

Effect of Institutional Based Physiotherapy Protocol on Cervical Active Ranges, Shoulder-To-Neck Posture and Oro-motor Functions in Congenital Muscular Torticollis with Unilateral Upper Limb Arthrogyrosis: A Rare Interesting Case Report

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ABSTRACT

Introduction: Congenital muscular torticollis (CMT) is a deformity result of unilateral shortening of the sternocleidomastoid muscle. Arthrogyrosis Myogenic Congenita (AMC) i.e. amyoplasia is rare combination along with CMT in present case. To date no set protocol for the number of sessions, duration, frequency or dosage of the intervention mentioned and no study report about oro-motor dysfunction in children with CMT.

Material and Methods: A 2year 8month old male child with congenital CMT and right upper limb arthrogyrosis was evaluated in high sitting position for cervical active, shoulder neck angle was measured and external auditory meatus to acromion distance was measured. The oromotor dysfunction was evaluated subjectively by structured questionnaire and severity of affection was graded. Follow up evaluation was performed after 2weeks, 4weeks and 8weeks of treatment protocol and data was obtained for comparison.

Data analysis and Results: SPSS version 10.0 was used for analysis. The data were compared first day of evaluation with 2weeks, 4weeks and 8weeks post intervention protocol for cervical active range of motion, ear-to-shoulder distance, and shoulder-neck angle along with grades of severity of oro-motor affection. There was improvement in active cervical ranges as well as shoulder neck angle and ear to shoulder distance reached to symmetry at the end of 8weeks treatment protocol. The oro-motor functions also reached to normal at 8weeks of treatment.

Conclusion: The 8weeks institutional based Physiotherapy treatment protocol was effective in improving active ranges of cervical spine, symmetry in shoulder-to-neck posture as well as improve oro-motor functions to normal.

Key words: Congenital Muscular Torticollis, Arthrogyrosis, Goniometry, Physiotherapy, Intervention Protocol, Oro-Motor Function.

INTRODUCTION

Congenital muscular torticollis (CMT) is a deformity which is congenital or acquired in origin, characterized by lateral inclination of the head to shoulder, with torsion of the neck and deviation of the face.¹ CMT is a common postural and muscular disorder occurring at or shortly after birth³ it is also known as wry neck or twisted neck.^{2,3} CMT is a form of infantile torticollis that is clearly distinguished in the literature from non-muscular congenital causes of torticollis.⁴ CMT result of unilateral shortening of the sternocleidomastoid (SCM) muscle which is caused by fibromatous contracture of SCM muscle and its shortening causes head tilt toward the ipsilateral side and chin rotation to the opposite side.²⁻⁶

The congenital muscular torticollis (CMT) is the third most common congenital musculoskeletal anomaly after dislocation of the hip and clubfoot.^{2,7} CMT affects 0.3% to 2% of newborns and infants with the

incidence as high as 16%.^{2,6-8} The incidence of CMT in studies of infants at a few days of age to three months and 12 months old, has been reported at 16%, 1.9% and 1.3%, respectively.⁴ The etiology of CMT remains unknown; however, the most widely cited theories are intrauterine fetal constraint, birth trauma, infection, ischemia and postnatal positioning.^{4,6,8} with a slightly male predominance (ratio of 3:2) and is more common on the right side.⁷

Among different types of CMT, sternomastoid tumour (SMT), in which a palpable sternomastoid lump or tumour is present; and muscular torticollis (MT), where there is muscle tightness but no tumour or pseudo-tumour, sternocleidomastoid imbalance or postural CMT (POST), is described, which involves a weakness of one SCM muscle rather than muscular tightness or tumour.⁴ Postural torticollis usually has decreased active range of motion (ROM) but normal passive ROM, whereas torticollis with SCM involvement and kinetic imbalance due to suboccipital strain (KISS) show decreased active and passive range of motion (ROM).⁹ CMT has been associated with dysfunction in the upper cervical spine and is sometimes referred to as KISS.² A positional torticollis, which is rarely seen, caused by a functional disturbance of the joints in the cervical spine.⁴ The characteristics of CMT, and their responsiveness to treatment, change depend upon the age of the infant.⁴

