CONGENITAL MUSCULAR TORTICOLLIS (CMT) AND CRANIAL DEFORMATION (CD): CURRENT TRENDS IN TREATMENT, MANAGEMENT, & DIFFERENTIAL DIAGNOSIS THROUGH EVIDENCE-BASED PRACTICE
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DIAGNOSIS, EVALUATION, & TREATMENT

COURSE OBJECTIVES

1. Recognize the use of the American Physical Therapy (APTA) Clinical Practice Guideline (CPG) for CMT for identifying severity of CMT.
2. Identify the eight classifications of CMT as outlined by the APTA CPG for CMT.
3. Identify red flags for referral to outside specialists.
4. Adding evidence-based data to the pediatric P.T. CMT evaluation.
5. Identify the four types of cranial deformation.
6. Identify the Argenta Classification scale for cranial deformation.
7. Recognize techniques used to measure A/PROM in CMT.
8. Identify developmental milestones most impacted in CMT.
9. Identify the two primary cervical spine motions impacted by CMT and muscles impacted.
10. Recognize secondary complications due to CMT.
11. Recognize first choice treatment used in addressing CMT.
12. Identify when to refer for a helmet for CD based on clinical findings and the Argenta Scale.
13. Identify discharge criteria for CMT.

DEFINING TORTICOLLIS

Congenital Muscular Torticollis (CMT): A condition in which the infant’s head is tilted to one side and rotated to the opposite side, resulting in loss of ROM of ipsilateral cervical rotation and contralateral lateral flexion. Can occur at birth, in utero, or following birth. Defined by direction of lateral flexion positioned in.

Incidence: Ranges from 3.9% to 16%. Slightly more frequent in males and infants who are exposed in utero to opioids.

ORIGINS & CAUSES

Concurrent theories related to the origin of SCM muscle impairment in CMT include intrauterine crowding, muscle trauma during a difficult delivery, soft-tissue compression leading to compartment syndrome and congenital abnormalities of soft-tissue differentiation within the SCM muscle. SCM mass can be present due to trauma from the pull on muscle.

Clinical review of 48 children with CMT showed a relation between birth position and the side affected by the contracture. CMT is the third most common pediatric diagnosis.

MEET JACOB. Do you really understand CMT?

AGE: 6 months

SELF ASSESSMENT

BEFORE WE BEGIN... TEST TIME

Use of the Academy of Pediatric Physical Therapy Clinician Self-Assessment of the APTA Clinical Practice Guideline (CPG) for Congenital Muscular Torticollis (CMT)
DEFINING CMT
Defined by the direction of the tilt: Left Torticollis
Left lateral tilt
Right cervical rotation
CMT is typically categorized as 3 types:11
1. Postural
2. Muscular
3. Sternocleidomastoid (SCM) Mass

WHAT MUSCLES AND BONES ARE INVOLVED?
Muscles: By definition the sternocleidomastoid (SCM) is the primary muscle involved but experience proves the upper trapezius is a major player in the game.

UPPER TRAP VS SCM
Upper Trapezius: The trapezius muscle is a postural and active movement muscle, used to tilt and turn the head and neck, shrug, steady the shoulders, aide with upward rotation of the scapula (in combo with lower traps), and twist the arms. The trapezius elevates, depresses, rotates, and retracts the scapula, or shoulder blade.
SCM: The primary actions of the muscle are rotation of the head to the opposite side and ipsilateral lateral flexion of the neck.

INFANTS ARE IN CONSTANT DEVELOPMENT
Erythema and deeper skin folds along the anterior lateral side of the neck are indicative of SCM tightness.
Erythema and deeper posterior neck skin folds are more indicative of tightness in the trapezius muscle.12

CLASSIFICATION SCALE FOR CMT
The APTA adopted a CPG for classification and treatment of CMT, with the latest update in 2018.11
Determined by three factors:11,12
1. Age at which infant was referred/evaluated by P.T.
2. Limits of cervical rotation
3. Presence of or absence of SCM nodule
1+2+3=Classification

