Kyphoscoliosis

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What is Kyphoscoliosis?

- Scoliosis refers to coronal plane (medial/lateral direction)
- Kyphosis refers to sagittal plane (anterior/posterior direction)
- Difficult to define due to rib rotation without knowing if kyphosis is present

Etiology/Mechanism of Injury

- Primary condition:
  - Most common cause (80% of cases) are idiopathic and develop in childhood

- Secondary to:
  - Neuromuscular disease-
    - Muscular dystrophy
    - Poliomyelitis
    - Cerebral palsy
  - Vertebral disease-
    - Osteoporosis/osteomalacia
    - Pott's disease (tuberculous spondylitis)
    - Neurofibromatosis
    - Rickets
  - Disorders of Connective Tissue-
    - Marfan’s syndrome
    - Ehlers-Danlos Syndrome *
    - Morquio’s Syndrome
Patient Presentation

- **Signs/Symptoms**
  - Morphological deformity
    - Asymmetrical shoulder and/or pelvis, decreased respiratory function
  - Back pain
  - Decreased trunk/UE mobility

- **Risk Factors**
  - Early age onset, ~3 years of age
  - Conditions listed on previous slide

- **Complications**
  - Decreased pulmonary function- rib cage deformity
    - Hypercapnic, respiratory muscle fatigue
    - Eventual changes in lung tissue
    - Cardiorespiratory failure is typical cause of death in severe cases
  - Abnormal wear and tear on spinal structures
  - Nerve damage/impingement (from curve or surgery)
  - Emotional repercussions of decreased function and/or physical deformity
When can PT help?

- To manage symptoms/impairments:
  - Adolescents before bones have ossified (Risser’s sign)
  - Adults until symptoms can no longer be controlled with conservative treatment.
- Pre-operatively—“conservative treatment may improve the pain and stabilize the condition however it will never correct the actual deformity.”
  - *In conjunction with primary condition when KS is secondary, as symptoms may be compounded.
- Post-operatively—achieve/maintain functional movement, manage pain, neuromuscular re-education with spine fusion.

COBB’S ANGLE REMINDER:
- <10 degrees - normal
- 20-40 degrees - may benefit from conservative treatment and/or bracing
- >40 degrees (w/stage iv or v Risser’s sign) - surgery
Neurofibromatosis type I with severe dystrophic kyphoscoliosis and its operative management via a simultaneous anterior-posterior approach: a case report and review of the literature

- 51 y.o. male who presents with NF-1, a 165 degree thoracic kyphotic deformity, associated scoliosis, varied degree of vertebral destruction of T9-T11, and paraparesis below T10
- Spine Surgeon 9 yrs. prior but pt. refused reconstructive surgery
- Rationale - Pt. presents with severe case of kyphoscoliosis leading to surgery which brought up different treatment discussion for pre and post surgery treatment
Impairments Before Surgery

- Past several years, patient’s posture and deformity became progressively worse
- Confined to a wheelchair
- 2 years prior, patient lost motor function in L.E., has function of bowel and bladder
- Able to stand with AD, hip-knee-ankle-foot orthosis
- Neurological Exam -
  - No motor function below L1 and partial sensory below T10
  - LE Reflexes - hyperreflexive
  - Babinski reflexes present
  - 5 beat clonus present
- Xray, MRI, CT Scans
  - MRI - sagittal view - 165 degrees at T10
  - CT scan - almost complete destruction of T10
Surgery

- Decompress spinal cord and reconstruct spine
- Anterior and Posterior fixation
- Anterior vertebrectomy of T9-T11
- Posterior Laminectomies and a posterolateral costotransversectomy was performed of T9-T10
- Posterior Fusion from T6-L2
- Apex of deformity was centered at T10
- Rod instrumentation entailed T5-L2 with screws secured at T5, L1, and L2
- Entire procedure lasted 12 hrs with 2 liters of blood loss
Postoperatively