The clinical diagnosis of CMT varies across studies, depending on the reference values for normal range of neck motion that are applied, for example, few studies use 70° passive neck rotation and 60° passive lateral flexion as normative values, whereas some use up to 120° for passive neck rotation and up to 90° for passive lateral flexion.^{3,4} Clinically many criteria's are used for diagnosis such as restriction in passive cervical rotation is most commonly used, but restriction in active cervical motion, passive lateral flexion and lateral head righting may also be used, evaluation of symmetric head posture, the thickness of the

SCM muscle or any of the above.⁴ The severity of CMT may be derived by examining absolute measures of the parameters on both sides, or comparing the difference in measurements between the left and right sides.⁴ If torticollis remains untreated for even a few years, contractures may result into prolonged twisted position of the neck may lead to compensatory changes of adjacent skeletal structures as well as long-term craniofacial asymmetry may persist or increase in severity.² also may affect dental occlusion, visual field development and cosmesis which overall can cause secondary changes like functional problems, including breastfeeding problems and oro-motor dysfunction like difficulty in feeding, chewing, drinking, swallowing etc.^{2,4,5} There is also concern about CMT due to association with developmental dysplasia of the hip, brachial plexus injury, foot or lower limb anomalies, cognitive and motor development.²

Early diagnosis and Physiotherapy is necessary to improve the deformity.⁵ Treatment of CMT is mainly conservative, consisting of parents/ caregivers education (about measures of environmental modification, positioning, and home exercises) and physical therapy techniques.⁷ There is strong evidence that earlier Physical therapy intervention is more effective than intervention started later.⁸ Treatment techniques available are including an array of manual therapies^{2,4} infant positioning and handling⁴ i.e. repositioning therapy (including tummy time)² exercises and active movement, soft neck braces, acupuncture, taping and electrotherapy- electric stimulation therapy, passive and active stretching² of hypertonic SCM muscles, massage, strengthening of weak neck and trunk muscles, symmetric movement and positioning and environmental adaptations.^{2,4,8,9} Irrespective of the technique that is employed, there is no set protocol for the number of sessions required, or the duration, frequency or dosage of the intervention.⁴ For example, the reported protocol of stretching for the

shortened SCM muscle varies in repetitions per session, duration of holding at end range and frequency of treatment.⁴ Manual stretching is the most common evidence-based treatment for congenital torticollis.⁹

Exercise movement therapy is purposeful to enable symmetrical weight bearing in sitting, and symmetrical trunk mobility in sitting, crawling and walking which include developmental exercises, which stimulate righting reactions in upright and lying postures, and involve visual and auditory tracking to prompt head turning.⁴ A soft collar or tubular orthosis may be provided for children and babies over four months of age in order to support the head into a neutral position which they should only be used when the patient is awake, and may not be well tolerated when breastfeeding.⁴

Further, some of the literature states that non-surgical, non-pharmacological interventions are only effective for CMT for the population aged from birth to 12 months, while other studies report good results up to the age of two years.⁴ The results for CMT showed that manual therapy in the form of practitioner-led stretching had moderate favorable evidence for increased range of movement.² Advice, guidance and parental support were recommended to reassure parents of the favorable trajectory and nature of these conditions over time.² Practitioner-led stretching was low risk, potentially helpful and inexpensive interventions for parents to consider.² In response to parental concerns that manual stretching elicited stress responses for their infants with CMT observed infants crying during manual stretching.⁶ In study, it was found that the physical stiffness of the fibrotic mass was reduced and the cervical ROM was restored in infants with CMT after 3 months of physical therapy, despite a still-thickened SCM mass.³

Among rare condition such as Arthrogyrosis Myogenic Congenita (AMC), the most common type is amyoplasia.¹⁰ Amyoplasia is a sporadic

