Barind Medical College Journal
Abbreviated Key Title: BMCJ
ISSN: 2518-3249 (Print)
https://bmcj.org/index.php/bmcj
Volume-10 | Issue-1 | Jan-Jun, 2024 | DOI: https://doi.org/10.70818/bmcj.2024.v010i01.007

OPEN ACCESS

Original Research Article

Evaluation of the Results of Unipolar Release of Congenital Muscular Torticollis in Children

Md. Shoeb Sarwar Murad[1]*, Md Mahfuzzaman[2], Salauddin Sheikh[3]

[a]Associate Professor, Department of Orthopedic Surgery, Anwer Khan Modern Medical College, Dhaka
[b]Assistant Professor, Department of Orthopedic Surgery, BIHS General Hospital, Dhaka, Bangladesh

[c]Registrar, Department of Orthopedic Surgery, AKMMC

***Correspondence to:**

Dr. Md. Shoeb Sarwar Murad
Associate Professor, Department of Orthopedic Surgery, Anwer Khan Modern Medical College, Dhaka
Email: smurad115@gmail.com

Article History
Received: 12.02.2024
Accepted: 24.04.2024
Published: 30.06.2024

Abstract: ***Background*:** Congenital muscular torticollis (CMT) is a common congenital neck deformity that primarily involves the sternocleidomastoid muscle, causing the head to tilt and rotate. It affects 0.3-1.9% of live births. ***Objective:*** This study aims to evaluate the functional, cosmetic outcomes, and complications of distal unipolar release surgery in children with congenital muscular torticollis, assessing its effectiveness in managing the deformity. ***Methods:*** A quasi-experimental prospective study was conducted at Dhaka Medical College Hospital, NITOR, and BSMMU. Twelve patients, aged 5-12 years, with conservatively treated or untreated CMT, were included. Distal unipolar release of the sternocleidomastoid muscle was performed, followed by regular postoperative physiotherapy. The functional and cosmetic outcomes were evaluated using Lee et al.'s scoring system. Informed written consent was obtained from the parents, and patients were followed up for 3-18 months. ***Results:*** Among the 12 patients (2 boys and 10 girls), 8 had right-sided torticollis and 4 had left-sided. The average follow-up period was 12 months. Preoperative assessment showed a mean functional score of 6.5 out of 9. Postoperative assessment showed excellent and good results in 83.4% of cases (10/12 patients), with 7 patients achieving excellent outcomes and 3 showing good results. The mean postoperative score was 16.4 out of 18, demonstrating significant improvement in both function and cosmesis. ***Conclusion:*** Distal unipolar release is a simple and effective surgical method for correcting CMT in children, providing excellent functional outcomes and aesthetically acceptable scars. The procedure yields high success rates with minimal complications.

Keywords: Congenital Muscular Torticollis, Distal Unipolar Release, Functional Outcome, Cosmetic Outcome, Surgical Treatment.

Cite this as: Murad MSS, Mahfuzzaman M, Sheikh S. Evaluation of the Results of Unipolar Release of Congenital Muscular Torticollis in Children. BMCJ. 2024;10(1):22-28.

Introduction

Congenital muscular torticollis (CMT) is the third most common congenital musculoskeletal anomaly after DDH & clubfoot.[1] It is seen in 0.3-1.9% 0f all live births. The term congenital muscular torticollis (CMT) refers to the neck deformity that primarily involves shortening of the sternocleidomastoid muscle that leads the head to turn toward the affected side and the chin to point to the opposite. Numerous theories have been proposed, but the true etiology of CMT remains uncertain. Variouscauses implicated for CMT includes intrauterine crowding or vascular phenomenon,

fibrosis from peripartum bleeds, compartment syndrome, primary myopathy of the SCM and traumatic delivery.[2] Most cases of CMT resolve completely either spontaneously within months after birth or with conservative measures initiated early, such as gentle controlled passive manual stretching exercises on the affected side. Chang *et al*. found that 95% of patients diagnosed and treated effectively before the age of one year did not need surgical treatment.[3] In patients seen later, surgical intervention should be considered as the treatment of choice in order to avoid further irreversible changes. Surgery is also recommended in patients with residual head tilt, passive rotation deficit or lateral bending of more than 150 at the age of 6 months.[4] The optimal time for surgery is between 1 and 4 years. Coventry and Harris reported that operation up to 12 years of age produced good results and this way supported by similar study. Patients with congenital muscular torticollis can benefit from surgical treatment even in adulthood. Sufficient unipolar or bipolar release of the sternocleidomastoid muscle and intensive postoperative care are expected to yield satisfactory treatment results in patients older than school age, even for those who have finished growth.