APTA CMT CPG CLASSIFICATION

<table>
<thead>
<tr>
<th>Classification</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 1: Early Mild</td>
<td>Infants between 0 and 6 months of age with only postural preference or a difference between sides in passive cervical rotation of less than 15°</td>
</tr>
<tr>
<td>Grade 2: Early Moderate</td>
<td>Infants between 0 and 6 months of age with a difference between sides in passive cervical rotation of 15° to 30°</td>
</tr>
<tr>
<td>Grade 3: Early Severe</td>
<td>Infants between 0 and 6 months of age with a difference between sides in passive cervical rotation of more than 30° or an SCM mass</td>
</tr>
<tr>
<td>Grade 4: Later Mild</td>
<td>Infants between 7 and 9 months of age with only postural preference or a difference between sides in passive cervical rotation of less than 15°</td>
</tr>
<tr>
<td>Grade 5: Later Moderate</td>
<td>Infants between 10 and 12 months of age with only postural preference or a difference between sides in passive cervical rotation of less than 15°</td>
</tr>
<tr>
<td>Grade 6: Later Severe</td>
<td>Infants between 7 and 9 months of age with a difference between sides in passive cervical rotation of more than 30° or between 10 and 12 months of age with a difference of 15° to 30°</td>
</tr>
</tbody>
</table>
### Classification

<table>
<thead>
<tr>
<th>Grade 7</th>
<th>Later Extreme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants between 7 and 12 months of age with a difference between sides in passive cervical rotation of more than 30°</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade 8</th>
<th>Very Late</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants and children older than 12 months of age with any asymmetry, including posture preference, any difference between sides in passive cervical rotation, or an SCM mass</td>
<td></td>
</tr>
</tbody>
</table>

To add to the validity of our field it is important to include the Grade of the CMT on your evaluation for physicians. The more we educate our referral source on the evidence-based data for CMT, the stronger we advocate for the patients and early referral.

### PROGNOSIS OF CMT

<table>
<thead>
<tr>
<th>Referral age</th>
<th>Avg Tx time</th>
<th>% recovery</th>
<th>Outcomes</th>
<th>Surgical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3 mo old</td>
<td>1.5 mos</td>
<td>99%</td>
<td>No lateral tilt, full c-spine rotation</td>
<td>N/A</td>
</tr>
<tr>
<td>1-3 mo old</td>
<td>5.9 mos</td>
<td>89%</td>
<td>No lateral tilt, full c-spine rotation</td>
<td>N/A</td>
</tr>
<tr>
<td>Before 3-4 mos</td>
<td>92-100%</td>
<td></td>
<td>Full passive cervical rotation and lateral tilt</td>
<td>0-1% cases</td>
</tr>
<tr>
<td>Between 3-6 mos</td>
<td>7.2 mos</td>
<td>62%</td>
<td>No lateral tilt, full c-spine rotation</td>
<td>N/A</td>
</tr>
<tr>
<td>Elan 6-12 mos</td>
<td>8.9 mos</td>
<td>19%</td>
<td>&quot;Excellent outcome&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### PROGNOSIS OF CMT

Five factors have been associated with full or more complete symptom resolution including the infant’s:

1. Participation in physical therapy intervention.
3. Decreased difference in cervical rotation PROM between sides.
4. Decreased difference in SCM muscle thickness between sides.
5. The caregiver’s ability to frequently implement a home program of active positioning and passive stretching.

### COMORBIDITIES ASSOCIATED WITH CMT

- **Reflux**: Correlation was established with a retrospective study, spanning five years of 2159 patients. The study found a higher prevalence in children with CMT and reflux who had a history of breech presentation.

- **Balance Challenges**: Preferred rolling in one direction, visual-spatial deficits. Impact on timely acquisition of gross motor milestones such as rolling prone–supine, sitting, crawling.

- **Feeding Problems**: Associated w/ CMT and/or physiologically or asymmetrical jaw positioning, nursing preference side, as well as side of bottle feeding. As many as 44% of infants with CMT may demonstrate a feeding preference to one side and as many as 3.4% are described as having additional feeding problems.

- **Hip dysplasia**: There is a correlation between CMT and hip dysplasia. Data shows 8% of infants with CMT have hip dysplasia, hip dislocation, and subluxation of the acetabulum.