condition, its genetic cause is still unknown.^{10,11} The exact etiology is also unknown, but among a number of factors, foetal akinesia is a prevalent factor in developing AMC.^{10, 12} The prevalence of AMC is 1 in 3000 live births.^{10,12} Arthrogyrosis of the upper extremity is easy to diagnose.¹³ Individuals born with these conditions exhibit multiple joint contractures in at least two different body areas, including the upper and lower limbs, spine and jaw.¹² The degree of involvement in the upper limb varies from those at one end of the scale whose limbs are almost totally involved to those in whom only the fingers are affected.^{11,12} The classical picture consists of a wasted-looking shoulder with limited abduction and lateral rotation, an elbow that is rigid in flexion or full extension^{11,12}, a wrist fixed in flexion, and variable stiffness of the fingers.¹¹ The thumb is often small and clutched into the palm.¹⁴ Deltoid, biceps, and forearm muscles are commonly inactive and the whole arm has a featureless, tubular shape and may either be very thin.¹⁴ Amyoplasia, is a combination of decreased muscle mass and joint contractures with some distinct characteristics; typically the shoulders are adducted and internally rotated, the elbows are extended and the wrists are flexed and ulnarly deviated.¹⁰ Sometimes the upper limb involvement shows flexion contracture at the elbows and wrists.^{11,12} The thumb is usually adducted and flexed in a palmar direction. The small joints of the fingers are stiff, and frequently the fingers are ulnar deviated.¹³ The overall intelligence is normal and there is no major malformation in the central nervous system, heart, gastrointestinal tract, and genitourinary system in patient with amyoplasia.¹¹

The combination of contractures and muscular weakness makes activities such as self-feeding, reaching the face and handling objects difficult or impossible.¹⁰ The goal in treating upper extremity deformities in Arthrogyrosis is to provide one extremity that can be brought to the mouth for feeding and hygiene and one that can be used to

push up from a sitting position or to be used with a crutch if necessary.¹³ The wrist, shoulders, and fingers rarely respond, in childhood, to formal exercise programs which have a very limited use because the child rapidly becomes bored and soon abandons the whole idea whereas if exercises are constructed into a game or some form of sport, they are much more likely to be accepted such as swimming is most valuable in this regard and should be encouraged from an early age.¹⁴ There was a similar level of perceived happiness between children/adolescents with congenital upper extremity conditions compared to the normal pediatric population based on pediatric outcomes data collection instrument (PODCI) scores.¹⁵

In literature, it was found that Arthrogryposis (amyoplasia) is rare congenital condition for unilateral upper limb whereas CMT is so commonly observed in children but combination of these two conditions will be the rare most combination to manage in the field of pediatric rehabilitation. This single case study gives treatment protocol to manage such rare combination of physical conditions together. To date protocol followed for physical therapy to manage condition like congenital muscular torticollis is not yet documented regarding repetition or frequency of Physiotherapy intervention⁴, as well as it is unknown about how an effect of eight weeks institutional based physiotherapy treatment protocol on rare combination of condition i.e CMT with upper limb Arthrogryposis (amyoplasia) on neck ranges, shoulder to neck symmetry as well as on oromotor functions. This rare combination makes this case study more challenging and interesting for author.

MATERIAL AND METHODS

A single case study with 8 weeks intervention follow up was performed. A 2 year 8 month male child, visited out-patient department of neurosciences in a month of August 2019. As per information received from mother, child was born through C-

section delivery at 39 week of gestation (birth weight 2.40 kg and height 50cm). When the boy was approximately 1 month old, his pediatrician noted neck posture in right rotation, right lateral flexion (congenital torticollis) with thick mass in neck muscle (right sternocleidomastoid) and at age of 3 months diagnosed Arthrogryposis for right upper limb. Left upper limb and bilateral lower limb showed no abnormality/deformity.

At the time of assessment, his right shoulder appeared tight and inflexible. His mother did not know what type of torticollis it was. He was a “quiet” baby and slept well; he crawled at 11 months, his sitting and standing history was unclear, and he started walking at 15 months. Child was cognitively sound, following all verbal and motor commands well. He was left-handed when performing gross motor movements (eg. handling objects, throwing and catching a ball). Mother was complaining that child always keep head tilted to right side and rotated to right side since birth and there was difficulty in feeding, chewing food, drinking water, stasis of food in cheeks and mouth as well as drooling of saliva from mouth while feeding due to neck deformity (torticollis along with right upper limb Arthrogryposis).

