Neurogenic TOS in Competitive Athletes: How is it Best Managed and Diagnosed?

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Introduction: NTOS in Competitive Athletes

• NTOS is underappreciated and often overlooked
• Social media has drawn attention to suboptimal athletic performances – created favorable attention for NTOS
• Comprises a distinct population of athletes:
  – High predisposition to developing NTOS

Pearl TOS Springer 2013, Langosch 2013

• Nichols published a review in 1996
• Included 45 articles on TOS in the competitive athlete

NTOS in Competitive Athletes

• Symptoms of NTOS in athletes are repetitive, activity specific
  – Location and severity depend on motion and level of activity
• Repeated, exaggerated and often violent movements of the upper extremity
  – Place the shoulder at the extreme of abduction and external rotation


• Predisposing Activities:
  – Any sports require strenuous repetitive overhead activities
  – Exaggerated motions cause repetitive stretch injury to the shoulder and scalene muscles
  – Loss of shoulder girdle stability, hyperthermia of scalenes, pect minor
  – Water polo, baseball, softball, volleyball, tennis, football, golf, cheerleading, cross fit, wrestling, bodybuilding, gymnastics

Disclosures

• None
MLB Pitchers with TOS

- Tyson Ross
- Matt Harvey
- Mike Foltynewicz
- Luke Hochevar
- Phil Hughes
- Jaime Garcia
- Dillon Gee
- Jarrod Saltalamacchia
- Kenny Rogers
- Jeremy Bonderman
- Hank Blalock

- John Rhinecker
- David Cone
- Ian Kennedy
- Mike Adams
- Chris Carpenter
- Matt Harrison
- Chris Young
- Clayton Richard
- Noah Lowry
- J.R. Richard
- Shaun Marcum
- Josh Beckett

NTOS in Competitive Athletes

- Double Hit Hypothesis:
  1) Congenital predisposition
  2) Repetitive activity
  - Compression of structures in the interscalene triangle, subcoracoid space
  - AS/MS acute and chronic inflammation, spasm, hypertrophy
  - AS/MS/PM hypertrophy
  - Muscle changes compress and irritate the cervical nerve roots, brachial plexus

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Clinical presentation is non-specific

- Sx reproducible with activity

- Symptoms of NTOS in athletes:
  - Pain, paresthesias, numbness
  - Weakness, fatigue
  - Neck to fingers

- Pain may not be localized to the shoulder, biceps, elbow or forearm
  - If localized to a joint be cautious
  - no dermatome preference

Diagnosis: NTOS in Competitive Athletes

- PExam- reproduce symptoms with provocative maneuvers:
  - Posture, shoulder drop
  - Shoulder, elbow ROM
  - Scalene or pect minor tenderness
  - Cervical rotation and lateral flexion
  - ULTT, EAST, Wright, Adson
  - Costoclavicular maneuver

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Differential Diagnoses: NTOS in Competitive Athletes

- Alternative diagnoses shouldn’t be overlooked:
  - Cervical strain
  - Superior labral tear (SLAP)
  - Biceps strain
  - Medial collateral ligament trauma
  - Epicondylitis
  - Cubital tunnel syndrome
  - Pronator syndrome
  - Compartent syndrome
  - Glenohumeral instability

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Ancillary Testing: NTOS in Competitive Athletes

- H&P key to accurate diagnosis
- Diagnostic imaging neck, chest, shoulder
  - X-ray/MRI/CTA- routinely completed by the referring team
- Electrophysiologic testing- rule out other pathology
- Blocks- scalene, pect minor
  - temporary resolution supports the diagnosis
  - may predict response of decompression
- Duplex imaging- compression of artery or vein
Treatment: NTOS in Competitive Athletes

- Physical Therapy for 3 months
- Initial 4-6 weeks: education and alleviation of sx:
  - Rest, cessation repetitive activities
  - Stretch scalene & pect minor
  - Posture correction, nerve glide techniques, myofascial release
  - Anti-inflammatory agents and muscle relaxants

Treatment: NTOS in Competitive Athletes

- PT goals:
  - Strengthen levators, SCM, traps-open TOS
  - Stretch pecs and scalene
  - Myofascial release
  - PT alone in high performance athletes fails to provide satisfactory & durable sx relief
  - Lack of efficacy is likely attributed to forceful and repetitive nature of their activity

Early results of a highly selective algorithm for surgery on patients with neurogenic thoracic outlet syndrome

- 93 patients with NTOS (2000-09)
- Implemented a selective treatment algorithm: objective disability criteria, DUS, PT for 2-4 months
- 41% had modest improvement with PT
- 21 underwent decompression
- 90% sx improvement vs. 50% (p<.008)
- Demonstrated that compliance with a TOS specific PT and following a selective TOS algorithm improved surgical outcomes

Rehabilitation: NTOS in Competitive Athletes

- Post op: immediate ROM with analgesia
  - Limit weight (2 lbs for 2 weeks)
- Initiate PT: 2 weeks after surgery
  - Focus on posture and ROM
  - Progressive strengthening and conditioning
  - Full use by 6-8 weeks
- Gradual resumption and progression of athletic activities
- Most athletes return to full activity by 4-5 months

Decompression: NTOS in Competitive Athletes

- Sound diagnosis and attempted conservative treatment
- Supraclavicular approach:
  - Ant and middle scalenectomy
  - First rib resection
  - Brachial plexus neurolysis
  - Pect minor tenotomy

Thoracic outlet syndrome in high-performance athletes

- 27 competitive athletes (2000-13) with NTOS
- Highly selective algorithm with PT
- 18 (67%) underwent decompression
- 83% that underwent decompression returned to full competition at 4.6 months
- Most athletes with NTOS can successfully return to competitive sports
Conclusion

- NTOS in the competitive athletes is associated with repeated exaggerated movements of the upper extremity
- Symptoms in athletes can be vague but are activity specific
- Thorough history and physical combined with comprehensive PT regimen are keys to accurate diagnosis
- Surgical decompression in appropriately selected patients can provide relief and future protection
- Team approach provides the best outcomes

Thank you

3 month follow-up

6 month follow-up