



# Kyphoscoliosis

---

Matt Orchard, Tori Orłowski, Sara Patterson, Jenna  
Plummer

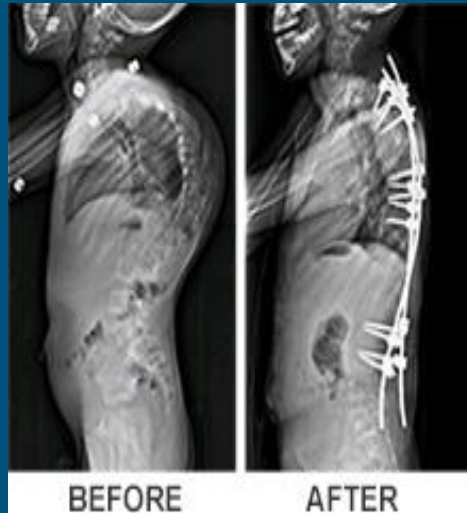


# What is Kyphoscoliosis?

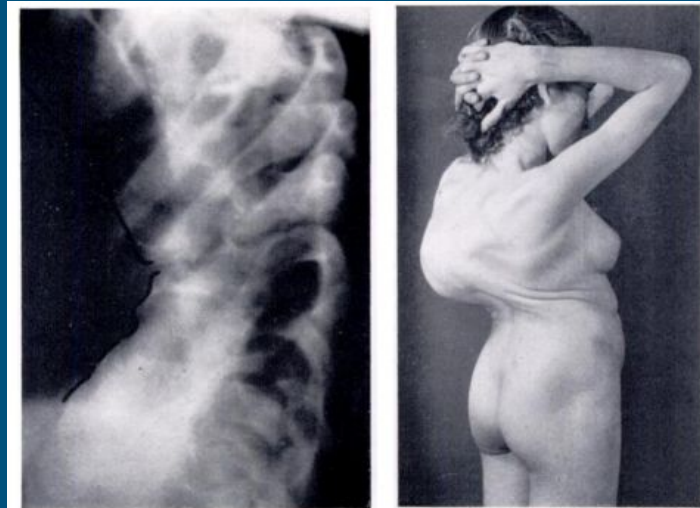
- Scoliosis refers to coronal plane (medial/lateral direction)
- Kyphosis refers to sagittal plane (anterior/posterior direction)
- Difficult to define due to rib rotation without knowing if kyphosis is present



Idiopathic Scoliosis



Kyphoscoliosis



Case 1. Figure 3—Kyphosis of 68 degrees. Figure 4—Photograph of patient eighteen months later.  
James, J. I. P. (1955). Kyphoscoliosis. *Bone & Joint Journal*, 37(3), 414-426.

# 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?

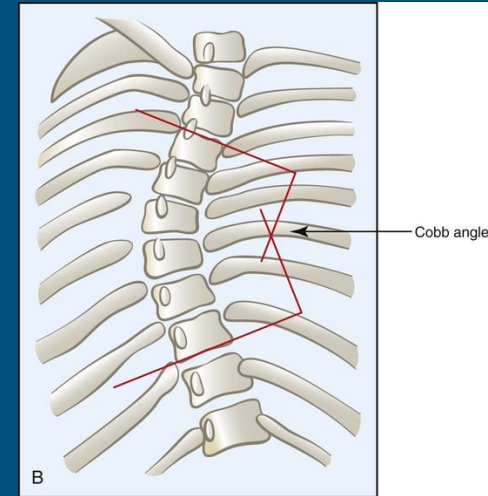
- To manage symptoms/impairments:
  - Adolescents before bones have ossified (Risser's sign)
  - Adults until symptoms can no longer be controlled with conservative treatment.
- Pre-operatively- *"conservative treatment may improve the pain and stabilize the condition however it will never correct the 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