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. The type of surgery that produces the best results remains the subject of debate. The most commonly described technique is open myotomy techniques at the upper pole, other authors Kuo *et al*., have upon bipolar tenotomy and recommended radical resection of the sternocleidomastoid muscle to prevent recurrence and a stretching program to avoid the use of a postoperative brace.[5] However, radical resection of the sternocleidomastoid muscle leads to the loss of function and the sternocleidomastoid column. Bipolar release is reported to be superior in older patients with more severe deformity. Division of both sternal and calvicular head of SCM is easy and safe surgical technique for the treatment of CMT of olderchildren and adolescents. It is performed at its origin from the mastoid process when the deformity is so severe that it cannot be corrected by manipulation after unipolar release.[6] If we can recognize that SCM tension will decrease and limitation of the range of motion for the neck will improve, selection of unipolar resection is a surgical option.

The postoperative management of congenital muscular torticollis has consisted of retention in the correct position by means of immobilization is unnecessary if physiotherapy is used Wang *et al*., however, affected children tend to return to the tilted position after surgery out of pain or habit.[7] If the neck returns to this titles position, this cause a scar to from on the contracted sternocleidomastoid muscle that may cause recurrence, meaning that retention in the correct position is requird. Numerous reports have described the postoperative management of congenital muscular torticollis by means of braces or plaster cast immobilization. The aim of this study is to evaluate the effectiveness of distal unipolar release surgery for congenital muscular torticollis (CMT) in children. The specific objectives include assessing functional and cosmetic outcomes, and identifying potential complications in children aged 5-12 years undergoing this surgical intervention.

Materials and Methods

Study Design

This study is a quasi-observational, prospective study aimed at evaluating the outcomes of distal unipolar release surgery for congenital muscular torticollis (CMT) in children aged 5-12 years. The primary objective is to assess functional and cosmetic results and identify potential complications. Data was collected preoperatively, immediately postoperatively, and during follow-up visits. The study was conducted across multiple hospitals, following a standardized surgical procedure, with careful monitoring of post-surgical recovery and long-term outcomes.

Inclusion Criteria

Children aged 5-12 years diagnosed with congenital muscular torticollis (CMT) and admitted for surgical treatment were included in the study. Only children who had either received conservative treatment or remained untreated were selected. Guardians must have provided informed written consent, acknowledging their understanding of the study's procedures and potential risks. Participants were required to comply with prescribed postoperative care, including follow-up visits and

physiotherapy to ensure effective evaluation of surgical outcomes.

Exclusion Criteria

Patients under 5 years or older than 12 years were excluded to focus on the targeted age group. Children with forms of torticollis other than congenital muscular torticollis, such as those with neurological or trauma-related torticollis, were not included. Additionally, patients whose guardians were unwilling to provide informed consent or did not agree to participate in the study were excluded. Children unable to follow postoperative care or with significant health complications were also excluded from the study.

Data Collection

Data was collected using a pre-tested structured questionnaire that included patient history, clinical examination, and diagnostic investigations. Preoperative and postoperative clinical assessments were performed using Lee et al.'s scoring system to evaluate functional and cosmetic outcomes. The primary focus was on the range of motion in neck rotation, head tilt, and facial asymmetry. Postoperative data was collected at regular intervals to monitor recovery, complications, and improvements in both function and appearance.

Data Analysis

Data analysis was conducted using SPSS version 26.0. Descriptive statistics, including means, percentages, and frequencies, were used to summarize demographic characteristics and clinical variables. Preoperative and postoperative scores were compared using paired t-tests to evaluate the efficacy of the surgical intervention. The outcomes were categorized based on Lee et al.'s scoring system, and statistical significance was assessed at a p-value of <0.05. Confidence intervals were calculated to determine the precision and reliability of the results.