### NORM-REFERENCED GUIDELINES FOR CERVICAL STRENGTH

Scores of Muscle Function Scale (Measure of C spine, Lateral Flexion)

- **The Muscle Function Scale**
- **On head below horizontal line**
- **1 Head slightly horizontal line**
- **3 Head over horizontal line (by 3 months of age)**
- **4 Head very high over horizontal line, approaching vertical**

Test both sides and note asymmetries.
NORM-REFERENCED GUIDELINES

Reference values for typically developing infants:

ROM Reference:
- Rotation mean ROM is 100-110 degrees.
- Lateral flexion is 65-70 degrees.

Muscle Function Score Standard Norms:
- Active Lateral Flexion (strength and ROM assessment)

Infants of 2 months of age had a median muscle function score of 1 (interquartile range, 1-2). This is due to head control not fully emerging until 3 months.

Muscle function increased to score 3 to 4 by 10 months.

USE OF THE CMT CLASSIFICATION SCALE

WHAT ABOUT JACOB?

What do we know?
- Referred to P.T. at 6 months
- Caregiver was working on stretches at home that P.C.P. suggested.
- DATA OBTAINED? YES
- First step toward finding his classification scale

CRANIAL DEFORMATION (CD)

"The etiology of CD can be attributed to intrauterine deformation that worsens postnatally."

Three Types of Cranial Deformation, note ALL due to uneven distribution of pressure on cranium due to positioning:

- Plagiocephaly
- Brachycephaly
- Dolichocephaly/Scaphocephaly

CRANIAL DEFORMATION

ARGENTA CLASSIFICATION SCALE FOR CD

Plagiocephaly and torticollis are closely connected based on the longevity of torticollis and intrauterine conditions (multiple births, intrauterine fibroids).

# of cases of torticollis and plagiocephaly: 1 in every live 60 births.

Prognosis for full resolution of CD has been shown to be 77% after parent/caregiver education in repositioning techniques and 94-96% after cranial remolding therapy (more to come) independent of being combined with parent education in repositioning.

CRANIAL DEFORMATION

Type of Cranial Deformation

Plagiocephaly
- Definition: Flattening on the back of the head with bulging on the forehead of the same side as the flattening. Flattening is typically on the side where more weight is being distributed.

Brachycephaly
- Definition: Symmetrical flattening on the back of the head. This flattening causes the head to appear wide above the ears and short from front to back. From a side view, the back of the head appears taller than the front.

Brachycephaly with Asymmetry
- Definition: Combination of plagiocephaly and brachycephaly.

Dolichocephaly/Scaphocephaly
- Definition: Head shape that is long from front to back and very narrow from side to side.

Prognosis

Prognosis for full resolution of CD has been shown to be 77% after parent/caregiver education in repositioning techniques and 94-96% after cranial remolding therapy (more to come) independent of being combined with parent education in repositioning.
Plagiocephaly, what we typically see with CMT is on the side of dominant rotation. Jacob has a left lateral tilt preference with right rotation and thus right plagiocephaly.

No bossing per my clinical assessment.

Forehead bossing?

Ear displacement/shift?

Flattening, even, one-side, temporal?

THE CMT and CD P.T. EVALUATION

The Physical Therapy evaluation should evaluate and document across the 4P domains of body structure, function, activities, and participation.

**Body Structure and Function Limitations**
- Presence of tight band or nodule in the SCM
- SCM, upper trapezius, or cervical tightness and weakness
- Asymmetrical posture in all positions
- Pain during stretches
- Red, irritated skin folds
- Hip dysplasia
- Cervical and thoracic scoliosis
- Limited cervical motion

**Activity Limitations**
- Limited cervical movement
- Inability to prone and positional preference
- Asymmetrical movements and transitions
- Resistance to stretching
- Limitation with rolling, visual-spatial work

**Participation Restrictions**
- Challenges cleaning infant's neck
- Preference of bottle feeding or breastfeeding to one side
- Tolerance to prone positions
- Developmental delays of certain milestones

Diagnostic Imaging

- Sonoeleastography
  - To quantify the size, shape, organization, and location of fibrous bands or masses
- Cervical spine X-ray
  - For children under 1 year, the current standard of care does not include magnetic imaging of infants younger than 3 years with suspected or diagnosed CMT - Clinicians should refer if they see red flags to evaluate further assessment such as internal MRI without progression.

