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Physio therapeutic management of congenital muscular torticollis in Infants

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Abstract: The focus of this research is on children who were born with congenital muscular torticollis (also known as CMT). A unilateral shortening of the sternocleidomastoid muscle is the cause of cervical mastication of the sternum (CMT), a frequent musculoskeletal disorder that results in an unequal posture of the neck. A comprehensive literature analysis was carried out in order to evaluate the effectiveness of the physiotherapy techniques that are currently being used for the treatment of CMT. It is emphasised in the research that a variety of physiotherapeutic therapies, including as microcurrent therapy, kinesio taping, soft tissue mobilisation, manual therapy, and coordinated parental education, are effective in treating the condition being studied. Our evaluation of these therapies focused on how well they improved functional outcomes in general, as well as how well they promoted cervical mobility, lowered muscle tension, straightened the head and neck, and realigned the head and neck. The findings emphasise the need of properly diagnosing musculoskeletal issues at an early stage and initiating physiotherapy as soon as possible in order to enhance the healing process and prevent long-term repercussions. The study also identifies gaps in the previously conducted research and makes recommendations for further research to cover those gaps in order to contribute to the improvement of the physiotherapeutic treatment of CMT in neonates based on evidence.

Keywords: Congenital Muscular Torticollis (CMT), Infant Physiotherapy, Pediatric Rehabilitation, Sternocleidomastoid Muscle, Cervical Range of Motion, Manual Therapy, Stretching Exercises, Kinesio Taping, Soft Tissue Mobilization, Early Intervention

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INTRODUCTION

Congenital muscular torticollis, often known as CMT, is one of the musculoskeletal anomalies that occurs more frequently in newborns than any other. This disorder is characterised by an unequal head posture, which may be attributed to a unilateral fibrosis or shortening of the sternocleidomastoid (SCM) muscle. Among the most common signs of congenital abnormalities in neonates, chin rotation and lateral head bending towards the affected side are two of the most common symptoms. It is possible to see this peculiar head posture in the first few weeks of a newborn's existence, or even just after the infant is delivered[1]. However, the particular aetiology of CMT is still unclear, despite the fact that many etiological factors have been proposed as potential causes. Intrauterine positioning, birth trauma, compartment syndrome, and ischaemia of the subcutaneous muscle (SCM) are some of the conditions that would fall under this category. A number of potential repercussions of the condition, including but not limited to craniofacial asymmetry, plagiocephaly, delayed motor development, and persistent postural issues, might arise if the sickness is not addressed.

Epidemiology and Clinical Presentation

Although there are some studies that have revealed a somewhat higher prevalence in males, CMT is a condition that affects both men and women equally. Although the real number may be higher if diagnostic expertise is improved, it is assumed that between 0.3 and 2% of neonates who are still alive are affected by this genetic condition[2]. In the clinical setting, a significant fibrotic growth that develops within the subchondral space (SCM) is referred to as a "sternomastoid tumour of infancy." Other symptoms include temporary soreness in the neck.

CMT can be classified into three types:

1. **Postural CMT** – No palpable mass; limited range of motion is due to postural preference.
2. **Muscular CMT** – Tightness of the SCM with or without a palpable mass.
3. **SCM mass CMT** – Presence of a fibrotic mass or tumor within the SCM[3].

Importance of Early Diagnosis and Intervention

Detection at an early stage is very necessary in order to successfully treat CMT. There is a possibility that, in the long term, developmental delays and musculoskeletal disorders might be caused by delays in diagnosis and treatment. The identification and referral of infants who display signs of poor head posture to paediatricians and physiotherapists may be accomplished in a short amount of time. Diagnostic methods that are often used include clinical examination, cervical range of motion tests, and ultrasonography (for the presence of subcutaneous fibrosis)[4]. When infants are treated with conservative physiotherapy, they often demonstrate significant development in their posture, symmetry, and gross motor milestones. This is especially true when discovered at an early stage. On the other hand, a delayed diagnosis may result in the need for surgical intervention or the continuation of anomalies after therapy has been administered.

Physiotherapeutic Goals in Managing CMT

Restoring symmetrical cervical mobility is a physiotherapy goal. Passive stretching is recommended first. These routines stretch the small SCM muscle to boost the baby's active range of motion[5]. Achieving proper posture is also crucial. Manual treatment and positioning techniques improve head midline control and reduce compensatory postures. Include side-balancing exercises in play and caregiving to help kids maintain excellent posture. CMT babies may develop scoliosis and plagiocephaly (skull flattening) if not treated early. Timely physiotherapy may reduce these risks by promoting normal gross motor growth and symmetrical musculoskeletal development.