As per mother, child had received Physiotherapy treatment on out-patient department basis for 8 days duration at hospital immediately after 1month of delivery and went home town with home exercise program but due to unavailability of Physiotherapy facilities at rural area, continued with unsupervised home stretching program for neck by mother. Mother reported that since birth child had wry neck to right side and pediatrician advised neck movement for sternocleidomastoid mass on right side and was advised regular neck muscle stretching exercise program at home. Mother reported cry while performing passive neck movements in child at home hence could not performed effectively on regular basis. Masseur was used to perform massage for

neck and right upper limb for first 6 month of life at home. On follow up at age of 2 year 6 month, pediatrician advised regular supervised Physiotherapy treatment program for uncorrected cervical deformity as well as noted significant feeding difficulty and oro-motor dysfunctions. There was no pathology in the other visceral system.

In present case, on first day of evaluation, there were contractures of right side neck and upper limb with scapular (elevation-protraction), shoulder (adduction-internal rotation), elbow flexion, forearm pronation, thumb adduction, wrist and hand fingers in flexion and ulnar deviation (i.e. the hook appearance of the hand).

Institutional ethical committee approval was taken. Permission from institutional head and head of department of Neurosciences was obtained. Consent was obtained from parents. On first day of assessment, the neck flexion/extension, rotation and lateral flexion were assessed using goniometry as well as by still photography and a computer program calculating total six cervical ROM (flexion/extension/side flexion to right and left/rotation to right and left) angles at day

of evaluation, 2 weeks,4 weeks and 8 weeks post intervention for cervical muscular torticollis (CMT) and tailored institutional Physiotherapy treatment protocol was prepared for the case including various Physiotherapy treatment approaches explained in detail in Table 1.

In the preparation of protocol, one pediatric neuro-therapist was involved having more than 10 years of clinical and teaching experience in the field of pediatric rehabilitation. Institutional based Physiotherapy treatment protocol prepared on the basis of clinical experience and routine treatment followed in institution for congenital torticollis which incorporates electrotherapy (ultra sound therapy), cervical muscles stretching protocol, various manual therapy techniques and use of custom made cervical semi hard collar.

Child was evaluated in detailed on first day of evaluation with demographic data and characteristics (Table 2). As well as for cervical joint range of motion with half circle universal goniometer (flexion, extension, side flexion (right and left), and rotation to right and left)[Figure 1 and Table 3].



Figure 1: Half Circle Universal Goniometer



Figure 2: Measuring Tape

Ear to shoulder (i.e. external auditory meatus to acromion process) distance was documented on either side using measuring tape [Figure 3 and Table 4]. Shoulder neck angle was measured on both sides with goniometer [Table 5]. Oromotor function was evaluated by using direct close ended questions subjected to mother for oromotor functions(like on Self Feeding/ eating, Drooling, Stasis of food, Drinking liquids, Brushing teeth) and degree of severity of oromotor dysfunction /response was recorded on scale i.e. normal function, mild affection, moderate affection and severe affection.(Table 6) Prior X-ray cervical spine was considered to evaluate structural changes in cervical spine (both AP and Lateral view) and no bony abnormality expect change in cervical spinal right lateral deviation noted by institutional radiology expert. Every two weeks still photographic follow up was kept to regulate progression of treatment (i.e. at end of 2week [Figure 4(a)], 4weeks [Figure 4(b)] and at end of 8week [Figure 4(c)] and data was obtained.



Figure 3 [08/08/2019]



Figure 4 (a) [27/08/2019]



Figure 4 (b) [09/09/2019]



Figure 4 (c) [08/10/2019]

Figure 3: Shoulder Neck Posture On First Day Of Evaluation, Figure 4(a): Shoulder Neck Posture After 2 Weeks Of Protocol, 4 (b): Shoulder Neck Posture After 4 Weeks Of Protocol, 4 (c): Shoulder Neck Posture After 8 Weeks Of Protocol

This child with congenital muscular torticollis on right side and amyoplasia (Arthrogyrosis) of right upper extremity received 6 sessions per week of Physiotherapy institutional based protocol administered for 40–50 minutes without observed pain. Specific palpation and stretching techniques addressed restricted tissue areas of neck, head and right upper extremity. Oro-Motor development was assessed on first day, 2weeks, 4 weeks and 8 weeks of post intervention of institutional based protocol.

Table 1: Institutional based 8 weeks Physiotherapy treatment protocol for congenital torticollis.