THE CMT AND CD P.T. EVALUATION

**Clinical Assessment - Range of Motion (ROM)**

- **Active and Passive:** Lateral Flexion of C-spine
- Active and Passive: Rotation of C-spine

CLINICAL ASSESSMENT

**Clinical Assessment:**

Take a minute to observe, as these are topics that can reveal underlying concerns or thresholds to discharge.

- **First Posture:** supine, sitting, side lying, prone, standing. All important positions to assess in.
- **Second Posture:** At rest, what are the eyes doing? Strabismus, nystagmus, convergence?
- **Cranial Shape:** Note shape of cranium
- **Facial Symmetry:** Eye position, nose, cheeks
- **Muscle Tone:** Hypotonia, normal tone, spasticity

3 posture to observe.

What is harder measuring the cervical ROM of a giraffe or a toddler?
**Cervical Spine ROM guidelines**

**Cervical Spine Rotation**
- ACTIVE ROTATION (2 months and up)
- PASSIVE ROTATION (All AGES)
  - Arthrodial Goniometer
  - Clinical Observation

**Cervical Spine Lateral Flexion**
- Active Lateral Flexion (2 months and up)-Righting Reaction
- Passive Lateral Flexion (All AGES)
  - Arthrodial Goniometer
  - Muscle Function Scale

**Muscle Function Scale**

Looking for a head righting reaction ~bring it back to midline!

**ACTIVE MOVEMENT ASSESSMENT**

<table>
<thead>
<tr>
<th>Cervical Movement</th>
<th>Age</th>
<th>Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical Rotation</td>
<td>&lt;2.5 months</td>
<td>- Following toys to initiate rolling</td>
</tr>
<tr>
<td></td>
<td>2.5 months</td>
<td>- Stool test, sitting/standing and stabilizing trunk while child looks for a toy (active builds on error, skill)</td>
</tr>
<tr>
<td></td>
<td>&gt;2.5 months</td>
<td></td>
</tr>
<tr>
<td>Cervical Lateral Flexion</td>
<td>&gt;2.5 months (closer to 3) and up</td>
<td>- Tilt sideways and looking for a return to midline-Muscle Function Scale</td>
</tr>
</tbody>
</table>

**ARHRODIAL GONIOMETER**

Lateral Flexion
Norm= 65-70 deg
Rotation
Norm=100-110 degrees

**Muscle Function Scale—Active Lateral Flexion Assessment**

Strength and Active ROM

**Technique:** Hold infant vertically in front of mirror and tip child horizontally to 90 degrees in each direction, observing for the amount of neck righting reaction from horizontal line.

The Muscle Function Scale is reliable for assessing lateral flexion in the CMT population

Scores of Muscle Function Scale (Measure of C spine Lateral Flexion & Strength)

- 0=Head below Horizontal Line
- 1=Head on Horizontal Line (norm for 2 months of age or less)
- 2=Head slightly over horizontal line
- 3=Head over horizontal line (by 3 months of age)
- 4=head very high over horizontal line, approaching vertical

**ACTIVE MOVEMENT ASSESSMENT**

Looking for active rotation - therapist remains stationary on the stool. With music and/or noise toys encourage child to rotate

Can be useful in treatment with the therapist rotating the stool in the opposite direction.
**EVALUATION: SUBJECTIVE, CAREGIVER INTERVIEW**

Area of Concern

Pertinent Questions for the Caregiver

**Birth History**
- Complications with pregnancy or delivery (breach?)
- Gestational length?
- Gestational diabetes?

**Infant/Child's history**
- When did you first notice a tilt or rotational preference?
- History of reflux?
- Any other medical complications?
- History of hip dysplasia? Clicking/popping/gait issues?

**Sleeping and Positioning Preferences**
- Time spent in prone, supine, in car seat, other seats?
- Direction the child prefers to look? Preference of tilt?

**Prior Treatments**
- If had therapy prior, at what age referred?
- What treatments were effective? Ineffective? (e.g., taping, stretches)
- Diagnostic images taken?

