

Thoracic outlet syndrome due to hyperextension-hyperflexion cervical injury

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Alexandre A, Coro L, Azuelos A, Pellone M.

FROM ABSTRACT:

Posttraumatic brachial plexus entrapment in fibrotic scarring tissue is taken into consideration as the cause of complaints for patients who suffered a hyperextension-hyperflexion cervical injury.

All 54 patients included in this analysis were symptom-free before the accident and subsequently complained for pain, paresthesia and slight weakness in the arm.

In 14, neurological signs of brachial plexus entrapment were observed.

Electro-neurophysiological summary index testing was positive for a brachial plexus involvement in all cases.

Conservative measures, comprising physical therapy and vasoactive drugs were applied for a period of 6 to 12 (mean 8.4) months; surgical procedure of neurolysis was then proposed in 39 cases to solve the problem.

Thirty-two patients were operated on. Twenty of these had a neat improvement on a 6-month to 1-year follow-up. Seven patients had refused surgery; of these, 6 patients had clinical worsening at the same follow-up period while 1 remained unchanged.

All [whiplash] patients with clinical symptoms not reversed after some time post-injury should be investigated for a possible brachial plexus entrapment.

THESE AUTHORS ALSO NOTE:

Posttraumatic thoracic outlet syndrome (brachial plexus entrapment in fibrotic scar tissue) may be the physical basis for prolonged complaints of patients who suffered from slow-speed rear-end accidents. **[Important]**

Improvements in vehicle safety systems [like shoulder harness seat belts] have altered the mechanism of traction and distortion on cervical vertebrae, ligaments, and nerve structures during motor vehicle crashes.

The patients in this study suffered from "mild car accidents."

These patients were evaluated an average of 10 months after injury, with a range between 2 to 27 months.

"All patients [54/54] complained of neck pain and stiffness."

27/54 = 50% complained of shoulder pain.

17/54 = 31% complained of headache.

10/54 = 19% complained of arm pain. Tingling in the arm and hand was usually worse during sleep.

8/54 = 15% complained of dizziness.

1/54 = 2% complained of blurred vision.

All patients showed tenderness and muscular stiffness in the supraclavicular region and reduced neck motion in all directions.

Adson's test was positive in all patients.

45/54 = 83% had straightening of cervical lordosis on initial x-rays.

All patients had received conservative treatment for their injuries prior to being evaluated in this study.

These authors injected corticosteroids into the scalene muscles or into the loose connective tissue in all 54 patients, resulting in lasting improvement in 15/54 = 28%.

The remaining 39 patients were proposed surgery, of which 32 accepted and 7 refused.

The operative finding was "moderate to dense scar tissue surrounding completely the offended nerve trunks at the point of their exit from the interscalenic space." **[IMPORTANT: Fibrosis of Repair]**

"The subclavian artery was frequently observed to be hardly adherent to the middle trunk [of the brachial plexus]. As the scar tissue had formed a sheet around both structures incorporating them."

"Of the 7 patients not operated on, 6 worsened at a 6 month follow-up, while one patient remained unchanged."

Of the 32 operated on patients, 24 (75%) showed improvement at the 6 month follow-up.

When a car is hit from behind, the neck of the occupant hyperextends.

This hyperextension stretches the neck muscles and stretches the brachial plexus.

The sudden stretch of the neck muscles causes a physiological contraction, narrowing the interscalenic space, compressing the brachial plexus while it is also stretching.

The sudden intense muscle contraction causes a myofascial pain syndrome causing prolonged compression on the brachial plexus nerve trunks.

The nerve damage is further aggravated by edema, which further compromised neuronal blood flow.

The result is fibrosis at the site of the primary injury.

Chronic compression of nerve trunks interferes with its blood supply, alters the permeability of the perineurium with swelling and edema. This causes a proliferation of fibroblasts, changing the matrix collagen formation, and resulting in "endoneurial fibrosis at the site of the lesion and distal to it."

"If fibrosis is not solved, thinning of the myelin sheath is observed."

"During surgery fibrotic scar tissue enveloping the nerve trunks was found, and the site of greatest scarring" was the anterior scalene muscle.

If the entrapment is prolonged, the fibrotic changes and demyelination become irreversible. **[Important]**

The individuals who develop post-whiplash thoracic outlet syndrome usually have a predisposing posture or work habits, and the cervical injury disrupts a fragile equilibrium. **[Important]**

Conservative treatment will usually abate chronic sequels if initiated early enough after injury, including postural improvements and specific treatments to the brachial plexus.

KEY POINTS FROM DAN MURPHY

1) Hyperextension-hyperflexion cervical injury can result in posttraumatic brachial plexus entrapment in fibrotic scar tissue.

2) Posttraumatic thoracic outlet syndrome is a brachial plexus entrapment in fibrotic scar tissue.

- 3) Post-traumatic thoracic outlet fibrotic scar tissue is probably the physical basis for prolonged complaints of patients who suffered from slow-speed rear-end accidents. **[Important]**
- 4) Typical complaints subsequent to post-traumatic thoracic outlet fibrotic scar tissue include neck pain and stiffness (100%), shoulder pain (50%), headache (31%), arm pain with tingling in the arm and hand that is worse during sleep (19%), dizziness (15%), and blurred vision (2%).
- 5) 83% of post-traumatic thoracic outlet fibrotic scar tissue patients have reduced cervical lordosis on initial x-rays.
- 6) The site of greatest scarring from post-traumatic thoracic outlet syndrome is the anterior scalene muscle.
- 7) If the post-traumatic entrapment is prolonged, the fibrotic changes and demyelination become irreversible. **[Important]**
- 8) The individuals who develop post-whiplash thoracic outlet syndrome usually have a predisposing posture or work habits, and the cervical injury disrupts a fragile equilibrium. **[Important]**
- 9) Conservative treatment will usually abate chronic sequels if initiated early enough after injury, including postural improvements and specific treatments to the brachial plexus.
- 10) All whiplash patients with clinical symptoms not reversed after some time post-injury should be investigated for a possible brachial plexus entrapment.