Treatment week	Mode Of Treatment (1* to 12*)	Methods and Area Of Treatment	Frequency, Duration And Intensity
First and second week	^{1*} Parent Education	About Cause And Severity Of Torticollis	Precautions To Avoid Further Contractures
	^{2*} Positioning In Prone	During Sleep In Prone To Adopt Correct Positioning	Maintained In Opposite Side Head Rotation And Side Flexion During Day And Night Time.
	^{3*} Massage: Kneading Technique And Manual Stretching Technique With MFR-Myofascial Release Technique.	To Bilateral Trapezius, Sternocleidomastoid And Levator Scapulae.	3 Repetition/ 60 Seconds Hold Each
	^{4*} Pulsed Therapeutic Ultrasound Therapy	Proximal 1/3rd Of Sternocleidomastoid (SCM) Mass Right Side	6 Days/Week Frequency: 3MHz, Duration: 6min, Intensity: 1mv
	^{5*} Cervical Orthosis	Semi Hard Cervical Collar	Duration: Night Splinting, And Most Of The Time In A Day (30min Break In Every 3hrs).
Third And Fourth Week	As Above (^{1*} To ^{5*})	As Above	As Above
	^{6*} Active Assisted Movements At Neck At Available ROM	All Neck ROM	10 Repetitions Each ROM
	^{7*} Advice Home Exercise Stretching Program	(All Neck ROM) By Parents	3 Repetition/ 60 Seconds Hold Each (Twice A Day)
	^{8*} Strengthening Program With Manual Resistance	Progressive Resistance To Neck Muscles	Repetition :3 Times Frequency: 1 Time/Day Intensity : Submaximal Efforts
Fifth And Sixth Week	As Above (^{1*} To ^{5*})	As Above	As Above With No Use Of Cervical Collar During Day Time
	^{9*} Active Movements At Neck At Available ROM	All Neck ROM	10 Repetitions Each ROM
	^{10*} Hold Relax Technique To Improve Strength And Length Of Neck Muscles	On Sternocleidomastoid , Trapezius And Levator Scapulae On Right Side	Repetition :3 Times Frequency: 1 Time/Day Intensity : Submaximal to maxima Efforts
Seventh And Eighth Week	As Above (^{1*} To ^{5*})	As Above	As Above
	^{11*} Resisted Movements At Neck At Available ROM	On Sternocleidomastoid , Trapezius And Levator Scapulae On Right Side	Repetition :3 Times Frequency: 1 Time/Day Intensity : Maximal Efforts
	^{12*} Hold Relax Technique To Improve Strength And Length Of Neck Muscles	On Sternocleidomastoid , Trapezius And Levator Scapulae On Right Side	Repetition :3 Times Frequency: 1 Time/Day Intensity : Maximal Efforts

DATA ANALYSIS

SPSS version 10.0 was used to analyze the data. The data was entered in excel sheet and difference in data were compared with first day of evaluation with 2 weeks, 4weeks and 8 weeks post intervention protocol for cervical active range of motion (ROM) in degrees, ear to shoulder distance in centimeters, and shoulder neck angle in degrees. The grades of severity of oro-motor affection was compared with first day of evaluation with 2weeks, 4weeks and 8 weeks post

intervention treatment protocol as per grading system (Normal , Mild, Moderate And Severe).

RESULTS

The demographic data of age, height, weight, head circumference and characteristics of mode of delivery is given in Table 2. It is indicated that child was born preterm with low birth weight whereas presently showed height and weight within normal limits (percentile) for his age, which is indicative of near normal growth pattern.

Table 2: Characteristics and Demographic data of child at birth and on the first day of evaluation