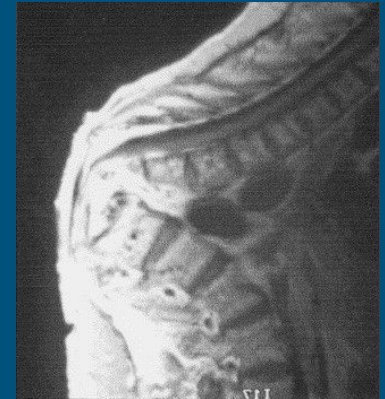
# Neurofibromatosis type I with severe dystrophic kyphoscoliosis and its operative management via a simultaneous anterior-posterior approach: a case report and review of the literature

- 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



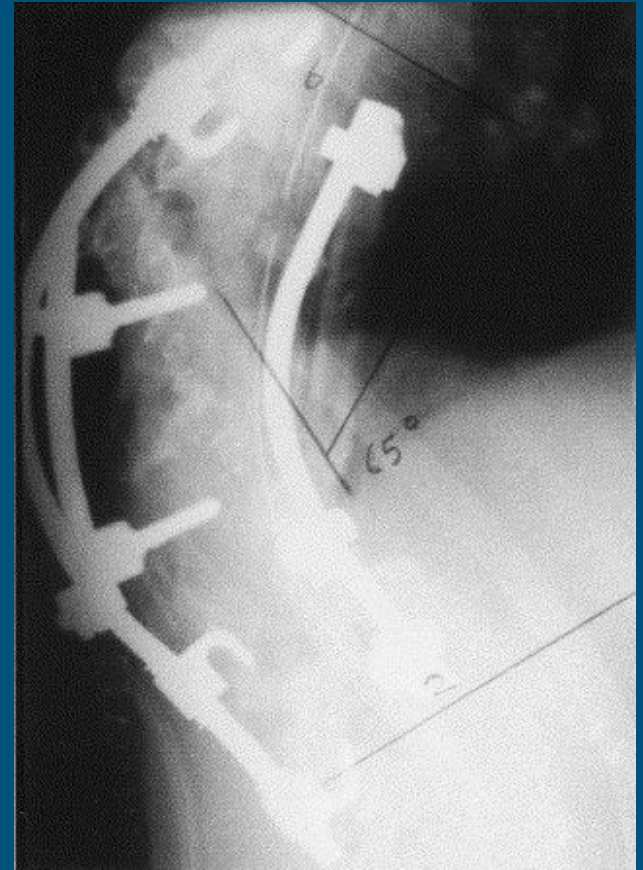
# Impairments Before Surgery

- 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
  - B. 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 the 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