Ethical Considerations

This study adhered to ethical standards, with approval from the relevant institutional review boards. Informed written consent was obtained from the guardians of all participants. The study emphasized patient confidentiality, ensuring that all personal data was anonymized and securely stored. Participants were informed of their right to withdraw from the study at any time without consequences. The study ensured that no risks outweighed the potential benefits of participation, and ethical guidelines were strictly followed throughout.

Results

Twelve patients between the ages of 5 and 12 years were surgically treated for CMT during July 2016 & June 2018. There were 2 boys and 10 girls. Out of 12 patients 8 were right sided and 4 were left sided. In preoperative assessment, all patients had some degree of facial asymmetry, head tilt, and decreased range of movement of the neck. The majority of patients had moderate to severe changes in all categories, shown in table 3. Postoperatively, 9(75.0%) of the patients had mild facial asymmetry, 9(75.0%) had no head tilt at follow-up, and 9(75.0%) regained full range of motion of the neck. The cosmetic results are shown in table 5. Of the patients, 9(75.0%) had a very fine scar and 3(25.0%) patients had a slight spreading of the scar and no keloid formation. Only 5(41.7%) patients showed no loss of the sternomastoid column. A lateral band was present in 5(41.7%) of the patients. The final breakdown of results with all these criteria is shown in table 6. 10 (83.4%) of the patients had excellent and good results. The excellent or good results were related to age at operation. This disparity is shown in table 7. When the postoperative results were analyzed according to age at operation, 66.7% of children operated on between ages of 5-7 years had excellent and 33.3% good results. 71.4% found excellent between the ages of 8-10 years. However, only 50.0% of those operated on between ages of 11 and 12 years had only good results. Facial asymmetry tended to resolve fairly quickly in the <10 age group.

Table 1: Distribution of the patients according to age (n=12)

Age(years)	Frequency	Percentage (%)
5-7	3	25.0
8-10	7	58.3
11-12	2	16.7
Total	12	100.0
Mean ± SD	8.08±2.46	
Range	5-12	

Table 1 shows that, 3 patients (25.0%) were within 5-7 years age group, 7 patients (58.3%) were within age group 8-10 years and 2 patients (16.7%) were 11-12 years age group. Mean age 8.08±2.46 *yrs*. n = Total number of patients.

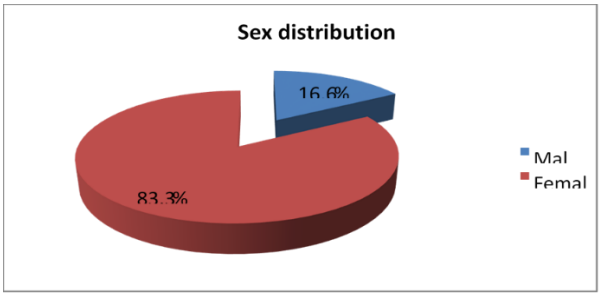

Figure 1: Pie diagram showing the sex distribution of the study subjects (n=12)

Figure 1 shows the sex distribution of the study respondents, it was found that 10 (83.33%) were females and 2 (16.67%) were males.

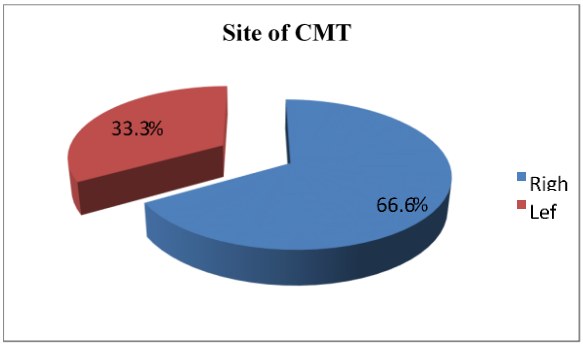

Figure 2: Pie diagram showing the sight of the study subject (n=12)

Figure 2 shows the sight distribution of the study respondents, it was found that 8 (66.67%) were Right CMT and 4 (33.33%) were Left CMT.