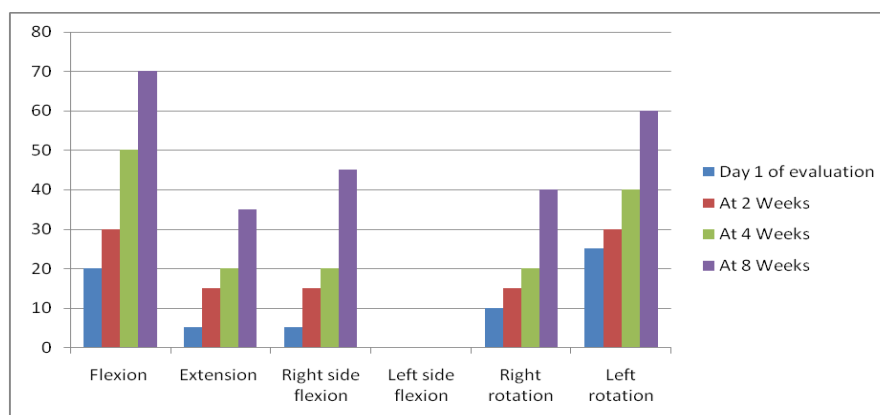
Sr. No.	Characteristic and Demographic data	At birth	On the first day of evaluation
1.	Age (years/month/weeks)	39 weeks of gestation	2 year 8 month
2.	Height (cm)	48	96
3.	Weight (Kgs)	2.40 Kgs	14.50 Kgs
4.	Head circumference (cm)	Not available	44
5.	Type/mode of delivery	C-section	Not Applicable

As the protocol advances there is improved cervical active range of motion from the first day of evaluation to 8 weeks of intervention. It is also observed that there is increase in all cervical active range of motion. The cervical flexion increase by 50 degrees (from 20 to 70 degrees), extension increase by 30 degrees (from 5 to 35 degrees), right side flexion increase by 40 degrees (from 5 to 45 degrees), left side flexion reaches to neutral from 45 degrees of right side flexion i.e. increase by 45 degrees, right rotation increase by 30 degrees (from 10 to 40 degrees) and left rotation increase by 35 degrees (from 25 to 60 degrees) (Table 3)

Table 3: Cervical active range of motion (ROM) at first day of assessment and after 2 weeks, 4weeks and 8 weeks.

Cervical Active Range Of Motion (ROM) (From *Starting Position)	First Day Of Assessment (In Degrees)	After 2 Weeks (In Degrees)	After 4 Weeks (In Degrees)	After 8 Weeks (In Degrees)
Flexion	20	30	50	70
Extension	5	15	20	35
Right Side Flexion (difference)	40 to 45 (5)	30 to 45 (15)	25 to 45 (20)	0 to 45 (45)
Left Side Flexion	Not Possible	Not Possible	Not Possible	0
Right Rotation	10	15	20	40
Left Rotation	25	30	40	60

*Starting position: High sitting on small stool and feet stable on ground, neck side flexed to right at 45 degrees and 45 degrees of neck rotation towards left side.

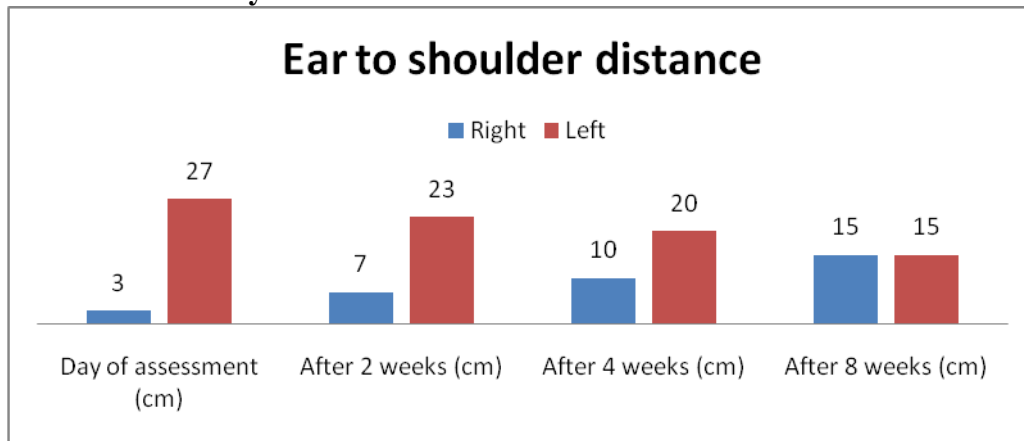


It is observed that, as active neck ranges improves, acromion to EAM distance reached to bilateral symmetry (15 cm) in 8 weeks from 3cm distance on right and 27 cm distance on left side on first day of evaluation (Table 4) of institutional based treatment protocol.

Table 4: Ear to shoulder distance (External Auditory Meatus To acromion process) on first day of evaluation and after 2 weeks, 4weeks and 8 weeks follow up.

