diffuse proliferation of fibroblasts, fibrosis, and myocyte atrophy are histologically evident in CMT, no histological differences relevant to pathogenesis have been described. Therefore, there is a need for research on the causes of CMT from many different perspectives.

Despite many comprehensive reviews, especially those by Chandler and Altenberg (1944) [22] and Lidge [23], there is little agreement regarding the etiology of sternal tumors or torticollis. Chandler and Altenberg considered progression from one tumor to another so certain that they recommended resection of all tumors at the earliest age. In contrast, Hulbert (1950) [24] and Coventry and Harris (1959) [25] suggested that the majority of tumors will resolve completely without the need for aggressive treatment. Gray (1935) [26] and Bianco (1958) [27] stated that most children with torticollis have no history of sternal tumors, but Coventry and Harris (1959) [25] stated that in half In their case, tumor was present. The tumor was missed by the parents and was only discovered during a routine pediatric examination.

It is now clearly established that sternocleidomastoid tumors often precede breech, forceps, or first birth (Witzel 1883 [28], Fitzsimmons 1933 [29], Chandler and Altenberg 1944 [22], Hulbert 1950 [24], Coventry and Harris 1959 [25]). It's tempting to assume that the common factor is trauma. Stromeyer (1838) [30] postulated that muscle rupture during childbirth produces hematoma, and that fibrous replacement causes subsequent torticollis.

Terminology and classification

The term torticollis or "congenital" torticollis is widely used but seems inappropriate because the old title is used in much of the German literature, emphasizing the obstetric context but otherwise having little meaning. modern meaning. This condition was termed "infantile" by Adams (1967) [31] although cases may appear at any age up to childhood or even adolescence. Anderson (1893) [32] simply called "sternocleidomastoid" torticollis, and overall, the term "muscular" torticollis (Chandler 1948 [18]) seems more appropriate because it emphasizes the underlying pathological process.

In addition to differences in terminology, there are doubts about the uniformity of all cases. Anderson (1893) [32] distinguished between torticollis that is truly congenital in nature and torticollis that arises only as a result of birth trauma. Hulbert (1950) [24] described a transient "postural" type and a "muscular" type that was attributed to a previous sternal tumor. Finally, both Hulbert (1950) [24] and Coventry and Harris (1959) [25] showed that most sternocleidomastoid tumors resolve completely and do not progress to muscular torticollis. This has led some to question whether the two are, in fact, separate pathological entities.

There is a strong similarity between the association of early sternal tumors in breech babies, after forceps delivery, and in first-born infants, and the association in infants with later signs of torticollis. obstetric events. On the other hand, only one in seven babies with a sternal tumor later develops torticollis. In what remains, the tumor has disappeared, or although careful examination in some children has later discovered intermediate-stage remnants, such as an intramuscular band or restriction light exercise. This relationship is further emphasized by the prominent right-sided superiority of both lesions after breech birth, an observation previously noted by Coventry and Harris (1959) [25]. It suggests that the cause of both lesions may be related to prenatal positioning rather than birth trauma. This is supported by the finding of plagiocephaly in one in five infants with sternal tumors, an incidence twice that in the normal population under one year of age by Wynne-Davies (1968) [33]. Family factors, although not dominant, may play a role. Nine out of 100 cases have an affected first- or second-degree relative. One patient with a sternocleidomastoid tumor also had congenital pyloric stenosis.

Three such cases were recorded by Chandler and Alten berg (1944) [18]. Therefore, the relationship between the two conditions is complex. Whatever the muscle change, it appears to have been present before or during birth and has three infrequent and variable sequelae. It may resolve completely: it may manifest clinically as a sternal mass: or it may remain clinically latent, then undergo a varying degree of scarification to produce torticollis.

In cases of torticollis, contractures are more common at the head of the clavicle as described by Jahss (1936) [34]. In one case, this was associated with a bony abnormality at the head of the clavicle, similar to that previously noted by Middleton (1930) [35]. Facial asymmetry is generally present, although not always, but its severity cannot be compared with torticollis as suggested by Hough (1934) [36]. The relationship doesn't have to be a direct one.

Surgical congenital muscular torticollis

Several surgeries can be performed for CMT such as monopolar, bipolar, and Z-plasty. CMT surgery can be performed endoscopically to release the sternocleidomastoid muscle with good results [37]. In this study, we formed 60 bipolar cases (Table 3). Some reports of Botox injection into the sternocleidomastoid muscle have an immediate effect in relaxing tight muscles in the CTM [38].

Improvement of ROM in anteroposterior operation showed improvement in lateral flexion restriction in variation 1/variation 2: 95.2%/63.2% (P value = 0.042455) with different signs; and Limited head rotation and tilt, they are not distinct signs (Table 4).