Table 2: Scoring system for assessment of Congenital Muscular Torticollis (n=12)

	Functions				**Cosmesis**	
Points	**Facial Asymmetry**	**Neck Movement**	**Head Tilt**	**Scar**	**Loss of column**	**Lateral Band**
3	None	Full	None	Fine	None	None
2	Mild	Limited	Mild	Slight	Slight	Slight
1	Moderate	10-25^0	Moderate	Moderate	Obvious but cosmetically acceptable	Obvious but cosmetically acceptable
0	Severe	>25^0	Severe	Unacceptable	Unacceptable	Unacceptable

According to Lee et al., score system the highest fuctional score is 9 and highest cosmesis score is 9. Lowest functional & cosmesis score both are 0.

Table 3: Lee et al. scoring and grading (n=12)

Score	**Grading**
17-18	Excellent
15-16	Good
13-14	Fair
<12	Poor

Table 4: Preoperative functional assessment showing percentage of patients (n=12)

Functions	**Points**			
	0 (Severe)	1(Moderate)	2 (Mild)	3 (None)
Facial Asymmetry (%)	25	50	25	-
Head Tilt (%)	40	45	15	-
Neck Movement (%)	35	50	15	-

Table 4 shows, preoperative severe facial asymmetry found in 3(25%), severe head tilt in 40% & severe neck movement restricted in 35% patients. Moderate facial asymmetry in 50%, moderate head tilt in 45% & moderate neck movement restricted in 50% patients.

Table 5: Distribution of study populations by complication (n=12)

Complications	**Number of patients**	**Percentage (%)**
Infection	0	0
Spreading scar	3	25
Hypertrophic scar	0	0
Wound gap	0	0
None	9	75
Total	12	100

Among 12 patients, 3 (25%) had spreading scar and 9 (75%) had no complication.

Table 6: Postoperative results (n=12).

Outcome	Number of patients	Percentage	Average age (yr) at operation
Excellent	8	66.7	7.4
Good	2	16.7	10.5
Fair	2	16.7	10.5
Poor	0	-	-

Table 6 shows, 8 (66.7%) patients had excellent result whose average age at operation was 7.4 years. 2 (16.7%) had good and 2 (16.7%) had fair result whose age at operation was 10.5 years.

Table 7: Postoperative results in terms of age (n=12)

Age(yr) at operation	No. of patients	Results			
		Excellent	Good	Fair	Poor
5-7	3	67.0	33.3		-
8-10	7	71.4	14.3	14.3	-
11-12	2	-	50.0	50.0	-

Table 7 shows, 66.7% patients had excellent results in 5-7 years age group, 71.4% patients had excellent results in 8-10 years age group and 50% patients had good results in 11-12 years age group.

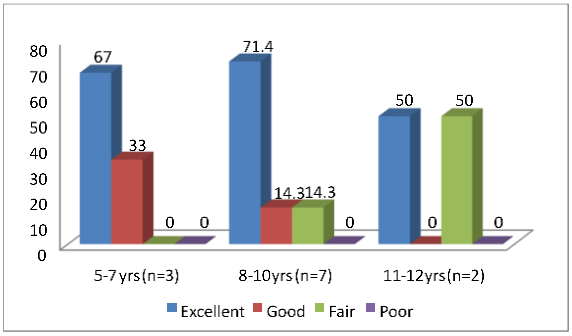

Figure 3: Bar diagram showing the postoperative results according to age group

Discussion

Traditionally, the operative treatment of congenital muscular torticollis has been largely determined by the age of the patient. Although some authors have suggested that operations should be performed within a few weeks of birth Berkowitz *et al*., later reports have shown spontaneous resolution of symptoms within a year of birth or satisfactory results with conservative treatment, such as bracing, exercise and massage.[8] An operation performed too early, particularly before one year of age creates problems in post-operative wound management owing to easier formation of hematomas and increased prevalence of infection. Therefore, some authors have reported that the optimal time for operation is between one and four years of age. Kaplan *et al.* reported that operation up to 12 years of age produced good results and this was supported by.[9] They showed 71% excellent and good results in children less than 12 years of age. Open unipolar tenotomy of the sternocleidomastoid muscle could be followed by tethering of the scar to the deep structures, reattachment of the clavicular head or the sternal head of the sternocleidomastoid muscle, loss of contour of the muscle, failure to correct the tilt of the head, or failure of facial asymmetry to correct. Tethering of the scar to the deep structures is more common in younger patients; therefore, the operation should be postponed until after 4 years of age. The present study showed excellent and good result (83.3%) in children between 5 years and 12 years of age.

