



## Bipolar release technique in neglected congenital muscular torticollis

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**Congenital Muscular Torticollis (CMT) is the third most common congenital musculoskeletal anomaly. After the age of 5 years, the efficiency of the surgery is controversial. The aim of this prospective study was to report the functional and cosmetic results after bipolar release of the sternocleidomastoid muscle (SCM) in patients older than 5 years of age. Between 2012 and 2015, 8 patients with a mean age of 17.3 years (range, 7-22 years) were diagnosed with neglected CMT and were surgically treated. The bipolar release technique was performed in all patients under general anesthesia. Physiotherapy was started immediately after surgery. Preoperative and final assessment was made again using Lee's scoring system. Patients with congenital muscular torticollis can benefit from surgical treatment even in adulthood. Bipolar release of the SCM muscle should be considered even in adults with irreversible deformities such asfacial asymmetry with low complication rates.**

**Keywords :** Bipolar release ; congenital muscular torticollis ; older children ; sternocleidomastoid.

### INTRODUCTION

The incidence of congenital muscular torticollis (CMT) ranges from 0.3% to 1.9% and it is the third most common congenital musculoskeletal anomaly (3,15). CMT has been well described in literature; it is a condition in which the sternocleidomastoid muscle (SCM) is effectively shortened on the involved side, leading to ipsilateral tilt and contralateral

rotation of the face and chin (4). However, the etiology and pathogenesis of the disease are still a matter of debate. Primary myopathy of the SCM muscle, birth trauma, fibrosis from peripartum bleeds, intrauterine malposition, venous occlusion, infection and ischaemia have been proposed as causative factors (4,14,15).

In patients with poor socio-economic conditions, treatment may not be able to be applied although the presence of CMT is realized by the patient's family. Generally, these cases consult an orthopaedic surgeon in late adolescence (12-18 years) or early adulthood (18-25 years). This form of CMT is severe enough to be addressed by first-line physiotherapy, obviating the need for surgery.

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There are studies in literature suggesting that surgical release of the SCM muscle for neglected CMT patients is still effective for functional improvement, cosmetic purposes and pain reduction (11). However, some studies have reported that improvement in secondary musculoskeletal deformities (facial asymmetry, head tilt and rotational deformities) after surgery is uncertain in patients older than 5 years, and some late complications such as scar and the presence of lateral bands can be encountered (12,13). Therefore, postoperative prognosis is influenced by the timing of surgery, and surgical treatment of CMT before the age of 5 years has been recommended (2,7).

There are different surgical techniques for CMT, the most widely used of which include isolated unipolar or bipolar release, the Fraenkel procedure, and transaxillary subcutaneous endoscopic release of the SCM (5,8). Of these techniques, bipolar release is the most widespread. Even in neglected CMT adult patients with irreversible facial and skeletal deformities, this technique has been shown to restore the range of neck motion and resolves the head tilt, thereby improving the quality of life and cosmesis (1).

The aim of this prospective study was to report the functional and cosmetic results after bipolar release of the SCM muscle in patients older than 5 years of age.

## PATIENTS AND METHODS

Between 2012 and 2015, 12 patients (6 female, 6 male) between the ages of 7 and 22 years (mean age: 16.2 years) with a diagnosis of CMT were surgically treated. Of the 12 patients 4 were lost to follow-up after surgery. In the remaining 8 patients, left -side torticollis was determined in 5, and right-side in 3. All the patients were diagnosed with CMT before the age of 5 years but none had previously received any conservative or surgical treatment. All the patients were checked by both an ophthalmologist and a neurologist to eliminate other non-SCM muscle causes of torticollis. Cervical radiographs and clinical photographs were routinely taken of all patients.

Patients were questioned about any other congenital anomalies such as developmental dysplasia of the hip, scoliosis, pes equinovarus or hydrocephalus but none of the patients had any additional congenital anomaly. All patients were vaginal delivery and cephalic presentaiton.

