

CONSERVATIVE MANAGEMENT OF THE THORACIC OUTLET COMPRESSION SYNDROME

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Abstract

Aim of the study: To assess the results of sports rehabilitation of patients suffering from thoracic outlet compression syndrome.

Material and methods: Participants of the study were 12 patients of the Vascular, General and Transplantation Surgery Clinic, treated for thoracic outlet compression syndrome (TOS). Only patients of asthenic build, without bone or fibro-ristle anomalies in the thoracic outlet region were qualified for surgery. The syndrome was detected clinically by applying provocative maneuvers as modified by Lang test, together with non-invasive imaging (ultrasonography Duplex-Doppler). The same procedures were used when evaluating rehabilitation effects. The pre- and post-treatment functions of upper extremity were assessed from DASH (Disabilities of the Arm, Shoulder and Hand) questionnaire. The patients were qualified for conservative therapy consisting mainly of exercises strengthening the shoulder girdle muscles. The objective of rehabilitation was reduction or elimination of pressure on the brachial plexus, and on subclavian artery and vein, jammed between the first rib and clavicle.

Results and conclusions: The incidence of positive provocative maneuvers were reduced by Lang-test. Total improvement of the blood flow in subclavian artery was demonstrated in by Duplex-Doppler imaging. The majority of patients exhibited full functional recovery of upper extremity in DASH scale. It was concluded that application of rehabilitation exercises to patients with thoracic outlet compression syndrome offered them chance to avoid surgery.

Key words: thoracic outlet compression syndrome, DASH – questionnaire, strengthening exercises, shoulder girdle

Introduction

Thoracic outlet compression syndrome (TOS) is manifested by neurological and vascular (arterial and venous) symptoms in upper extremities, resulting from pressure on brachial plexus, subclavian and axillary veins in the thoracic outlet region. That pressure is usually exerted on all elements of neurovascular bundle, one of the groups of symptoms (neurological, arterial or venous) dominating (1-4).

Anatomical peculiarities, congenital defects, neck and shoulder injuries and functional disorders, as well as somatotype, gender and age, contribute to the expression of TOS symptoms (1, 3). The syndrome prevails in women with asthenic body build, in the 3rd decade of life (1), when physiological shoulder drop may take place, and the neurovascular bundle becomes compressed predominantly between the first rib and clavicle. In men, muscle hypertrophy plays the deciding role in pressure development, the most susceptible so that syndrome thus being those who apply heavy loads on upper extremities like bodybuilders, gymnasts or miners (1, 4).

In a high percentage of patients with TOS, typical postural defects are detected: anteversion of the pelvis with elimination of lumbar lordosis, elimination of thoracic kyphosis, protruding lower edges of shoulder blades (2, 3). Among other causes of the syndrome

are degenerative changes in the cervical region of the spine and discopathies, which induce tension of certain muscles or bring about postural defects (1, 2).

In people with normal body build, TOS may result from the existing bone pathologies (mostly cervical rib, rudimentary or double 1st rib), fibromuscular pathologies (fibrous bands connecting the transversal process of the C7 vertebra with the 1st rib, translocation or adhesion of scalenus muscles (1, 2, 4).

Principal TOS symptoms are related to the degree of compression of brachial plexus, or subclavian vein or artery, the dominating one being pain of the upper extremity and shoulder, typical of neural and artery compression. In case of venous compression, oedema and livedo appear (4, 5).

Qualification of patients for surgical treatment of TOS is based on clinical tests, non-invasive procedures (X-ray of the cervico-thoracic region, Duplex-Doppler, electromyography) and, in selected cases, also invasive ones, like phlebography and arteriography (1, 4-6).

The surgical management of choice consists of removing the 1st rib together with possible bone or fibromuscular pathologies (1-6). In some patients surgery may be avoided by applying conservative treatment consisting of motor rehabilitation, analgesic drugs, heat, ultrasound and massage (5, 6).