Physiotherapeutic Interventions: A Multimodal Approach

The use of manual stretching treatments is the cornerstone of conservative management. One of these treatments involves softly instructing the patient's neck to rotate and flex laterally in the opposite direction as the SCM that is affected. The frequency, intensity, and duration of these exercises will be determined by the severity of the restriction associated with the newborn as well as the infant's tolerance[6]. Soft tissue mobilisation and gentle massage are two techniques that may help reduce muscle tension and poor

circulation in the subcutaneous layer (SCM) region. The remodelling of muscles may be facilitated as a result of this, and stretching exercises may become more effective.

A growing number of people are turning to kinesio taping and other supplementary techniques in order to provide modest support and encourage the appropriate activation of muscles. Microcurrent therapy has been shown to have the potential to enhance muscle tone and hasten the healing process in some individuals, according to some research evidence[7]. When it comes to the success of physical therapy, parental involvement is very necessary. Educating caretakers on the proper positioning, handling, and home exercise routines increases the likelihood that therapy will be constant, and it also speeds up the rate at which effects are visible. Typically, parents are taught how to include therapy into their child's daily routine, which may include mealtimes and playtimes and other activities.

In spite of the fact that there is a wide variety of physiotherapeutic therapies available, clinical procedures for CMT are not standardised. The data supporting some therapies is more compelling than that supporting others, and the actual execution of an intervention may vary significantly from one setting to another[8]. The objective of this study is to provide a summary of what is currently known about physiotherapeutic techniques to regulating central nervous system tumours (CMTs) in infants, to demonstrate how effective these approaches are, and to highlight areas in which more research is required.

OBJECTIVES

1. To assess how well different physiotherapy treatments work to improve head posture and cervical mobility in babies with congenital muscle torticollis.

2. To stress how crucial prompt rehabilitation and early diagnosis are to avoiding long-term musculoskeletal problems linked to CMT.

METHODOLOGY

A thorough literature analysis was conducted on paediatric physiotherapy therapies for congenital muscular torticollis (CMT). The research focused on randomised controlled trials (RCTs) and experimental studies. In order to conduct the literature search, the three primary databases that were used were Google Scholar, PubMed, and MEDLINE. There were only resources written in English that were included in the evaluation. For the purpose of doing a structured search, relevant keywords such as "congenital muscular torticollis," "physiotherapy," and "physical therapy" were used. We used Boolean operators (AND, OR) to focus and broaden our search in order to guarantee that we had covered all of the bases using our investigation[9]. The studies have to fulfil all three of the following requirements in order to be considered for inclusion: (1) All paediatric patients diagnosed with CMT should be included in the study; (2) the effectiveness of physiotherapeutic treatments should be evaluated; and (3) the study should be designed as either a randomised controlled trial or experimental research. Studies that did not satisfy the following criteria were not taken into consideration: they did not focus on physiotherapy management; they did not undergo peer review; and they did not include case reports, reviews, or meta-analyses. There were a total of twenty-seven objects discovered at the beginning of the process. Following the removal of duplicates and the assessment of the relevance of abstracts and titles, there were a total of seventeen articles

remaining. In this case, two of them were left out because the whole texts were not accessible, and six of them were removed since they did not have any relevance to the problem that was being investigated[10]. There were nine studies that were included in the final analysis, and all of them passed the inclusion and exclusion procedures.

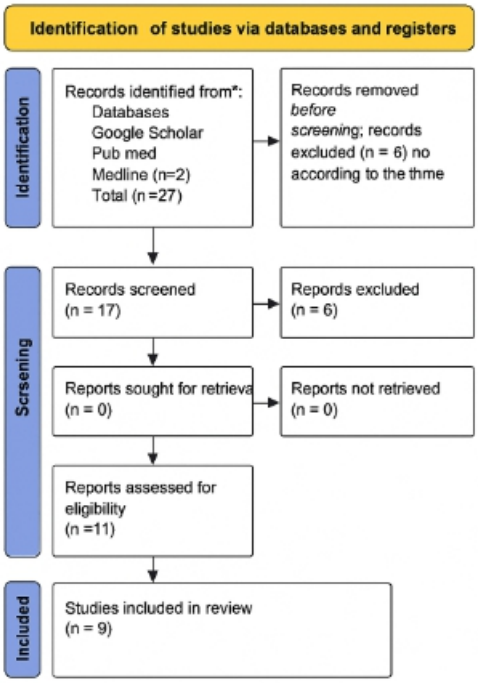

Figure 1: PRISMA flow chart[11].