The type of surgery that produces the best results remains the subject of debate. The most commonly described technique is open myotomy at the lower pole of the sternocleidomastoid muscle.[10] Kiilerich *et al*., described open myotomy techniques at the upper pole.[11] Other authors Suhr *et al*., have described upon bipolar tenotomy.[12] Bipolar release is reported to be superior in older patients with more severe deformity.[13] If we can recognize that SCM tension will decrease and limitation of the range of motion for the neck will improve, selection of unipolar resection is a surgical option Yuan *et al*., suggest that if unipolar tenotomy is performed completely, good results could be obtained in patients older than 8 years, as is true for bipolar tenotomy.[14] Karmel-Ross *et al*., treated 19 patients (> 6 years of age) surgically by partial resection of sternocleidomastoid muscle and were followed for more than 1 year.[15] They found improvement both function and cosmesis in all cases. Facial asymmetry was improved postoperatively in 86.7% patients. Operative scar was noticeable only in 6(31.6%) patients of them scar of 5 patients descended from the clavicle and could be hidden under clothing. It ascended in only one patient. Lateral band was visible in 74% patients with their heads 'fully bending to the contralateral side and was inconspicuous with their head in neutral

position. The limitation of neck movement improved in all patients.

The present study was done in 12 patients whose age at surgery was between 5 years and 12 years and all patients were treated surgically by unipolar release of sternocleidomastoid muscle and were followed for 3 months to 18 months (average 12 months). Postoperative physiotherapy was started 7th day after operation. We obtained 83.4% excellent and good results by adhering to a fairly rigid scoring system in patients between the ages of 5 and 10 years. The functional criterion showing the biggest gain was that of the range of motion of the neck, with 8 (75.0%) of the 12 patients capable of full range of motions. 8(75.0%) patients showed improvement in terms of facial asymmetry, but all of these patients were younger than 10 years. The most important factor of the resolution of facial asymmetry, we believe, is the potential for growth and remodeling. This explains the poorest results in post pubertal patients. As to cosmesis, the majority of patients had only a fine scar. Loss of the sternomastoid column did not cause a cosmetic problem in most of the patients.

A persistent lateral band was slight in only 5(41.7%) patients, although it was not present in the other 7(58.3%). The persistent lateral band is caused by reattachment of part of the clavicular head of the sternomastoid, and in the more obvious cases, it is associated with mild limitation of range of motion of the neck. Post-operative immobilization of the head and neck in an overcorrected position has been an important principle, and some authors recommended the application of a cast brace along with early exercise. Lee *et a*l. had good clinical results with postoperative bracing and rehabilitation in children older than two years.[16] Lim *et al*., suggested that a long-term Minerva cast could prevent recurrence.[17] Postoperative protocol of Lepetsos *et al*., included head halter traction for three weeks and physiotherapy, including both active and passive movement.[18] 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, and thereafter every six months. At each follow-up, neck range of movement (ROM), head tilt and craniofacial asymmetry were assessed.[19] In this study we used cervical collar brace from the second postoperative day to 6 months until correction was achieved. Postoperative physiotherapy started from 7th POD and continued for about 6 months until satisfactory result was achieved. Although this study has proven that the best results can be expected in children of younger than 12 years, we believe should also be considered in patients older than 12 years as well. The latter patients benefit from correction of head tilt and gain increased range of neck movement, but facial asymmetry is unlikely to improve.[20]

Conclusion

Present study encourages the surgical treatment of congenital muscular torticollis by distal unipolar release. It is s very simple method for correction of deformity, good functional outcome and providing aesthetically acceptable scars in children. Unipolar release for CMT should be popular in surgeons. Similar study should be performed on more advanced age group. Similar type of study should be performed on large sample size. Follow up of similar type of study should be done in longer period.

Funding: No funding sources.

Conflict of Interest: None declared.

Ethical Approval: The study was approved by the Institution of Ethics Committee.