Material and methods

A group of 12 female patients, aged 17-37 years, in whom TOS was detected were treated in the period 2004-2005. The diagnosis was based on clinical examination and non-invasive imaging, the latter being performed in upper extremity position like in the Lang's abduction test. Only patients with asthenic build and without bone or fibro-gristle anomalies in the thoracic outlet region, detected by X-ray imaging of the cervical-thoracic region, were qualified for treatment.

Preliminary diagnosis was based on provocative maneuver - Lang's abduction. The abduction test, modified by Lang, consists of assessing peripheral pulse on the arm flexed at the elbow joint, hand under the occiput, head twisted to the contra lateral side. Subclavian artery was assessed at rest and in the Lang's test by USG Duplex-Doppler imaging. The treatment consisted of exercises strengthening the shoulder girdle muscles in order to reduce or eliminate the compression of neurovascular bundle by the 1st rib - clavicle osseous shears. The following exercises were recommended to patients:

1. Deep breathing exercises :patients in reclined position, hands put under head, breathes deeply (10 repetitions);
2. Exercising serrati muscles: patient in reclined position, pushes up a weight (2kg) arms extended (3 series, 10 repetitions each);
3. Exercising middle part of trapezius muscle: patient lying in prone position, raises 2kg weight, arms flexed at elbow joints so, that shoulder blades be maximally together (3 series, 10 repetition each);
4. Exercising back extensor (longissimus dorsi): patient lying in prone position, arms along the body, pillow under the belly, straightens back by moving arms and head up (10 repetitions);
5. Exercising lower part of trapezius muscle: patient lying in prone position, raises forearms and elbows (15 repetitions);
6. Exercising smaller pectoral muscle: patients stands upright, slightly astride, with anteversion, draws him-/herself to a wall (5 repetitions);
7. Exercising upper part of trapezius muscle: patient raises arms and abducts them, bringing shoulder blades maximally together (3 series, 10 repetitions each).

Every patient exercised for 3-4 months, after which provocative maneuvers and Duplex-Doppler test were performed. Patients assessed upper extremity functions before and after rehabilitation by filling DASH (Disabilities of the Arm, shoulder and Hand) questionnaire 1-3 years after the treatment had been discontinued. That questionnaire was issued by the American Academy of Orthopedic Surgeons, contains

30 questions pertaining to symptoms and function of upper extremity and is used principally in orthopedics.

Results

Provocative maneuvers were rated as positive upon pulse fading over the radial artery and appearance of bruit above the subclavian artery. In all cases Lang's tests was positive. Blood flow disorders were detected by Duplex-Doppler examination in all patients, in the terminal segment of subclavian artery beyond the crossing of the first rib and clavicle which evidenced vessel compression in osseous shears.

Progressing or severe pathological symptoms in upper extremities were reported in DASH questionnaire by 75% of patients (9 patients) which was also reflected in deteriorated professional activities, as well as physical fitness and the ability to play music instruments (9 patients - 75% and 8 patients - 66,6%, respectively).

Following the training courses lasting 3-4 months, frequencies of positive Lang's tests decreased by 33,3% (4 patients). A full recovery of blood flow in the subclavian artery was noted in 50% of patients. No pathological symptoms in upper extremities or only slight ones were reported by 83% of patients (10 patients) of DASH scale, i.e. by 58,3% more than pre-training. Moreover, 83,3% (10 patients) and 75% (9 patients) of patients rated their improvement in professional activities or physical fitness and playing, respectively, as very good.

Discussion

Thoracic outlet compression syndrome is a rare disease and discerning it from other diseases associated with pains in upper extremities is essential for selecting an appropriate therapy (4, 5). Like reported by other authors, a higher incidence of the disease was noted in this study for women aged 30-50 years (1, 4-6).