DATA ANALYSIS AND RESULT

The research that was selected yielded a number of important data points, including study designs, sample sizes, intervention specifics, outcomes that were studied, and findings. A narrative synthesis was used to provide a summary of the findings, which revealed that a number of physiotherapy therapies for CMT were beneficial.

Quality assessment

Randomisation, blinding, sample size, and the extent to which follow-up was completed were some of the methodological quality factors that were used in the evaluation of each of the included research studies. It was helpful to conduct this assessment in order to ensure that the results of the review were supported by substantial evidence. The publications that were examined are shown in Table 1, which also offers a synopsis of the current status of treatment for paediatric physical therapy.

Table 1: Reviews of Infant CMT Physiotherapy Interventions[12].

Sr. No.	Author	Participants	Study Setting	Inclusion Criteria	Outcome Measures	Conclusion

1	Song et al.	Infants aged 0–3 months	Rehabilitation center, Yongin City, Korea	CMT with head tilt >15°, identified by a medical practitioner	SCM thickness, A/N ratio, head rotation angle	Passive stretching was the most effective intervention for improving head rotation.
2	Pastor-Pons et al.	Infants <28 weeks	Health centers, Zaragoza, Spain	Positional plagiocephaly with cranial diameter difference >5 mm	Alberta Infant Motor Scale (AIMS)	Manual therapy combined with caregiver education improved neck mobility; no effect on neuromotor development.
3	Hwang et al.	Infants aged 0–3 months	Not mentioned	Presence of SCM bulge; diagnosed CMT by pediatric expert	Neck ultrasonography	Shear wave velocity via ARFI elastography may predict outcomes related to stiffness and mobility limitation.
4	Keklicek & Uygur.	Infants aged 0–6 months	Dept. of Physiotherapy, Hacettepe University	Head tilt of 5–20 degrees	Muscle function scale, degree of head tilt, cervical ROM	STM approaches led to rapid improvements in treating CMT.
5	Durguti et al.	Infants aged 0–9 months	Physical Therapy Clinic, Pristina, Kosova	Neck mass or limited movement	Cervical lateral flexion range of motion	Early initiation of physiotherapy resulted in significantly better outcomes.
6	He et al.	Infants aged 0–3 months	Rehab Dept., Guangzhou Women & Children's Center	Head tilt, limited passive neck mobility; parental compliance with study protocol	Cervical ROM, muscle function scale, SCM thickness ratio	Two doses/day of stretching improved neck mobility, head tilt, and SCM development.

7	Giray et al.	Infants aged 3–12 months	Outpatient Pediatric Rehabilitation Clinic	Referral to clinic	Cervical ROM, muscle function severity, plagiocephaly severity index (PSI)	Kinesiology taping with exercises showed no added advantage; application method didn't affect outcomes.
8	Öhman.	Infants aged 2.5–12 months	Dept. of Physiotherapy, Queen Silvia Hospital	Evident muscle imbalance in cervical lateral flexors (via MFS)	Muscle Function Scale (MFS)	Kinesiology taping on affected side had immediate effects on MFS and muscular imbalance.
9	Kwon & Cho.	Infants aged 0–3 months	Not mentioned	SCM thickness >10 mm with palpable lump on ultrasound	Passive cervical ROM, SCM muscle thickness and cross-sectional area, red pixel intensity, therapy duration	Microcurrent therapy combined with exercise and ultrasound improved outcomes in cases affecting the entire SCM muscle.

Increasing range of motion (ROM) was the objective of the upper cervical spine manual treatment program, as stated by Pastor Pons et al. (2021). This was accomplished by moving the occiput, atlas, and axis. Within the course of the procedure, the therapist would take the baby's head and hold it in her hands. The condylar region of the occipital bone was contacted with the fourth and fifth fingers, the articular processes of the axis were touched with the middle finger, and the cervical vertebrae beneath C2 were felt with the index fingers. The thumbs were placed on the anterior side of the atlas, on the transverse processes, in order to gently position the atlas in a dorsal orientation. Myofascial methods were used by the therapist in order to enable the child's head movements in flexion, extension, side bending, and rotation. At the same time, the therapist applied gentle pressure in order to relax the cervical myofascial tissues. It was clear that these movements were consistent with the child's normal movements[13].