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**EVALUATION: OBJECTIVE ASSESSMENT**

Area of Concern

Assessment/Outcome Measure

**Cervical ROM**
- Goniometer
- Stool Test (rotation)

**Muscle Function Scale**
- Cervical Strength
- Muscle Function Scale (Lateral Flexion)
- Extension (prone)
- Head control all positions

**Motor Milestones**
- Test of Infant Motor Performance: 34 weeks post-conception to 4 months postterm
- Alberta Infant Motor Scale: 0-18 months
- PDMS-2: birth through 5 years

**UE ROM**
- Active: Motor milestones, overhead reaching, observation and documentation
- Passive: goniometer

**LE ROM**
- Active: Motor milestones
- Passive: goniometer

**Hip Integrity**
- <3 months: Ortolani & Barlow
- >3 months: Galeazzi sign

**Palpation**
- SCM nodule? Trigger points in upper trapezius or SCM? Bony abnormalities (clavicle, humerus)?

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**EVALUATION: OBJECTIVE ASSESSMENT**

Area of Concern

Assessment/Outcome Measure

**Pain**
- Faces, Legs, Activity, Cry, Consolability Scale (FLACC)

**Craniofacial assessment**
- Facial asymmetry
- Fontanelles assessment
- Cranial shape
- Asymmetry (face/cranium) via 6 views: anterior, vertex (top down), posterior, two laterals, inferior

**Spinal assessment**
- Palpation of spinous process, pelvis assessment (level landmarks?), muscle palpation (asymmetry or hypertrophy?)

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## Jacob's Clinical Findings and History

- Referred at 6 months old after mom performed home stretches from guidance by her PCP
- No SCM nodule found
- Rotation findings:
  - Active: R=100 degrees, L=75 degrees
  - Passive: R=100 degrees, L=80 degrees
- Classification: Grade 2 - Early Moderate
- Muscle Function Scale: L=3, R=2
- Lateral Flexion PROM: L=65 degrees, R=50 degrees
- History: No therapy prior, does not tolerate prone, prefers time in the exersaucer, no history of reflux, WNL gestation age, no complications with vaginal delivery
- UE and LE A/PROM=WNL, to include hip integrity
- Developmental milestones: normal
- Palpation of spinous process, pelvis assessment
- Muscle palpation

---

## Prognosis for Jacob?

<table>
<thead>
<tr>
<th>Referral Age</th>
<th>Age to Time</th>
<th>% Recovery</th>
<th>Outcomes</th>
<th>Surgical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3 mo old</td>
<td>19 mos</td>
<td>99%</td>
<td>WNL</td>
<td>N/A</td>
</tr>
<tr>
<td>1-4 mo old</td>
<td>5 mos</td>
<td>89%</td>
<td>WNL</td>
<td>N/A</td>
</tr>
<tr>
<td>Before 3-4 mo</td>
<td>72 mos</td>
<td>82%</td>
<td>WNL</td>
<td>N/A</td>
</tr>
<tr>
<td>3-6 mo old</td>
<td>6.5 mos</td>
<td>10%</td>
<td>WNL</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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## Differential Diagnosis

<table>
<thead>
<tr>
<th>Diagnosis/Clinical Syndrome</th>
<th>Diagnostic Feature</th>
<th>Differential Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistent C-spine tilt</td>
<td>with or loss of A/PROM of the cervical spine</td>
<td>CBT, Ocular Tilted</td>
</tr>
<tr>
<td>Persistent Tilt</td>
<td>with or loss of A/PROM of the cervical spine</td>
<td>CBT, Ocular Tilted</td>
</tr>
<tr>
<td>Before 3-4 mo</td>
<td>O-1% case</td>
<td>CBT, Ocular Tilted</td>
</tr>
<tr>
<td>Between 3-6 mo</td>
<td>Normal spinous process</td>
<td>CBT, Ocular Tilted</td>
</tr>
<tr>
<td>After 6-12 mo</td>
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</tbody>
</table>

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## Evaluation: Objective Assessment