Preoperative assesment was applied using the functional scoring system of Lee et al., which includes functional and cosmetic ratings (9) (Table I).

Bipolar release of the SCM muscle was the choice of surgery in all patients. Before general anesthesia and muscle relaxants, the SCM muscle origin, extension and insertion were marked. Under general

Table I. — The Lee and Kang scoring system for the assessment of surgical outcomes of congenital muscular torticollis

Overall Results		Excellent (3 Points)	Good (2 Points)	Fair (1 Point)	Poor (0 Points)
Limitation of rotation or side flexion of neck	Functional Scores	0	<10	10–25	>25
Head tilt		No	Mild	Moderate	Severe
Facial asymmetry		None	Slight	Moderate	Severe
Scar	Cosmetic Scores	Fine	Slight	Moderate	Unacceptable
Loss of column		None	Slight	Obvious but cosmetically acceptable	Unacceptable
Lateral band		None	Slight	Obvious but cosmetically acceptable	Unacceptable
Scores		17-18	15-16	13-14	≤12
Dichotomous scale		Successful	Successful	Successful	Unsuccessful

anesthesia, the mastoid insertion was released first, followed by release of 2 distal (clavicular and sternal) insertion sites after the incision had been made in the sternoclavicular region at 1 cm superior to the clavicle to avoid scar formation. The reason for this priority was the possibility of reduction in the tension of the whole muscle after releasing one head of the SCM muscle. Dissection was also easier when the muscle was tense because of the close proximity of the greater auricular nerve which was seen and protected in 3 cases. The region was examined for the presence of any residual band. The layers were closed separately. The skin was closed using subcutaneous sutures. A drain was placed for 24 hours. All operations were performed by the same surgeon.

Patients were instructed to wear an all-day plastazote collar, applied in the correct neck position, for 3 months after surgery to maintain an overcorrected position (Figure 1a). Postoperative early physiotherapy was started immediately including active and passive neck flexion, extension, lateral bending and rotational movements. Physiotherapy was continued for 3 months. Home exercise included stretching exercises for at least ten minutes, four to six times daily for at least 6 months.

The patients were followed up monthly for the first six months after the operation and at 3-month intervals thereafter until the final follow-up examination. Clinical photographs were taken in each visit (Figure 1b-d). The final assessment was made using the functional and cosmetic scoring system of Lee et al (9).

Statistical analysis was performed using SPSS 16.0 software (SPSS Inc., Chicago, Illinois). Conformity of the data to normal distribution was assessed using the Shapiro - Wilks test. Descriptive statistics were stated with mean and standard deviation values. The Dependent t-test was applied to compare pre- and postoperative functional scores. A value of  $p < 0.05$  was accepted as statistically significant.

## RESULTS

The comparisons of the preoperative and postoperative scores are shown in Table II. The

mean follow-up time for the patients was 25.9 months (range, 18-47 months) (Table II). Mean operative time was 40 minutes. There were no intraoperative complications such as neurovascular injury or hematoma. All incisions healed without any scar hypertrophy.

Preoperative and postoperative functional scores according to the scoring system of Lee et al. were compared. The mean functional score increased from  $4.17 \pm 2.17$  preoperatively to  $8.42 \pm 0.79$  postoperatively ( $p < 0.0001$ ). The mean total (functional and cosmetic) postoperative score was  $17 \pm 1.13$  and this was considered as excellent in 6 patients and good in 2 patients (Table 2). No recurrence of the deformity was seen in any of the patients throughout the follow-up period.

## DISCUSSION

This study presents the functional and cosmetic results of bipolar release of the SCM muscle in



**Fig. 1.** — Early postoperative photograph of a patient with plastazote collar (a). Late postoperative (1 year) photographs of the same patient (b-d).