When qualifying for rehabilitative treatment, body build and absence of bone or fibro-gristle anomalies in the thoracic outlet region are of paramount importance, for an application of exercises aimed at strengthening chest muscles in subjects of athletic build or with pathologies like cervical rib, which reduce the space delimited by scalenus muscle triangle, may bring about intensification of pathological symptoms (1, 3, 4). Bone anomalies in the cervical-thoracic region may be ruled out by X-ray, but fibrous bands compressing the neurovascular bundle are detectable only upon surgery (3-5). Strengthening muscles under such circumstances may thus aggravated the effects of compression syndrome.

A preliminary diagnosis of TOS enabled by applying provocative maneuvers may be confirmed by

Duplex-Doppler examinations but none of them is capable of indicating the location of neurovascular bundle compression (1, 4-6). However, considering patient's asthenic build and absence of bone pathologies, compression of vessels and of brachial plexus within the shears of the first rib and clavicle may be assumed. Provocative maneuvers and non-invasive imaging confirm beneficial effects of rehabilitation on elimination or reduction of compression of the subclavian artery and vein and of brachial plexus in the costal-clavicular region but this is feasible only in thoroughly selected patients (5-9).

Rehabilitation of TOS patients represents therapeutic management which enables functional recovery in professional, sport and everyday areas, as demonstrated by the results of DASH questionnaire (10, 11).

Conclusions

1. Sports rehabilitation exercises applied to patients with thoracic outlet compression syndrome offer them chances to avoid surgery.
2. Disabilities of the Arm, Shoulder and Hand questionnaire designed by the American Academy of Orthopedic Surgeons is a useful tool for assessing rehabilitation outcome in patients with thoracic outlet compression syndrome.

References

1. Adamski S. Zespoły naczyniowo-nerwowe. In: Rykowski H. ed. Choroby naczyń. PZWL, Warszawa 1990.
2. Gruss JD, Hiemer W, Bartles D. Klinik, Diagnostik und Therapie des Outlet Syndroms. *Vasa* 1987; 16: 337-44.
3. Dunant JH. Diagnosis of thoracic outlet syndrome and indications for surgery. *Vasa* 1987; 16: 345-48.
4. Mackinnon SE, Novak CB. Thoracic outlet syndrome. *Curr Probl Surg* 2002; 39: 1070-145.
5. Pupka A. Ocena wyników badań diagnostycznych i leczenia operacyjnego w zespole uciskowym górnego otworu klatki piersiowej. *Acta Angiologica* 1995; 1: 51-9.
6. Kwiatkowska W. Zespół górnego otworu klatki piersiowej. *Pol Tyg Lek* 1993; 48: 669-72.
7. Aligne C, Barral X. Rehabilitation of patients with thoracic outlet syndrome. *Ann Vasc Surg* 1992; 6: 381-9.
8. Novak CB, Collins ED, Mackinnon SE. Outcome following conservative management of thoracic outlet syndrome. *J Hand Surg* 1995; 20: 542-8.
9. Novak CB. Conservative management of thoracic outlet syndrome. *Chest Surg Clin N Am* 1990; 9: 747-60.
10. Pupka A, Rybak Z, Kałuża G. et al. Zmiana strategii leczenia zakrzepicy żyły podobojczykowej w przebiegu zespołu uciskowego górnego otworu klatki piersiowej-rekomendacja kliniczna. *Przeg Flebol* 2003; 11: 37-42.
11. Hudak PL, Amadio PC, Bombardier C. Development of upper extremity outcome measure: the DASH (disabilities of the arm, shoulder and hand). The upper Extremity collaborative Group (UECG). *Am J Ind Med* 1996; 29: 602-8.
12. Lokanathan R, Salvian AJ, Chen JC. et al. Outcome after thrombolysis and selective thoracic outlet decompression for primary axillary vein thrombosis. *J Vasc Surg* 2001; 33: 783-8.

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Author's contribution

A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
E – Manuscript Preparation
F – Literature Search
G – Funds Collection