<table>
<thead>
<tr>
<th>Area of Concern</th>
<th>Assessment/Outcome Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face</td>
<td>FLACC</td>
</tr>
<tr>
<td>Head</td>
<td>Consolability Scale</td>
</tr>
<tr>
<td>Neck</td>
<td>Stool Test (rotation)</td>
</tr>
<tr>
<td>Shoulders</td>
<td>Ortolani &amp; Barlow</td>
</tr>
<tr>
<td>Hips</td>
<td>Galeazzi sign</td>
</tr>
<tr>
<td>Palpation</td>
<td>SCM nodule, Trigger points</td>
</tr>
<tr>
<td>Bony Changes</td>
<td>Clavicle, humerus</td>
</tr>
</tbody>
</table>

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**Differential Diagnosis**

- Persistent C-spine tilt with or loss of A/PROM of the cervical spine
- Ocular Tilted
- Persistent Tilt with or loss of A/PROM of the cervical spine
- Ocular Tilted
- Before 3-4 mo
- O-1% case
- Between 3-6 mo
- Normal spinous process
- After 6-12 mo
- Normal spinous process

---

**Conclusion:**

- Jacob is referred to PT at 6 months old after mom performed home stretches from guidance by her PCP.
- No SCM nodule found.
- Rotation findings:
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- Muscle palpation
**EVALUATION~RED FLAGS**

<table>
<thead>
<tr>
<th>Area of Measurement</th>
<th>Red Flag Findings</th>
<th>Action to Take/Referral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip</td>
<td>Clunking/clicking (&lt;3 mos)</td>
<td>Pediatric Orthopedics, Hip Dysplasia correl. with CMT in 8.5% of cases</td>
</tr>
<tr>
<td>Gluteal Fold Asymmetry</td>
<td>Leg length difference</td>
<td>Pediatric Orthopedics, Hip Dysplasia correl. with CMT in 8.5% of cases</td>
</tr>
<tr>
<td>Antalgic gait</td>
<td></td>
<td>Pediatric Orthopedics, Hip Dysplasia correl. with CMT in 8.5% of cases</td>
</tr>
<tr>
<td>Cervical Spine</td>
<td>Treatment for a year (prior) with no resolution</td>
<td>Full ROM, passive/active (strength) with tilt</td>
</tr>
<tr>
<td>Vision</td>
<td>Nystagmus, Strabismus</td>
<td>Ocular torticollis~Rate is 3.19%</td>
</tr>
<tr>
<td>Cranial Assessment</td>
<td>Bony ridges on cranium, Facial asymmetry not due to gravity</td>
<td>Craniofacial, PCP, Genetics, Neurology Neurosurgery to rule out craniosynostosis</td>
</tr>
</tbody>
</table>

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**TREATMENT~CMT**

**First Choice Interventions: Most common practice**

1. *Parent Education*
2. *Environmental Adaptations*
3. *Passive C spine ROM: Most Effective First Choice of Tx*
4. *Active ROM of C spine and trunk (rolling)*
5. *Facilitation of symmetrical movement activities (acquisition of developmental milestones)*

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**TREATMENT~CMT**

*2018 APTA CPG on CMT for specific CMT severity classifications*

- Stretching should be frequent through the day, every day. However...
- Still no data supporting the amount of dosage standard for the technique or duration of stretches
- Still no data supporting repetitions for each treatment session (e.g. 10 vs 20 reps)
- No standard looking frequency of treatment sessions per day or overall duration of care or frequency of clinic visits
- No standard linking tapering schedule standard norms

All of the above indicates more information needs to be gathered in terms of: dosage, technique, tapering, frequency, repetitions for the best outcomes for CMT.

**TREATMENT~CMT**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Duration</th>
<th>Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stretching: Active and Passive</strong></td>
<td>APTA 2018 reports study that doses of 8 active per 10 minutes/day is more effective than 8 passive per day of 10 minutes or 10 active per 15 minutes. 8–10 minutes per day. They found 100 minutes is more effective.</td>
<td>Football carry-lateral flexion, Football carry-lateral flexion.</td>
</tr>
<tr>
<td><strong>Parent Education</strong></td>
<td></td>
<td>Hold Carry for lateral flexion stretch.</td>
</tr>
</tbody>
</table>

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**TREATMENT~CMT**

- Active cervical rotation
  - E.g. for left CMT to work on L rotation
- Prone work placing face of head with facilitation of thoracic extension & cervical extension
### Treatment for Jacob