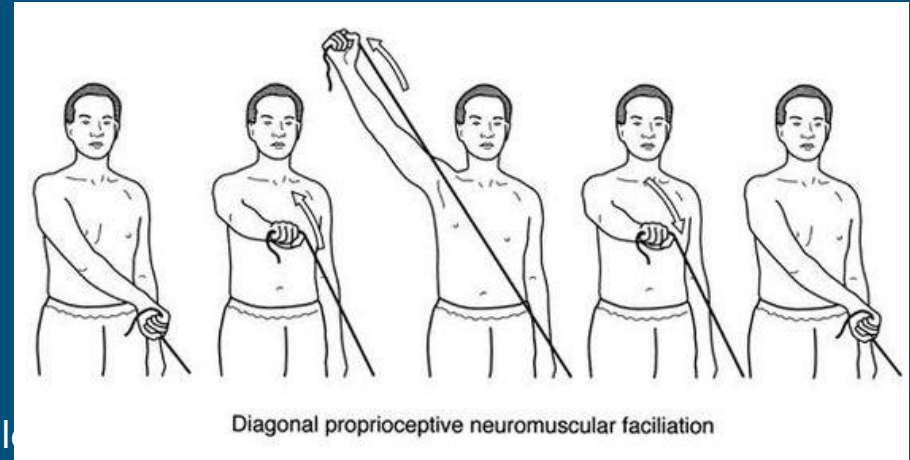
- **Therapeutic Exercise:**

- 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



# Home Exercise Program - Snow Angel

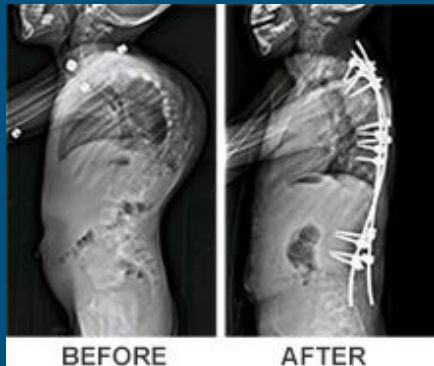
- Lay on your back with your arms at your sides and knees bent, feet flat on the floor.
- Tighten your abdominals muscles, gently pull your shoulder blades toward each other and gently push the back of your hands down into the floor.
- Without letting your shoulders roll forward, slowly slide your arms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

DOSAGE:  
3+ daily  
20 reps  
As tolerated



# Integration

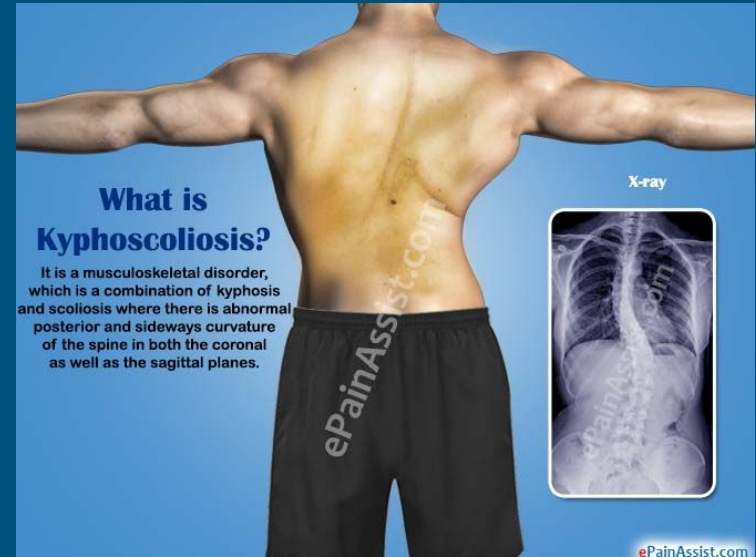
- Kyphoscoliosis is typically a secondary condition
  - Neuromuscular disease, vertebral disease, disorders of connective tissue
- Much of the conservative treatment was with adolescents
- If too severe, conservative treatment is no longer a viable option
  - Our case resisted getting surgery, but ended 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

---

1. James, J. I. P. (1955). Kyphoscoliosis. *Bone & Joint Journal*, 37(3), 414-426.
2. Singh, Kern, Dino Samartzis, and Howard S. An. "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." *The Spine Journal* 5.4 (2005): 461-466.
3. "CAS – Central Authentication Service". *Uptodate.com.libproxy.nau.edu*. N.p., 2016. Web. 12 July 2016.
4. Reid, W. D., & Dechman, G. (1995). Considerations when testing and training the respiratory muscles. *Physical therapy*, 75(11), 971-982.
5. Pardy, R. L., & Rochester, D. F. (1992, January). Respiratory muscle training. In *Seminars in respiratory medicine* (Vol. 13, No. 01, pp. 53-62). Copyright© 1992 by Thieme Medical Publishers, Inc..
6. "Exercise training in patients with chronic respiratory failure due to kyphoscoliosis : a randomized controlled trial." Cejudo P , López-Márquez I , López-Campos JL , Márquez E , de laVega F , Barrot E and Ortega F, *Respiratory care*, 2014, 59(3), 375, Cochrane Central Register of Controlled Trials, Publication Year: 2014
7. Zaky, L. A., & Rashad, G. M. (2013). Efficacy of Ischemic Compression Followed by Exercises Therapy Versus Rehabilitation Program in Treatment of Postural Scoliosis. *Bulletin of Faculty of Physical Therapy*, 18(1).