International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2020): 7.803

# Results of Bipolar Release in Previously Unipolar Release of Congenital Muscular Torticollis

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**Abstract:** ***Purpose: Unipolar release of congenital muscular torticollis (CMT) is common in developing countries like India, Little has been published regarding the management of such patients. The aim of our study was to evaluate the results of bipolar release in these patients. Methods: Over a period of 12 months, total seven patients older than ten years with previously unipolar release of sternal end of congenital muscular torticollis (CMT) were operated on with bipolar release of sternocleidomastoid muscle. Postoperative protocol included head halter traction for three weeks followed by intensive physical therapy. Results were evaluated using a modified version of the system of Lee et al and Tanabe's assessment criteria for torticollis. Results: Clinical and functional results were assessed using modified Lee's scoring system and Tanabe's assessment criteria for torticollis. Results were satisfactory in all the cases except one cases. At an average follow-up of around 12 months (range 6–12 months), excellent results were noted in three patients, good in two, fair in one, and poor in one. Postoperative improvements in range of motion, head tilt, chin deviation and cosmesis were noted in all patients, and these improvements were statistically significant. No surgery-related complications or recurrences requiring surgery occurred in any of the patients. Conclusions:-This study concluded that patients with CMT presenting with previously unipolar release of sternal end definitely benefit from surgery of bipolar release and complication-free method for such patients. We believe that bipolar release is a very viable option for correcting congenital muscular torticollis. The procedure is much more effective than unipolar release or subcutaneous tenotomy and is relatively complication free and safe. Lengthening of sternal head by Z-plasty restores the V-shape of base of neck, which adds to the cosmetic especially in a female patient.***

**Keywords:** Bipoloar Release, Unipolar Release, Congenital Muscular Torticolis

## 1. Introduction

Congenital muscular torticollis (CMT) is the third most common congenital musculoskeletal anomaly after dislocation of the hip and clubfoot [1], with a reported incidence of 0.3–1.9% [2, 3]. There seems to be a slight male preponderance of CMT cases, with a relative ratio of approximately 3: 2 [4]. The right side is more frequently affected [5].

Patients with congenital muscular torticollis present with tilting of the head toward the affected side due to a fibrotic and shortened sternocleidomastoid muscle [1]. Skull and facial asymmetry or plagiocephaly may occur in the presence of prolonged uncorrected head tilt. The characteristic appearance associated with torticollis includes recessed eyebrow and zygoma, deviation of the chin point and nasal tip, inferior orbital dystopia on the affected side, commissural canting toward the affected side, inferiorly and posteriorly positioned ipsilateral ear, and distorted craniofacial skeletal structures [6].

In fact, spontaneous resolution is expected in most patients [5, 7]. In patients over one year of age, corrective surgery has both cosmetic and functional benefits, with the best outcomes being obtained between the ages of one and four [8]. After the age of five, the form and efficacy of treatment are controversial. Some authors have stated that operative treatment is of little value after this age, and the results are even worse when the operation is done after puberty and may lead to more complications [9].

Unipolar release mostly sternal end of congenital torticollis is quite common in developing countries like India, where patients commonly operated at local practitioner. Little has been published on the management of such patients. The aim of our study was to evaluate the results of bipolar release in previously unipolar release. All 7 patients are previously operated around age of 5 to 7 years. All patient developed reoccurrence within 2 years.

## 2. Materials and Methods

Over a period of 12 months, from November 2019 to November 2020.7 cases were operated on for previously unipolar release congenital muscular torticollis. neck deformity in all 7 patients were noticed. Inclusion criteria included age more than ten years presence of unipolar release sternal end and absence of any congenital malformation. Detailed birth and family history data were taken. No pathology that could have been the cause of the torticollis was determined in any of the patients, and there were no other congenital deformities. Preoperative assessment was done for restriction of neck movements, head tilt and facial asymmetry, as per the scoring system of Lee et al. [10].

### Surgical Technique

Bipolar release was performed (i. e., release of both the inferior and the superior head) in all cases. Inferior release was done through an incision 1 cm above the medial third of the clavicle. The clavicular head and sternal head was released completely. The mastoid head was released though an incision just below the tip of the mastoid process. All tight fascial sheaths were released, taking due precaution not to injure any neurovascular structure. carotid sheath not released in any of the cases.

The postoperative protocol included head halter traction for three weeks and physiotherapy, including both active and passive movement. After three weeks, traction was applied during the night only. During the day the patient was put on

a cervical collar. Patients were reviewed every three weeks for three months, six-weekly for one year. At each follow-up, neck range of movement (ROM), head tilt and craniofacial asymmetry were assessed. At the final assessment, postoperative complications (including scarring, loss of sternomastoid column, and lateral bands) were recorded. A scoring system modified from Lee et al. [10], which included function and cosmetic results, was used. An excellent result corresponded to 17–18 points; a good result to 15–16 points; a fair result to 13–14 points; and a poor result to less than 12 points (Table 1). And Tanabe's assessment criteria for functional improvement as excellent, good, fair, poor (Table 2)

## 3. Results

Mean age of the patients was 14.14 years.5 of the patients were boys while 2 were girls, and their ages at presentation ranged from ten years to nineteen years. All of the patients had involvement of the right side.