Since 1967, 12 children with torticollis have been treated at the Los Angeles Shriners Hospital for Crippled Children with modified bipolar release of the sternocleidomastoid muscle. The results of this procedure were compared with those of 22 other patients who had received conservative treatment or other types of surgery and were examined between 1952 and 1981. The mean follow-up was 9 years (from 1 to 30 years). -three years). The 14 patients, most of whom were under 1 year old, were treated nonoperatively and had 86% good or excellent results. Bipolar release and z-plasty is performed when conservative treatment fails or in older children who have undergone other surgeries, and it provides 92% of good or excellent results. Only 15% of good results and 77% of fair results were achieved when surgical procedures other than bipolar release were performed [39] (Figure 6 and 7).

Controversy remains regarding the timing and method of surgical correction of CMT as well as the best surgical technique in adult patients (Table 3). Patient age is a key factor in CMT treatment. Manual stretching is effective in approximately 95% of patients first examined before age 1 year [40]; however, CMT does not resolve spontaneously after 1 year of age [25]. Asymmetry of the facial bones begins to appear after 5 years of age [41]. Any facial asymmetry can be prevented surgically during childhood, especially between 1 and 4 years of age, but facial aesthetic results are unsatisfactory after surgery later in life. 6 years old [13].

In contrast, other observations [42] found no difference in the restoration of craniofacial asymmetry between the younger group (1 to 4 years) and the older group (5 to 16 years). And Ling [13] reported that patients older than 5 years often experience later complications, such as loss of the sternum, disfiguring scars, and the presence of lateral bands.

The most common surgical treatment for CMT includes unipolar (distal) or bipolar (proximal and distal) SCM release. The degree of tightness of the SCM determines the choice of unipolar or bipolar release. The first type is considered suitable for young children and mild deformities, the second type may be prescribed for older patients and more severe deformities. Chen and Ko [43] recommend bipolar release as the treatment of choice for CMT in patients older than 6 years, whereas other authors [44] prefer to perform distal release in patients older than 6 years. Lim., *et al*. [45] reported that the release site is determined intraoperatively, with bipolar release performed when manipulation cannot be adequately corrected after unipolar release, in order to reduce.

Several surgeries can be performed for CMT such as monopolar, bipolar, and Z-plasty. CMT surgery can be performed endoscopically to release the depressor muscle with good results [37]. In this study, we formed 60 bipolar cases (Table 3). Some reports of Botox injection into the depressor muscle have an immediate effect in relaxing tense muscles in the CTM [38].

Surgical morbidity in older children and adults. Recurrence rates are nearly 7% after peripheral release, while low recurrence rates of 2 to 2.9% are after bipolar release.

Ferkel., *et al*. [39] described a modified bipolar release and Z-plasty, which can preserve the normal contour of the neck muscles; The clavicular head was completely released while the sternal head was lengthened with Z-plasty. This approach is especially useful to avoid dimpling at the distal end of the SCM. Patwardhan., *et al*. [46] reported that bipolar release with Z-plasty in 12 adults with CMT preserved the neckline, but estimating the degree of lengthening during surgery is difficult. towel. According to Modified Lee's scoring system, 6 patients had excellent results, 2 patients had good results and 4 patients had fair results. Another [43] bipolar release with Z-plasty showed a greater risk of binding or insufficient release of fibrous bands when compared with bipolar release without Z-plasty. In previous research on bipolar release without Z-plasty, with meticulous repair of the neck musculature and soft tissue, loss of the cervical column was not a cosmetic issue.

We found excellent results in 12.9% of patients, good results in 58.1%, and fair results in 29.0% in this report. There were no significant complications nor recurrence. These results are similar to those of several authors who have reported benefits in the form of both cosmetic and functional improvements in the neck without serious postoperative complications in adult CMT patients.

In the present study, bipolar release without Z-plasty provided satisfactory results at the neckline, without loss of the lateral column of the muscle, and with sufficient release of the lateral fiber tracts in most of the operated patients. meticulous neck muscle orthopedic surgery.

Therefore, for adult CMT patients, we believe that bipolar release without Z-plasty will be less complicated and surgical treatment simpler than bipolar release with Z-plasty. Bipolar CMT decompression in most adults treated in this study improved head tilt and underlying secondary cervical spine changes, similar to previous studies.

Postoperative management

Minerva cornstarch was used for six weeks [47] to maintain relief. Only a few authors [48] advocate early range-of-motion exercises without external immobilization. However, in recent years. We have had good results with exercises started in the first days after surgery by fully cooperative patients. Now, if there is no reason to believe preoperatively that the patient will be uncooperative postoperatively, then there is no need for a cast. Physical therapy is initiated on the first postoperative day [17] and our therapists see their patients several times per day. Since 1990, we have not had to apply a cast in the postoperative period due to lack of patient cooperation.

Both postoperative complications in this series were related to passive cast placement in the oven, as previously described [49]. If cast immobilization is deemed necessary, do so meticulously.

Attention must be paid to proper technique. The head is turned toward the treated side and bent to the opposite side. Two weeks after surgery, the cast was changed. when the patient is standing. Total time the remaining patients are referred back to the home physician. After the cast is removed, patients are primarily treated with stretching and muscle strengthening exercises, under the supervision of a physical therapist, for at least three months.

