THORACIC OUTLET SYNDROME: A FREQUENT CAUSE OF NON-DISCOGENIC BRACHIALGIA

Debora Garozzo
Brachial Plexus and Peripheral Nerve Surgery Unit
Neurospinal Hospital
Dubai, United Arab Emirates
THE THORACIC OUTLET REGION

Cervical spine

Pectoralis minor inferior border

- Interscalenic space
- Costoclavicular space
- Interpectoralis space
Classification of TOS

- **Neurogenic TOS (90-95%)**:
  a) without neurological deficit ("Disputed ” form)
  b) with neurological deficit ("True TOS”)

- **Arterial TOS (1%)**

- **Venous TOS (5%)**
Diagnosis is **mainly** based on clinical data

“Exclusion diagnosis”
<table>
<thead>
<tr>
<th>Condition</th>
<th>Main clinical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herniated cervical disc</td>
<td>Severe neck pain and stiffness, improvement of symptoms with elevated arm, no swollen hand</td>
</tr>
<tr>
<td>Cervical arthritis</td>
<td>Severe neck pain and stiffness, infrequent paresthesias</td>
</tr>
<tr>
<td>Fibromyalgia</td>
<td>Pain and tenderness in at least 10 muscles sites</td>
</tr>
<tr>
<td>Parsonage- Turner Syndrome</td>
<td>Acute onset of brachialgia frequently after a minor trauma, effort or viral infection. Spontaneous resolution of pain after 3/4 weeks followed by progressive atrophy. No paresthesias</td>
</tr>
<tr>
<td>Brachial plexus neoplasms</td>
<td>Pain and paresthesias usually worsen at night but not related to movements or activities. Possibility of progressive neurological deficits in malignant forms</td>
</tr>
<tr>
<td>Carpal tunnel syndrome</td>
<td>Hand pain and paresthesias in the median territory or the whole hand, radiation distal to proximal even up to the shoulder</td>
</tr>
<tr>
<td>Cubital tunnel syndrome</td>
<td>Hand pain and paresthesias in the ulnar territory worsened by elbow flexion/extension or leaning on hard surface</td>
</tr>
<tr>
<td>Rotator cuff tendinitis</td>
<td>Localized pain and tenderness over biceps tendon associated with shoulder pain during abduction, no paresthesias</td>
</tr>
<tr>
<td>Pancoast tumor</td>
<td>No neck pain, Horner’ sign, pain radiating along the upper limb without clear radicular distribution</td>
</tr>
</tbody>
</table>
“Exclusion diagnosis”

Cervical spine pathology (e.g. herniated cervical disk) or conditions such as other nerve entrapments (e.g. ulnar nerve entrapment) must be initially excluded
Multiple crush syndrome

Herniated cervical disk or nerve entrapments (e.g. ulnar nerve entrapment) may be contributing to the clinical picture although the main component still remains TOS.
In May 2017 Neurospinal Hospital opened a Brachial Plexus and Peripheral Nerve Surgery Unit.
Non-discogenic brachialgia (May 2017- May 2018)

• 59 non-discogenic brachialgias
• Age group: 3-5 decades
• Gender: 39 females and 19 males (2:1)
Clinical and radiological findings consistent with TOS

- 19 patients
- 12 females and 7 males
Management of neurogenic TOS

• Clinical evaluation

• Diagnostic assessment

• Indication for treatment:
  - conservative
  - surgical
Etiopathogenesis of TOS in female patients

- 11 primary cases

Long dating clinical history: 3 to 9 years
Etiopathogenesis of TOS in male patients

- 3 primary cases
- 1 post-traumatic case
- 3 cases secondary to cervical surgery
Incidence of bone anomalies

One female patient
Main phenotype in TOS

- Long and slender neck
- Narrow shoulders
- Heavvy breasts
Clinical presentation in disputed TOS

Pain along:

- the neck
- shoulder blade
- the ulnar territory
Clinical presentation in disputed TOS

- axilla and lateral part of the thoracic wall
Clinical presentation

- Pain radiating to the ipsilateral hemiface and nape
Clinical presentation

• Horner’s sign (3 cases)

In one case associated with mild muscle waste, no clear Gilliat-Sumner hand
Clinical presentation

Paresthesias

- Usually in the ulnar nerve territory
- Paresthesias in the median nerve territory or the whole hand are less frequent
Clinical presentation

- Pain and paresthesias normally worsen at night
- Swollen hand in the morning
Algoparesthesias worsen when performing repetitive work or under efforts, such as carrying weights.
Prolonged shoulder abduction triggers worsening of algoparesthesias
Provocative tests in TOS

- Adson’s test
- Wright’s test
- Allen’s test
- Eden’s test
- Halstead’s test
- Roos’ test
- Traction test
- Tinel’s sign
Roos’ test

Opening and closing the hands triggers worsening of algoparesthesias even after a few seconds.

The examiner should also perform the test at the same time.
Supraclavicular Tinel’s sign

One case of Tinel’s sign at infraclavicular level
Traction test
Diagnostic assessment

- MRI of the cervical spine
- MRI of the brachial plexus
- NCS/EMG
Investigations in TOS

«Dynamic» entrapment

«Dynamic» investigations
DINAMIC MR NEUROGRAPHY in TOS

- Hyperabduction
- Decreased costo-clavicular space
Dynamic MRI of the brachial plexus

Comparison of oblique scans of both upper limbs during shoulder abduction

Evidence of reduction of fat tissue around the structures and narrower costoclavicular space
MR angiography

Rest

Hyperabduction
Electrodiagnostic tests in neurogenic TOS without deficits

• *Usually unremarkable*
Electrodiagnostic tests in TOS

Useful to detect multiple crush syndrome

• 1 case of TOS + chronic C7 radiculopathy

• 2 cases of TOS + CTS

• 2 cases of TOS + cubital tunnel syndrome
Treatment in neurogenic TOS

- Conservative treatment

- Surgery
  (9 cases)
Surgical approach

- Transaxillary approach
- Posterior subscapular approach
- Anterior supraclavicular approach
Surgical procedural

• General anesthesia (No use of muscle blocks)

• Magnifying loupes

• Nerve stimulator
Surgical technique

- Extended neck with head contralaterally rotated and he ipsilateral shoudler elevated by a pillow
- Transverse incision parallel to the clavicle and 1-2 cm above it
Surgical technique

- Identification of the omoyoid muscle
Lymphatic vessels

- Not only on the left side
- Lymph is not always lactescent

A muscle, Surgicel and fibrin glue patch is the solution in case of lymphatic loss
Before starting scalenectomy, identify and isolate the phrenic nerve.
Exposure of the lung apex
Post-scalenectomy decompression
Infraclavicular exploration

Resection of pectoralis minor tendon was performed in one case
Outcome

- No postoperative complications
- *Immediate resolution of Horner’s sign*
- Progressive subsidence of pain and paresthesias
Conclusions

• Thoracic outlet syndrome is one of the main causes of non-discogenic brachialgia but it is frequently overlooked.
Conclusions

• A suspicion of TOS should be raised based on the clinical presentation and differential diagnosis

• The possibility of its association with other pathologies (e.g. carpal tunnel syndrome) must be carefully assessed
Conclusions

- Anatomical anomalies are not the main cause of TOS (found in less than 10% in surgical series)

- Neurogenic TOS is mainly consequent to a dynamic compression due to a muscle imbalance in the cervical spine-shoulder girdle complex

- Etiopathogenesis might present differences related to gender
Thanks for Your attention