The mean follow-up for the patients was around 1 year (range 6 months to 12 months). Excellent results were noted in three patients, good in 2, fair in 1, and poor in 1 (Table 3). No surgery-related complications or recurrences requiring surgery occurred in any of the patients. The age of the patient was not found to have any statistically significant relationship with postoperative results.

Postoperatively there was improvement in the functional range of movement in all patients. Restriction of movement was 10–25° in only one patient. Others had movements within normal limits or a restriction of less than 10°. Cosmetic improvement in the form of reduction in head tilt and chin deviation was present in all patients. Postoperative head tilt was mild or fully corrected in ten of the patients, while none had an unacceptable head tilt postoperatively. The V-shape of the neck at the sternum was retained in all 7 patients.

There was no cosmetically unacceptable scar visible at either of the two surgical sites in any of the patients.

Statistically significant improvements in neck ROM, head tilt and facial asymmetry were seen postoperatively (Table 4)

**Table 1:** Scoring system for assessment of congenital muscular torticollis

| Points | Neck movement | Head tilt | Scar | Loss of coloumn | Lateral band | Facial asymmetry |
|---|---|---|---|---|---|---|
| 3 | Full | None | Fine | None | None | None |
| 2 | <10° LOR or side flexion | Mild | Slight | Slight | Slight | Slight |
| 1 | 10°–25° LOR or side flexion | Moderate | Moderate | Obvious but cosmetically acceptable | Obvious but cosmetically acceptable | Moderate |
| 0 | >25° LOR or side flexion | Severe | Unacceptable | Unacceptable | Unacceptable | Severe |

**Table 2:** Tanabe's assessment criteria

| *Grade* | *Functional criteria* |
|---|---|
| Excellent | No complaints, limitation of ROM of the neck, or facial deformity |
| Good | Mild residual limitation of ROM of neck or mild residual facial deformity without complaints |
| Fair | Residual limitation of ROM of neck and residual facial deformity without complaints |
| Poor | Severe limitation of ROM of neck and obvious objective facial deformity, with complaints |

**Table 3:** Results and patient details:

| Patient | Age | Sex | Side | Follow up (months) | Postop score at final follow up | Result |
|---|---|---|---|---|---|---|
| 1 | 13 | M | Right | 5 | 17 | Excellent |
| 2 | 10 | M | Right | 8 | 17 | Excellent |
| 3 | 17 | M | Right | 6 | 13 | Fair |
| 4 | 17 | F | Right | 10 | 11 | Poor |
| 5 | 15 | F | Right | 7 | 17 | Excellent |
| 6 | 12 | M | Right | 10 | 15 | good |
| 7 | 13 | F | Right | 12 | 15 | good |

**Table 4:** Comparative analysis of preoperative and postoperative neck ROM, head tilt and facial asymmetry

| Parameter | Preoperative score | Postoperative score | P value |
|---|---|---|---|
| Neck ROM | 0.71-0.72 | 2.42 | 0.001 |
| Head tilt | 0.92+0.73 | 2.14+0.86 | 0.001 |
| Facial asymmetry | 1.78+0.80 | 2.14+0.66 | 0.025 |

## 4. Discussion

Most cases of CMT resolve completely, either spontaneously within months after birth or following the early initiation of conservative measures such as gentle controlled passive manual stretching exercises on the affected side [5, 7]. Sonmez et al. found that 95% of the patients diagnosed and treated effectively before an age of one year did not need surgical treatment [11].

Conservative management is usually tried before an age of one year. Nonoperative therapy after the age of one year is rarely successful [12]. The goals of surgical correction for older children are improvement in cosmetic deformity and cervical motion. The timing of surgery is controversial. Reversal of the craniofacial asymmetry is best achieved at an early age, when there is high growth and remodeling potential. Canale et al. [12] reported that full recovery offacial asymmetry after four years of age is difficult to obtain. Characteristically, there is flattening of the occiput contralaterally and depression of the malar prominence ipsilaterally, with downward displacement of the ear, eye and mouth on the affected side. Provided that the surgery is done while the patient is immature, these skeletal deformities may improve following surgery [13].