- Trunk control work in ring sitting, side-sitting to the right to facilitate right c-spine lateral flexion. 3x sitting with toys to the left and stabilizing trunk for left c-spine active rotation.
- Strengthening, A/PROM
- Trunk control work in ring sitting, side-sitting to the right to facilitate right c-spine lateral flexion. 3x sitting with toys to the left and stabilizing trunk for left c-spine active rotation.
- Thera-Band prone to facilitate c-spine extension (upper trapezius) in sitting for head righting reaction and lateral trunk righting reaction (slow slow, allow active movement into midline).
- Football and hold carry for elongation of the left SCM and upper trapezius.
- Soft tissue work to the left SCM and upper trapezius.
- Leukotape to left shoulder when Jacob started crawling.
- Parent education: Decrease time in gravity dependent devices (exersaucer), towels for support when in carrier, educate on how to do the things we do in therapy.

### Soft tissue work

- No data suggesting best practice. In this population the tolerance is typically less than 30 seconds each time.

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Duration</th>
<th>Technique/Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myofascial Release</td>
<td></td>
<td></td>
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<tr>
<td>Taping (Kt Tape, leukotape)</td>
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### Manipulation

- For the ATX CDS for CMT there is no evidence supporting this intervention.

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<td>N/A</td>
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### Measurement for CMT

- Low intensity alternating current (200uA) is applied superficially over the involved SCM so that the infant does not perceive the current. Stretching follows the Tx.

| Measurement for CMT | N/A | N/A |

### Manipulative Techniques for CMT

- Effemerhof's technique
- Myofascial Release
- Static Extension
- Static Rotation
- Peripherally involving the infant's upper extremity
- Peripherally involving the infant's lower extremity

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</table>
TREATMENT~ CMT: Supplemental Intervention with Evidence, When First Choice Treatment is not effective

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<tr>
<td>Myokinetic stretching for CMT</td>
<td>PT provides 60 reps over 30 minute tx session, 3 times a week in infants less than 50 days old.</td>
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<tr>
<td>Technique consists of applying mild overpressure with 1 or 2 fingers on the SCM while it is in its lengthened position.</td>
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Tscharnuter Akademie for Motor Organization (TAMO)

Poor outcomes in study with comparison to first choice treatment so hard to determine if beneficial. Not common practice.

Use of light touch and the infant’s response to gravity and support surfaces to facilitate movement exploration.

Treatment Ideas for “SAle”

The Tortle (www.tortle.com)
Goal: move the strap around to redistribute weight to different parts of the cranium. If already a flat spot then the strap will go over flat part as child stays off of it. Move every 2-3 hours. Works well for newborns. Commonly given in NICU.

Works well for newborns. Commonly given in NICU.

Soft foam collar: Used post-surgery but have not been shown to be effective in isolation of other interventions.

Custom Fabricated Orthosis: Post-surgery. Show better results than the soft collar but not good data in the literature.

Not a great deal of evidence based information on these items to date.

If torticollis is persistent past one year of treatment (not age) then options. Also consider for infants referred after 12 months and who have a Grade 7 and 8 severity (CMT classification).

- Tendon lengthening: Unipolar or bipolar release of SCM if persistent residual tightness of > 15 degrees.
  - Children who have the tendon lengthening prior to one of age have a better chance of reversing facial and skull deformities.

- Botox (Type A): growing body of support and evidence for use of this in cases of CMT not responding to First Choice Intervention.

TREATMENT~CD

1. **R/O CRANIOSYNOSTOSIS**: A birth defect impacting an infant’s skull in which one or more fontanelles fuse prematurely.

   Red Flags: Bony ridges, lack of cranial growth, lack of a “soft spot” on the cranium.