References

1. Carenzio G, Carlisi E, Morani I, Tinelli C, Barak M, Bejor M, Dalla Toffola E. Early rehabilitation treatment in newborns with congenital muscular torticollis. Eur J Phys Rehabil Med. 2015 Oct 1;51(5):539-45.
2. Hardgrib N, Rahbek O, Møller-Madsen B, Maimburg RD. Do obstetric risk factors truly influence the etiopathogenesis of congenital muscular torticollis?. Journal of Orthopaedics and Traumatology. 2017 Dec;18:359-64.
3. Chang SH, Ohtori S, Okawa A, Kawamura K, Saiki H, Nakada I, Shimada T, Nakamura J, Takahashi K, Sugiyama H. A surgical treatment for adult muscular torticollis. Case Reports in Orthopedics. 2013;2013(1):965693.
4. Keklicek H, Uygur F. A randomized controlled study on the efficiency of soft tissue

mobilization in babies with congenital muscular torticollis. Journal of Back and Musculoskeletal Rehabilitation. 2018 Jan 1;31(2):315-21.
5. Kuo AA, Tritasavit S, Graham Jr JM. Congenital muscular torticollis and positional plagiocephaly. Pediatrics in review. 2014 Feb 1;35(2):79-87.
6. Kim HJ, Ahn HS, Yim SY. Effectiveness of surgical treatment for neglected congenital muscular torticollis: a systematic review and meta-analysis. Plastic and reconstructive surgery. 2015 Jul 1;136(1):67e-77e
7. Wang JL, Qi W, Liu YJ. Endoscopic release of congenital muscular torticollis with radiofrequency in teenagers. Journal of Orthopaedic Surgery and Research. 2018 Dec;13:1-6.
8. Berkowitz MR. Osteopathic approach to treating a patient with congenital infantile torticollis reveals unusual presentation of absence of concomitant cranial base strain pattern: A case report. International Journal of Osteopathic Medicine. 2017 Sep 1;25:46-8.
9. Kaplan SL, Sargent B, Coulter C. Congenital muscular torticollis. Campbell's Physical Therapy for Children Expert Consult-E-Book. 2016 Dec 20:184.
10. Lepetsos P, Anastasopoulos PP, Leonidou A, Kenanidis E, Flieger I, Tsiridis E, Macheras GA, Leonidou O. Surgical management of congenital torticollis in children older than 7 years with an average 10-year follow-up. Journal of Pediatric Orthopaedics B. 2017 Nov 1;26(6):580-4.
11. Kiilerich B. The head posture of Alexander the Great. Acta ad archaeologiam et artium historiam pertinentia. 2017;29(15 NS):1-23.
12. Suhr MC, Oledzka M. Considerations and intervention in congenital muscular torticollis. Current opinion in pediatrics. 2015 Feb 1;27(1):75-81.
13. Ekici NY, Kizilay A, Akarcay M, Firat Y. Congenital muscular torticollis in older children: treatment with Z-plasty technique. Journal of Craniofacial Surgery. 2014 Sep 1;25(5):1867-9.
14. Yuan B, Qu F, Zhao G, Wang J, Shen X, Liu Y. Arthroscopic surgical treatment for neglected congenital muscular torticollis in adults. Journal of Craniofacial Surgery. 2015 Mar 1;26(2):512-5.
15. Karmel-Ross K. Torticollis: Differential Diagnosis, Assessment and Treatment, Surgical Management and Bracing. Routledge; 2013 Jul 4.
16. Lee GS, Lee MK, Kim WJ, Kim HS, Kim JH, Kim YS. Adult patients with congenital muscular torticollis treated with bipolar release: report of 31 cases. Journal of Korean Neurosurgical Society. 2017 Jan 1;60(1):82-8.
17. Lim KS, Shim JS, Lee YS. Is sternocleidomastoid muscle release effective in adults with neglected congenital muscular torticollis?. Clinical Orthopaedics and Related Research®. 2014 Apr 1;472(4):1271-8.
18. Lepetsos P, Anastasopoulos PP, Leonidou A, Kenanidis E, Flieger I, Tsiridis E, Macheras GA, Leonidou O. Surgical management of congenital torticollis in children older than 7 years with an average 10-year follow-up. Journal of Pediatric Orthopaedics B. 2017 Nov 1;26(6):580-4.
19. Hung NN. A comparison of outcome of age at time surgery between younger and older than 8 years old in children with congenital muscular torticollis. Open Access Library Journal. 2017;4(11):1.
20. Panigrahi R, Sahu B, Samant S. Management of neglected cases of congenital muscular torticollis with bipolar release. Int J Res Orthop. 2016 Oct;2:400-3.