- Monitored in intensive care unit for 3 days with a total hospitalization of 13 days
- Placed in a thoracic-lumbar-sacral orthosis for six months to facilitate a solid fusion
- Complication: Urinary retention treated with a self-catheterization program for 7 months that resolved but still required the use of ureocholine medication
- Reduction of kyphotic deformity was noted at 65 degrees with a scoliotic curve of 40 degrees and no coronal imbalance at a 1 year follow up
- 3 year follow up - patient remained asymptomatic
Treatment Plan

- **Dosage:** 3x a week for 5 weeks, ongoing
- **Overall goal:** Patient symptom management and increase function
- **Daily Patient Education:** Breathing techniques and importance as well as how to perform their daily activities with the spinal deformity, along with a proper HEP
- **Manual therapy:**
  - Complete before ther ex
  - Myofascial Compression (ischemia)
  - Stretching of concave side of curve
- **Assistive device:** Bracing, FWW, or crutches
- **Modalities/Pain control:** May be contraindicated due to cancer, except sensory TENS
Treatment Plan

- **Therapeutic Exercise:**
  - Respiratory Exercises: *In patients with chronic respiratory failure due to kyphoscoliosis, exercise training improved exercise capacity, peripheral muscle strength, dyspnea, and quality of life. “* (Cochrane Review RCT)
    - Strengthening: valsalva maneuver, mueller maneuver
    - Endurance: increase ventilation, e.g. running, aqua therapy
  - We cannot change curve or progression, we can teach how to function efficiently with deformity.
    - AROM exercises
    - Deep breathing exercises
    - Balance exercises
    - Trunk strengthening
      - Strengthening on convex side of curve
    - Gait training
Interventions

- First week of Treatment:
  - Arm cycle ergometer for ROM
  - Bed mobility, fall training
  - Deep breathing exercises, meditation
  - Seated or standing balance
    - Change base of support
    - Functional reach
  - Isometric TA holds
  - Long sit or half kneel PNF
  - Aerobic exercise on recumbent bike

- 2-3 Weeks into the Patient’s Rehab:
  - Manual or TheraBand resisted PNF
  - Muller and valsalva maneuver
  - Light gait for aerobic and gait training
  - Bungees for strengthening
  - Side stepping, backwards walking, obstacle navigation
Home Exercise Program - TA Activation, hip flexion

• Lie on your back with your knees bent and your back in neutral position (slightly arched).

• Engage your core by recruiting your pelvic floor and transverse abdominis.

• Maintain a steady abdominal breathing while you lift one leg up to 90 degrees at the hip keeping the knee bent.

• Keep your back and pelvis completely still at all times.

• Return slowly to the initial position and repeat with the other leg.

DOSAGE
3x daily
12-15 reps
As tolerated

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Home Exercise Program - Snow Angel

- Lay on your back with your arms at your sides and knees bent, feet flat on the floor.
- Tighten your abdominals muscles, gently pull your shoulder blades toward each other and gently push the back of your hands down into the floor.
- Without letting your shoulders roll forward, slowly slide your arms on the floor to raise them overhead, as high as possible with good posture and without pain.
- Do not let your shoulders shrug toward your ear.

DOSAGE:
- 3+ daily
- 20 reps
- As tolerated

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Integration

- Kyphoscoliosis is typically a secondary condition
  - Neuromuscular disease, vertebral disease, disorders of connective tissue
- Much of the conservative treatment was with adolescents
- If too severe, conservative treatment is no longer a viable option
  - Our case resisted getting surgery, but ended needing it in the end
- Exercise concepts and progression would be similar for all patients, but level of function is individualized
Take home message

- Kyphoscoliosis is a combination of kyphosis (outward curve) and scoliosis (lateral curve)
- PT can manage postural strength and pain, but severe cases require surgical intervention.*
  - *PT also has pre and post-op role
- Each patient that has kyphoscoliosis will present with different impairments and comorbidities, PT must adjust to each individual
- Always be mindful of patient breathing mechanics and cardiorespiratory functioning
References