EAM to acromion distance	First Day of assessment (cm)	After 2 weeks (cm)	After 4 weeks (cm)	After 8 weeks (cm)
Right side	3	7	10	15
Left side	27	23	20	15

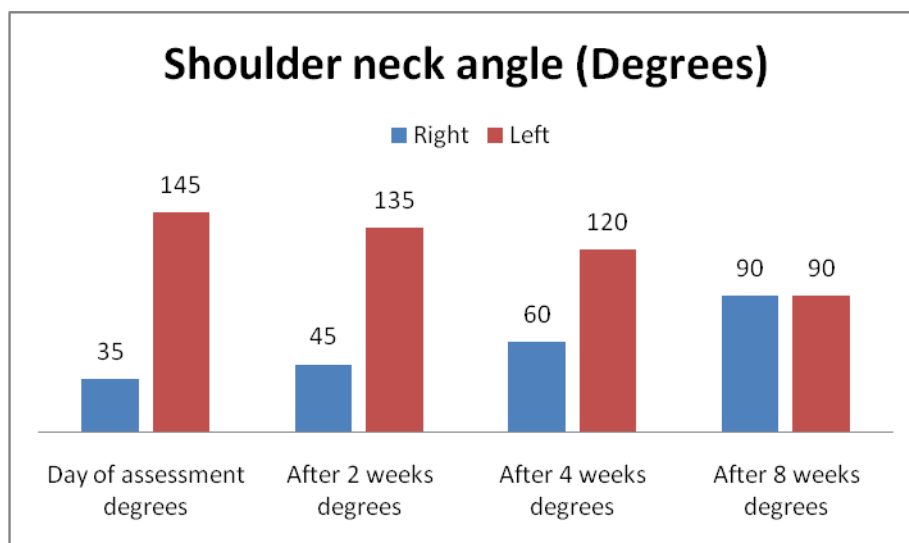
EAM- External Auditory Meatus



From table 5, the shoulder neck angle measured by using goniometer indicate that as the shoulder neck angle reached to more equal bilaterally (90 degrees each) at the end of 8 weeks institutional based treatment protocol.

Table 5: Shoulder neck angle at rest at first day of assessment and after 2 weeks, 4weeks and 8 weeks follow up.

Shoulder neck angle (Degrees)	First Day of Evaluation(Degrees)	After 2 weeks (Degrees)	After 4 weeks (Degrees)	After 8 weeks (Degrees)
Right	35	45	60	90
Left	145	135	120	90



As reported by mother, on first day of evaluation child was having mild difficulty self feeding and mild drooling of saliva difficulty, had moderate difficulty of stasis of food and

while drinking liquids, whereas showed severe difficulty while brushing teeth. From Table 6, it can be stated that as protocol advances the child reached at normal oro-motor functions at the end of 8 weeks treatment. This can be stated that as neck active movement increases and shoulder to neck posture reached to symmetry in child, the oro-motor function also improves and attain to normal functions.

Table 6: The severity of difficulty of oro-motor functions at first day of assessment and after 2 weeks, 4weeks and 8 weeks follow up.

Oro-Motor Functions (Severity Of Difficulty)	On First Day Of Evaluation	After 2 Weeks	After 4 Weeks	After 8 Weeks
Self Feeding/ Eating	Mild	Normal	Normal	Normal
Drooling	Mild	Mild	Moderate	Normal
Stasis Of Food	Moderate	Mild	Mild	Normal
Drinking Liquids	Moderate	Mild	Mild	Normal
Brushing Teeth	Severe	Moderate	Moderate	Normal

Degree of severity: Normal-(Not present), Mild, Moderate, Severe.

Hence, it can be concluded that after 8 weeks of institutional based Physiotherapy treatment protocol, the cervical active range of motion increases, ear to shoulder distance and shoulder neck angles reached to more symmetry bilaterally, the oro-motor function also reached to normal after 8 weeks of institutional based treatment protocol.

DISCUSSION

The aim of present case study was to establish institutional based protocol for Physiotherapy treatment for CMT as well as to evaluate effect of treatment protocol on oro-motor dysfunction in a case of right congenital muscular torticollis along with right upper limb Arthrogyrosis in child of age 2 years and 8 months.