The neck was not stretched into a completely rotated and extended posture utilising any of these approaches. We did not use any of these techniques. Over the course of ten weeks, participants in the paediatric integrative manual therapy (PIMT) group attended sessions that lasted twenty minutes each and were held once a week. The researchers Keklicek and Uygur employed soft tissue mobilisation in their

study from 2018 to reduce the amount of strain that was placed on the fascia and muscles of the neck. There is a significant amount of use of this method in therapeutic settings due to the adaptability it has. The intervention is broken down into three distinct phases. This is the "first stage of passive mobilisation," in which the therapist uses two or three fingers to grip the SCM muscle beneath its origin in a gentle but firm manner. After that, the therapist moves the muscle in a rhythmic manner in an anterior-posterior direction[14]. During the "second phase of mobilisation with stretching," the therapist applies mild pressure to the muscle in order to keep it in a slightly expanded state. After that, the therapist moves the muscle in an anterior-posterior motion. Last but not least, during the "third phase," the physical therapist continues to gently grasp the muscle while employing toys that are colourful and melodious in order to keep the kid involved in the process of encouraging the infant to actively rotate their cervical spine towards the side that was damaged. As described by He et al. (2017), the participants in this trial were requested to participate in a stretching exercise that was continuous, low-intensity, and did not produce any pain. This was done in accordance with the criteria for CMT treatment.

Each session focused on a different muscle area, and there was a ten-second break in between each of the ten manual stretches included in the routine. There was a wide range in the number of times per day that participants stretched; some of them stretched for 10 sessions, while others only stretched for five. One of the therapists would hold the newborn in a supine position while the other would gently rotate the head via cervical rotation and lateral flexion. The therapist would make sure that the rotation stayed below 90 degrees in order to reduce the risk of any potential hazards. Öhman (2015) revealed that the use of Kinesiology tape in combination with a relaxation method that included the SCM muscle of the afflicted side was effective in treating the affected side. In order to avoid damaging the powerful butts, the tape was carefully put while extending over them. Following a period of around six to seven minutes, the researcher removed the tape and then proceeded to evaluate the subject's muscle performance[15].

When it came to applying the tape, the time that was allowed was enough. In the study conducted by Kwon and Cho (2023), microcurrent treatment (EMI; Cosmic Co., Seoul, Korea) was used three times per week for a duration of thirty minutes throughout each session. In order to generate an alternating current in a rectangular pulse pattern with a monophasic rhythm, a microcurrent generator was set up. The polarity of the current was reversed every three seconds. In the course of the treatment, this pattern was used. Both the frequency, which was set at 8 Hz, and the intensity, which was set at 200 μA, are below the sensory threshold that newborns are able to perceive them[16].

When the baby's head was turned to the other side, it was much simpler to palpate and attach the electrical patch to the SCM muscle that was damaged, which allowed for more accurate application. After the patch was applied, the infant's head was gently restored to its usual posture, as indicated in Table 2[17]. This was done in order to reduce the amount of strain that was exerted on the SCM muscle while the therapy was being administered.

Table 2: Treatments for Congenital Muscular Torticollis[18].

Technique	Description	Benefits

Manual Therapy	Mobilizes occiput, atlas, and axis using gentle pressure and natural motions	Improves range of motion in the upper cervical spine
Soft Tissue Mobilization	Mobilizes SCM muscle in three phases: passive mobilization, mobilization with stretching, active rotation	Reduces tension in neck muscles and fascia
Stretching	Low-intensity stretches held for 10–15 seconds; 10 sessions/day or 5 sessions/day	Improves flexibility and range of motion in the neck
Kinesiology Taping	Tape applied across SCM muscle and held for 6–7 minutes	Provides support and stability to the neck muscles
Microcurrent Therapy	Applied to SCM 3 times/week, 30 minutes/session, at 8 Hz and 200 μA	Reduces pain and inflammation in the neck muscles

DISCUSSION

As a result of tension in the superior cervical muscle (SCM), a newborn who has central muscular tone (CMT) will have a head posture that is tilted. For those who do not get treatment, it has the potential to cause developmental delays. It is of the highest significance to get early diagnosis and treatment via physical therapy in order to achieve the best potential outcomes. According to the findings of [19], infants who are less than three months old and have cervical myofascial tightness (CMT) may benefit from passive stretching in order to expand their cervical range of motion (ROM). When compared to passive stretching, the thickness of the SCM muscle was significantly unaffected by the different physiotherapeutic techniques that were performed. Active stretching is not nearly as effective as passive stretching when it comes to increasing cervical rotation.