2. **REPOSITIONING**: First Choice Treatment

3. **Decrease supine time/Increase Prone time**
   - Back to Sleep, Belly to Play Campaign — First Choice Treatment

4. **HELMET**: Continues to be controversial. Thus, the need to discuss evidence-based information for helmets in children with CD

   Cranial Orthoses: Goal is NOT to restrict cranial growth but instead to redirect subsequent cranial growth into voided areas facilitating a symmetrical shape.
   - Should be initiated from 4-6 months, worn 20 to 23.5 hours/day, for 2-7 months.
   - Studies have shown at 5 months the rate of cranial asymmetry improvement is .93 mm/week vs at 8-11 months the rate of improvement stabilizes at .41-.42 mm per week.
   - Best outcome if correction initiated before 6 months, but correction can occur up to 15-18 months of age although correction will be likely incomplete and require longer wear. After 12 months there is less improvement due to rate of skull growth.
   - Challenge getting families on board due to studies to date comparing cranial remodeling therapy with parent ed in repositioning in 5-6 month old infants with mild to severe CD.
   - Outcome did not find statistically significant difference in cranial asymmetry between the two interventions when children were 2 years old.

   Cranial orthotic assessment recommended for infants > 4 months with severe CD that includes facial asymmetry (Argenta DP Type IV and temporal bulging and abnormal vertical growth of the skull. Argenta DP Type V, Argenta DP Type III) as outlined in the APTA CPG for CMT.

   Note: Jacob does not qualify = Type II Cranial orthotic assessment recommended for infants > 6 months with mild CD that include our displacement (Argenta DP Type III), temporal base prominence (Argenta DP Type III) as outlined in the APTA CPG for CMT.
TREATMENTS~CD~CONTRAINDICATIONS

Helmets Contraindicated for:
- Infants less than 4 months of age
- An infant at any age with mild CD limited to posterior skull (Argenta DP Type I or Argenta DB Type I)

Type I: Posterior skull
DP: Deformational plagiocephaly
DB: Deformational brachycephaly

Need to educate yourself on the Argenta scale, when appropriate to refer, and what orthotist in your area are consulting on the helmets.

DISCHARGE CRITERIA
as outlined by the APTA CPG

1. Full ROM of c spine, trunk, and extremities to within 5 degrees of non-affected side
2. Symmetrical movement patterns throughout the passive range
3. Age-appropriate gross motor development including symmetrical movement patterns between the left and right sides during static, dynamic, and reflexive movements
4. Improved skull symmetry to Argenta Type I or referred for further mg of CD
5. No visible head tilt
6. Parents/caregivers understand what to monitor as the child grows

GUIDELINES FOR FOLLOW-UP CARE

Per the CPG-Action Statement 17: Revised and updated

Reassess infants 2 to 12 months after discontinuation of direct services or when the child initiates walking and then discharge if appropriate.

- Postural preference
- The structural and movement symmetry of the neck, face and head, trunk, hips, upper and lower extremities
- Developmental milestones to assess for recurrence of CMT and evidence of atypical development

Evidence quality: II; Recommendation strength: Moderate

JACOB TODAY ~ 2.5 years old

- Long-term outcomes? Even with Classification 2 there is persistent tilt and weakness with fatigue and sickness
- Clamping Equipment: Refer back to CPG criteria
- Parents/Parents: Tell caregivers that there can be ongoing weakness, especially with fatigue or sickness

Summary

- Education of referral providers is imperative for early referral: prognosis, classification system, evidence-based data for CMT and CD
- Continuation of research for best evidence-based practice: duration, interventions, dosage
- Create a network with other pediatric providers
- Create an evaluation in your practice with classification systems as outlined by the APTA CPG

Resources For Caregivers And Clinicians

- The Academy of the Pediatric Physical Therapy: Tips for Positioning and Play to Help Your Newborn Baby’s
- The Academy of Pediatric Physical Therapy: Guidelines and Roles for Clinicians (e.g. Therapists, MDs)
- The Academy of Pediatric Physical Therapy: Classification Systems for Congenital Muscular Torticollis
- Tummy Time Tools:
- Safe to Sleep: www.safesleep.org
- Plagiocephaly: www.hopkinsmedicine.org/conditions-and-treatments/plagiocephaly
- The 2018 APTA CPG for CMT: www.pediatricapta.org/includes/fact-sheets/pdfs/Plagiocephaly.pdf
- The 2018 CPG for CD: www.pediatricapta.org/includes/fact-sheets/pdfs/Plagiocephaly.pdf
- The 2018 APTA CPG for CMT: www.pediatricapta.org/includes/fact-sheets/pdfs/Plagiocephaly.pdf
REFERENCES