Additional training is carried out in front of a mirror, by the patient himself or by parents. The period of physical therapy after surgery lasts six months.

We analyzed and compared the results of surgical techniques for CMT. Up to now, there is still an opinion about whether a cast is needed after surgery? This is one of the problems we mentioned in table 5. In table 5 there is an author similar to ours, with good results even without post-operative treatment including a cast.

Nu.	Author (n. Pat)	Surgical Technique			Post-Operative Treatment					Result			
		Unipolar	Bipolar	Bipolar Z-Plasty	No	Stretch	Cervical collar	Brace	Cast	Excel-lent	Good	Fair	Poor
1	Kamboh [50] (28)	28				S+R				17	6	5	
2	Lim [51] (37)	13	24			S+B				21	12	4	
3	Sudesh [52] (14)			14		S+C				3	7	2	2
4	Shim [53] (32)	14	18			S+B				15	14	3	
5	Shim [54] (47)	37	10			S+B				33	14		
6	Patwardhan [55] (12)			12		S+B				8	4		
7	Patwardhan [56] (12)			12			12			6	2	4	
8	Abokresha [57] (10)		10				10			3	5	2	
9	Farzad [58] (14)		14					14		7	5	2	
10	Jaiswal [59] (1)		1						1	1			
11	Shan [60] (22)		22		22					16	6		
12	Akazawa [61] (35)	35					35				33	2	
13.	Chen [62] (18)	2					2			1	1		
			16				16			7	3	5	1
14	Amemiya [63] (9)	5					9			2		2	1
			4							3		1	
15	Lepetsos [64] (31)		31			S+B				26	6		
16	Sahu [65] (34)	4				S+C				4	2		
			30			S+C				26	2		
17	Cheng [66] (84)	84						84		74		7	3
18	Panigrahi [67] (16)			16		S+R				4	8	2	2
19	Ekici [68] (6)			6			6			3	3		
20	Kashani [69] (14)		14					14		7	5		2

21	Hung This Study (41)			41	41					35	05	1	
22	Hung This Study (32)			32					32	26	05	1	

Table 5: *Surgical technique and post-operative treatment.*

Nu.: Numerical Order; Author [X]: Author (Referent; (n. Pat): number Patients; S+R: Stretch + Rehabilitation; S+B: Stretch + Brace; S+C: Stretch + Collar.

There were 549 patients have operated CTM:

- Surgical techniques: Unipolar: 222 (40.5%), bipolar: 194 (35,3%); and bipolar - Z-plasty: 133 (24.2%).
- Post-operative treatment: No (Neck immobilization was not performed): 63 (11.5%); Stretch + (Brace or collar): 251 (45.7%); Collar: 90 (16.4%); Brace: 112 (20.4%): Cast: 33 (6.0%).
- General result: Excellent: 347 (63.3%); Good: 148 (26.9%); Fair: 43 (7.8%); Poor: 11 (2.0%).

Comparision result of postoperative CMT:

1. Bipolar - Z-plasty: Accepted 89.5% (n = 133 with Excellent 85, Good: 34, Fair: 10, Poor: 4) and other techniques: Accepted 90.4% (n = 416 with Excellent: 262, Good: 114, Fair: 33, Poor: 7). P-valuate: 0.151924. There is no meaning of comparison. But after operation, imposed angle of lateral bending, limitation of rotation, head tilt (ACM angle) (Table 4) and Post-operation to show the column of sternomastoid muscle clearly in operative Bipolar - Z-plasty.
2. Postoperative CMT without/with immobilization: Accepted 98.4% (n = 62; with Excellent 51, Good 11, Fair 1) and with immobilization: Accepted 89.3% (n = 485; Excellent: 296, Good: 137, Fair: 42. Poor: 11). P-valuate: 0.210091. There is no meaning of comparison. But we accepted Shan's opinion. 2020 [60] that "neck immobilization was not performed in all patients after surgery". There is no immobilization after surgery, reducing surgery time and cost.

In this study, we divided into two variants, comparing with and without using a cast position after surgery, clearly, visible sternocleidomastoid column, no rotation restriction. Acceptable final result (Excellent + Good): Variant 1 (35+5) 97.60%/Variant 2 (26+5) 96.90%. P-valuate 0. 0218565 (Table 2 and 3). Therefore, post-operative patients do not need a cast.

Conclusion

The diagnosis and evaluation of CMT requires a systematic team approach with members from the fields of radiology, physical therapy, craniofacial surgery, orthopedics, neurosurgery, and ophthalmology. Patients should only have surgery to release their neck muscles if torticollis persists after one year of age. Post-operative result of no immobilization are reduce surgical time and cost.

Surgical result bipolar-Z-plasty was similar other techniques but to show the column of sternomastoid muscle clearly.

Limitations of the Study

The results of this study have some limitations. First, it is retrospective. Second, patients do not get an initial idea of how often to follow up on the final results. Third, because the time is too long to get the final results with the patient's condition.

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