Late presentation and unipolar release of congenital muscular torticollis is quite common in developing countries like India, where many female patients present with cosmetic concerns just prior to a planned wedding. Lee et al. [10] and Minamitani et al. [14] reported that late release of

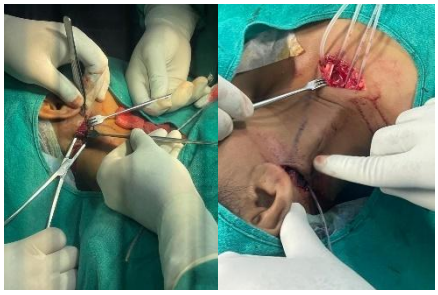
the sternocleidomastoid muscle for patients more than six years of age could yield acceptable results. In a group of patients over the age of 26, Ippolito and Tudisco [15] reported that, although there was no resolution in facial asymmetry, there was improvement in the neck movements of all patients, and there were no complications. In contrast, Coventry and Harris [16] reported that the upper limit for good results after surgery for muscular torticollis is twelve years. Ling [17] also maintains that the benefit of treatment is limited over the age of five, and that the complication rate is high.

In our study, we observed functional and cosmetic improvements in all the patients. Our results of bipolar release of previous unipolar release of sternal end indicate that good results can be obtained in patients treated late provided that optimum surgery and rehabilitation are carried out.

Although there are various surgical procedures for CMT, unipolar and bipolar release are the most popular. Subcutaneous tenotomy is not recommended, as it does not achieve adequate release, while total resection of the sternocleidomastoid muscle—the most effective method in older children—carries the significant risk of injuring the spinal accessory nerve. Bipolar releases are usually used inolder children with a severe deformity. Wirth et al. [18], in a review of 55 patients with an average follow-up of fifteen years after surgical release, recommended that biterminal release should be performed at the age of 3–5 years in all patients who do not respond to nonoperative treatment.

As advocated by Wirth et al., we also believe that bipolar release preserves the normal V contour of the sternocleidomastoid and ensures a better cosmetic outcome.

Preoperative picture of a 17 year old girl with muscular torticolisof right side who has previous unipolar release of sternal end (FIG 1, FIG 2)



Intraoperative picture of bipolar release of muscular torticollis (FIG 3. FIG 4)

The postoperative immobilization protocol for congenital muscular torticollis picture (FIG 5, FIG 6).

Intraoperative bipolar release of muscular torticollis (FIG 3. FIG 4). The postoperative immobilization protocol for congenital muscular torticollis is also controversial (FIG5, FIG6). Postoperative showing good correction of head tilt and improved neck ROM following bipolar release (FIG 7).

The various techniques utilized include traction, cast, halo vest and collar. In the initial days following surgery, the patient has a tendency to keep the head in its former position in order to reduce pain, and compliance with the prescribed exercises is poor. If the head remains in this position, the released structures will regain their former tightness. Gentle cervical traction given immediately postoperatively ensures sustained correction. Once postoperative pain subsides, the patient can be shifted to a collar, and an exercise protocol can be initiated to ensure a satisfactory outcome. We ensured strict adherence to our postoperative protocol in all patients by providing regular follow-up and motivation to ensure a uniformly good outcome.

Though our study does not establish improved outcomes with cervical traction, we strongly believe that postoperative traction and strict adherence to physiotherapy protocol play important roles in helping the patient to overcome the abnormally adjusted position of the head and neck.


Postoperative picture showing good correction of head tilt and improved neck ROM following bipolar release (FIG7)

Facial asymmetry is the most significant factor affecting the cosmetic outcome. We obtained improvements in facial asymmetry in most of our patients. However, the extent of the improvement varied. We also found that the perception of facial asymmetry decreased markedly in the immediate postoperative period, indicating that whatever the bony changes that occur, they usually look compounded by the abnormal soft tissue structures. We believe that surgical bipolar sectioning of the sternocleidomastoid muscle should be considered even in adults with irreversible facial and skeletal deformities. The surgery restores the range of neck motion and resolves the head tilt; it can improve quality of life.

However, there was no correlation between age of the patient or preoperative facial asymmetry and the final outcome. Thus, we believe that surgery should be performed in all cases of previously unipolar release congenital muscular torticollis, One potential limitation of our study was the subjectivity involved in measuring the preoperative and postoperative variables, such as head tilt, neck ROM, facial asymmetry, scar, etc. We also didn't attempt to measure interobserver variability in the measurement, which is a potential drawback of this study.

To conclude, we believe that bipolar release is a very viable option for correcting previously unipolar release congenital muscular torticollis. The procedure is much more effective than unipolar release or subcutaneous tenotomy, and is relatively complication-free and safe when compared to total resection of the sternocleidomastoid muscle. Release of the sternal head restores the V shape of the base of the neck, which adds to the cosmesis, especially in a female patient. Postoperative head halter traction and a well-planned physiotherapy protocol go a long way toward ensuring good to excellent results.

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