Table I. — The Lee and Kang scoring system for the assessment of surgical outcomes of congenital muscular torticollis

Patient	Age (years)	Gender	Follow-up time (months)	Lee and Kang scoring system, preoperative functional score	Lee and Kang scoring system, postoperative functional score	Lee and Kang scoring system, postoperative total score
1	14	F	24	5	9	17
2	22	F	29	1	7	15
3	7	F	20	3	9	18
4	22	M	19	2	8	16
5	16	M	18	6	9	18
6	21	M	47	5	9	18
7	16	M	38	8	9	18
8	20	F	30	6	8	17
Mean	17.3 ± 5.15		28.1	4.5 ± 2.33	8.5 ± 0.76	17.1 ± 1.13 (excellent)
p Value				0.0004		

neglected CMT patients. The results suggest that bipolar release of the SCM for patients older than 5 years of age with neglected CMT is associated with a high success rate.

Conservative treatment methods such as stretching exercises during infancy and head and neck position in sleep are mostly successful in the treatment of torticollis. However, conservative treatment in the older age group is insufficient. In literature, the timing and technique of surgical treatment modality for neglected CMT patients is still uncertain. However, there are various surgical procedures for CMT and the most common ones are the unipolar and bipolar release techniques (10,16).

Lee et al. surgically treated 33 patients with a diagnosis of neglected CMT using the unipolar release technique (9). The age of patients at operation ranged from 6 to 16 years. Surgery before the age of 12 years was recommended to obtain the most improvement with 71% excellent and good results. Moreover, it was stated that surgery could yield satisfactory outcomes in patients older than 12 years. Correction of the head tilt and improved range of neck movement are the benefits of surgery, but facial asymmetry is unlikely to improve. The scoring system designed by Lee et al for that study was the system used in the current study.

In order to improve the correction rate and cosmetic appearance, Ferkel et al introduced the bipolar technique with distal Z-lengthening (6). The results obtained were 92% good-excellent, however

77% fair results when unipolar or bipolar release technique alone. Of 10 patients, 4 required reoperation in the latter group due to persistent tight bands. An advantage of this procedure is the maintenance of the cosmetically important lower neck sternomastoid column fullness. Although bipolar release technique without Z-lengthening was used in the current study, no cosmetic complaints were observed in the neck region due to loss of column fullness. In addition, no lateral scar tissue band was observed that would require a second surgical procedure in any of the current study patients.

In a study of 31 cases of late presenting CMT, Lepetsos et al. emphasized the importance of surgical release accompanied by orthosis usage and structured physiotherapy (10). Lepetsos et al. choose bipolar release only in severe cases, whereas in the current study, bipolar release was applied to all cases. Unlike Lepetsos, a plastazote collar was used for the current study patients after surgery instead of head halter traction.

There were some limitations to this study. Only the results of bipolar release were evaluated in the study and there was no control group for comparison. Therefore, bipolar release can not be said to be any better than any other surgical technique or conservative treatment. The sample size was small as from the initial 12 patients, 4 were lost to follow-up. However, neglected torticollis is rarely encountered. The study lacked preoperative objective data about the presence of radiological

outcomes such as cervico-mandibular angle, lateral translation of the head and neck, and Cobb's angle of the cervicothoracic spine. The scoring system of Lee et al. was used which focuses more on cosmetic appearance.

The strength of the current study lies in including patients who had not received any previous treatment before the surgery, so it was possible to detect the absolute efficacy of the bipolar technique. All patients were treated with the same standard surgical technique in a single center by the same surgeon. Moreover, in the current study patients were operated in late adolescence and early adulthood, which demonstrated the success of bipolar release at an older age. However, the possibility of increased complications and irreversibility of craniofacial asymmetry in adults should be kept in mind (11).

In conclusion, patients with congenital muscular torticollis can benefit from surgical treatment even in adulthood. Bipolar release of the SCM muscle should be considered even in adults with irreversible deformities such as facial asymmetry. This surgery can improve head tilt and the range of neck motion, thereby improving quality of life. This procedure is an effective method with low complication rates.

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