It was observed that as the treatment protocol progresses from the day of evaluation to 8th week, the active cervical ranges improves as well as achieve symmetry in neck in regards of shoulder neck angle and shoulder to ear distance. The oro-motor dysfunctions² improves to normal for child who was having severe difficulty in brushing teeth, moderate difficulty with stasis of food in mouth and drinking liquids and mild difficulty in self feeding and drooling of saliva. This proposed that the institutional based Physiotherapy treatment protocol for CMT (Table 1) is significantly effective to achieve normal oro-motor functions in child.

The protocol was prepared (Table 1) by more than 10 years experience

Physiotherapist working in clinical as well as academic practice of pediatric rehabilitation , which give more advantage in formation of protocol which was based on clinical knowledge and experience. The knowledge of infant positioning and handling⁴, electrotherapy (ultra sound therapy)², massage technique^{7,8}, stretching techniques², manual therapy^{2,4} and cervical orthosis^{8,9} prescription in CMT was decided by all three therapist while preparing the institutional based treatment protocol for congenital muscular torticollis (CMT).

The demographic data (Table 2) indicated that even though child was born preterm with low birth weight, is now having age appropriate height and weight which is indicative of normal growth pattern. In development, child was slightly delayed in motor milestone of crawling, creeping, sitting independently which require bilateral upper limb support to perform but due to right upper limb affection with condition Arthrogyrosis since birth, child showed delayed motor milestones² which can be understood.

Pulsed ultrasound therapy, helps to break the adhesion/ contracture², help to improve length of muscle fiber of sternocleidomastoid (SCM) in congenital torticollis. Kneading massage technique^{4,8,9} over SCM also help to break adhesions in muscle hence kneading techniques help to achieve good length of soft tissue effectively. Passive stretching² for 60 sec hold period is effective in lengthened position for SCM. In study, it is found that

muscle stretch to complete range for at least 60 sec¹⁶ help to gain significant length and proved to be effective passive stretching technique.

Myofascial release (MFR)^{2,4} technique proved effective in achieving fascia length which get tight due to prolonged shorten position of muscle. Improved fascia length helps muscle to function in complete range. Once length of soft tissue like fascia and muscle is achieved, active participation of muscle improves hence active cervical ranges improved every two weeks of treatment protocol and reached maximum at the end of 8 weeks of treatment. Hold relax technique² and progressive resisted exercise (PRE) technique⁶ help to strengthen the muscles effectively even in small range as well as in complete range at cervical spine.

Oro-motor functions of child had improved from severe, moderate or mild difficulty to normal functions at the end of 8 weeks of treatment. This suggest that as the neck active ranges increases and neck symmetry establishes, and oro-motor dysfunctions² of self feeding, drooling of saliva, stasis of food in mouth, drinking liquids and brushing teeth of various severity also reaches to normal in functions.

Human body always demands for symmetry in posture as well as in movements to perform daily functions.⁷ In present case of right side CMT, the right upper limb Arthrogryposis, which adds on to more asymmetry to neck and body which could be the leading cause for oro-motor dysfunctions of the child. As soon as the shoulder neck symmetry establishes along with active neck movements and position, the oro-motor function reach to normal. This plays an important role for orientation of body in environmental space. The symmetric posture and movements at neck, serves the purpose of body movement in environment with good orientation for activities of daily living.⁷⁻⁹

The present study provides first ever institutional based Physiotherapy treatment protocol for CMT and also proved effective

in achieving normal oro-motor functions in rare combination of right upper limb Arthrogryposis. It was also found that institutional based Physiotherapy treatment protocol will be helpful for treating condition of CMT but need to evaluate on larger sample size and at multi centric level.

CONCLUSION

The 8 weeks institutional based Physiotherapy treatment protocol was effective in improving active ranges of cervical spine, symmetry in shoulder to neck posture as well as improve oro-motor functions to normal in rare case of 2 years 8 month old male child with severe congenital muscular torticollis (CMT) along with right upper limb Arthrogryposis. This single case study results cannot be generalized for application for all cases of CMT. Further application of protocol is recommended in multiple cases of CMT at early age on larger samples. The child should be followed up regularly to see the maintaining effect of treatment protocol in future.

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