The findings of [20] suggest that infants born with positional plagiocephaly may benefit more from positional infant movement therapy (PIMT) and education for carers in terms of improving cervical rotation. The importance of commencing therapy for these illnesses at an early level is shown by the good benefits that carer education and PIMT have on the development of neuromotor skills. According to the findings of a study that was conducted by [21], the degree of SCM muscle stiffness that is evaluated by acoustic radiation force impulse (ARFI) shear wave velocity (SWV) does not have the ability to accurately predict the long-term outcomes of neonates who have cerebral multiplication tumour (CMT). However, this measure does correspond with early cervical range of motion limits, despite the fact that it does not disclose any significant alterations in the features of the SCM tissue. In spite of the fact that it is conceivable that higher beginning SWV values might result in a longer period of time for complete neck movements, further research is required to ascertain the measure's impacts over the long run.

According to [22], infants with CMT who underwent soft tissue mobilisation saw transitory gains in neck mobility in comparison to those receiving conventional care. This was the case when comparing the two groups. Given that the outcomes did not keep up after a period of twelve weeks, it is clear that therapies that are adaptable are required. In light of these findings, it is clear that further research is required to provide support for evidence-based practice and the potential of physical therapy treatments for chronic muscle tension (CMT). Through their research, [23] brought attention to the need of early intervention in the management of CMT. When compared to treatments that are conducted later in life, physical therapy that does not begin until a baby is six months old significantly improves the range of motion in the cervical region. The findings of this study underline the need of quick treatment in order to maximise neuromotor development and prevent the progression of craniofacial muscular dystrophy (CMT).

The purpose of the study that [24] carried out was to determine how stretching affects CMT. Over and over again, they found that stretching exercises improved the development of the SCM muscle, as well as the flexibility of the neck and the tilt of the head in newborns who had CMT. Due to the fact that the frequency of stretching had a major influence on the deep effects of stretching, it seems that there is a dose-response link between stretching and the outcomes of therapy. According to the findings of [25], the use of kinesiology tape in conjunction with exercise therapy did not result in any beneficial effects. There was no difference in the clinical outcomes between the different taping approaches. Furthermore, [26] discovered that the application of kinesiology tape to the affected side of the neck resulted in an improvement in the ratings of muscle performance in a subsequent research study.

The research that [27] conducted in 2023 investigated the effectiveness of CMT when exercise, ultrasound, and microcurrent therapy were all used in conjunction with one another. Increasing cervical mobility and reducing the thickness of the SCM muscle were both outcomes that we achieved via the use of ultrasound in conjunction with other approaches. According to the findings of the study, the outcomes for infants diagnosed with CMT are improved when many treatments are used simultaneously. Physical therapy is a key component of the care of congenital malformations (CMT) since it helps to resolve muscle imbalances, increases cervical mobility, and promotes the overall development of the newborn. For the purpose of assisting this vulnerable population, researchers need to focus on intervention strategies that are designed to be long-lasting.

CONCLUSION

Physiotherapy is an essential component in the treatment of congenital muscle torticollis (CMT) in individuals who are neonates. Early identification and fast management are the only ways to attain normal cervical mobility, correct muscular imbalances, and promote healthy neuromotor development. These goals can only be accomplished by effective intervention. There are a variety of paediatric physiotherapy methods that, when utilised appropriately, have shown the potential to substantially improve clinical outcomes. Kinesiology taping, stretching, manual therapy, microcurrent treatment, and soft tissue mobilisation are some of the techniques that fall under this category. Personalised treatment plans and regular engagement from carers are two factors that contribute to an increase in the effectiveness of therapy. To ensure that infants who are affected by CMT get the best possible care, it is recommended that future research investigate the effectiveness of these therapies over an extended period of time and

standardise the approaches used in physiotherapy.

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