

CLINICAL AND RADIOGRAPHIC CHARACTERISTICS OF PATIENTS WITH CERVICALGIA AFTER PREVIOUS INJURY TO THE PECTORAL GIRDLE

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The health of the cervical spine (CS) and the functional state of the pectoral girdle are interdependent. Injuries to the pectoral girdle can be an underlying cause of CS pain, including cervicalgia. The aim of this study was to evaluate the condition of the cervical spine in patients with cervicalgia developed after a pectoral girdle injury using radiographic and physical examinations. The study included 400 patients complaining of cervicalgia. Pain intensity was evaluated on the visual analog scale (VAS); the impact of the condition on patients' lives was assessed using the Neck Disability Index (Russian language). During physical examinations, the general health of the spine was evaluated and abnormalities in the cervical spine were noted. All participants underwent a radiographic scan of the cervical spine in the lateral and anterior-posterior projections; 49.5% of patients underwent postural digital radiography to evaluate their CS sagittal profile. All patients received an MRI scan. Based on the results, we identified certain functional changes in the cervical spine which possibly caused cervicalgia. Structurally and functionally, the changes were divided into static and dynamic. We conclude that cervical spinal pain is a common problem among patients with previous pectoral girdle injury.

Keywords: cervicalgia, sagittal balance, spine, cone of economy, radiography, pectoral girdle injury, cervical spine, global alignment

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КЛИНИКО-РЕНТГЕНОЛОГИЧЕСКАЯ ХАРАКТЕРИСТИКА ПАЦИЕНТОВ С ЦЕРВИКАЛЬНЫМ СИНДРОМОМ ПОСЛЕ ТРАВМЫ НАДПЛЕЧЬЯ

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Состояние шейного отдела позвоночника (ШОП) находится во взаимосвязи с функциональным состоянием пояса верхней конечности. Повреждения пояса верхней конечности могут лежать в основе болевых ощущений в ШОП, в том числе вызывать цервикалгию. Целью исследования было оценить клинико-рентгенологическую картину ШОП у пациентов с цервикалгией, перенесших травму плечевого пояса. В исследование вошли 400 пациентов с жалобами на цервикалгию. Интенсивность боли оценивали по визуально-аналоговой шкале (VAS), ограничения жизнедеятельности — по опроснику NDI-RU (The Neck Disability Index, Russian language). При осмотре пациентов проводили оценку профиля позвоночника и локальных изменений в ШОП. Всем лицам, включенным в исследование, было выполнено рентгенологическое обследование ШОП в боковой и передне-задней проекциях, у 49,5% пациентов проведена постуральная цифровая рентгенография позвоночника для оценки сагиттального профиля ШОП. Всем пациентам была сделана магнитно-резонансная томография (МРТ). По результатам комплексного клинико-лучевого обследования у пациентов были отмечены функциональные изменения, которые можно трактовать как причину развития цервикалгии. С точки зрения структурно-функционального диагноза определены различные статико-динамические нарушения. Таким образом, было выявлено, что болевой синдром в области ШОП является часто встречающейся проблемой у пациентов, перенесших травму надплечья.

Ключевые слова: цервикалгия, сагиттальный баланс, позвоночник, конус экономии, рентгенография, травма верхней конечности, шейный отдел позвоночника, общее строение

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In the recent decade structural deformities and functional impairments of the spine have been deemed increasingly important as an underlying cause of both axial and peripheral pain syndromes. Biomechanically, the spine and the pectoral and pelvic girdles resemble an intricate rigging system [1, 2]; the spine, its central component, is a "mast" supported

by "shrouds", i.e. the pectoral girdle, pelvis, and spinal and limb muscles. In this biomechanical system, a change in the spatial orientation of one component will entail adaptive shifts or functional adjustments of others. Through such adaptation energy-efficient performance is achieved, meaning that the body can maintain its postural balance within the cone of

economy, as described by Dubousset (Fig.1) [3–6]. Thus, functional statuses of the cervical spine (CS) and the shoulder girdle should be seen as interdependent [1, 3, 7, 8].

Injuries to the pectoral girdle are very common and nowadays account for 15% of all skeletal injuries [9]. They are most often seen in young patients of working age and are a result of household, sport-related and road accidents.

Based on the analysis of treatment outcomes in patients with pectoral girdle injuries, we can isolate a group of patients with cervicgia. This group is heterogenous and includes differently aged individuals who previously received operative or non-operative treatment for their condition. Of particular interest here are young and middle-aged patients who had no clinical signs of cervicgia before the injury. Neck pain entails functional limitations and slows down rehabilitation, affecting its intensity; it also deteriorates the patient's quality of life [7]. It is worth noting that there are no reliable data in the literature on the prevalence of cervicgia in patients with previous injuries to the pectoral girdle or on its possible causes.

The aim of our study was to evaluate the condition of the cervical spine in patients with cervicgia after a pectoral girdle injury based on radiographic and physical examinations.

METHODS

The study was conducted in 400 patients undergoing treatment at the facilities of the Trauma Unit (Botkin City Clinical Hospital, Sechenov First Moscow State Medical University, Department of Traumatology, Orthopedics and Disaster Surgery) between 2015 and 2018. The study included male and female individuals aged from 18 to 59 years (mean age was 41.3 ± 1.1 years) with localized neck pain (suggestive of cervicgia) and an isolated unilateral injury of the pectoral girdle received at least 6 weeks before the study.

Patients with clinical signs of cervical radiculopathy, any previous injury to the spine, the narrowing of the cervical spinal cord of any etiology and multiple injuries were excluded from the study.

Age- and sex-based distribution of patients is shown in Table 1.

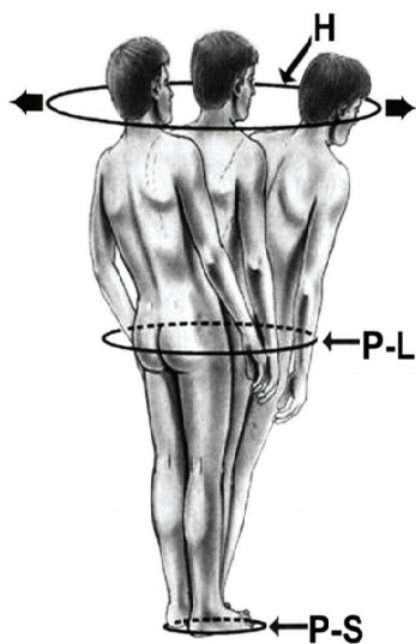


Fig. 1. The picture of the optimal standing posture of the human body as proposed by the "cone of economy" concept [3]

Of all selected patients, 276 (69%) received surgical treatment, 124 (31%) received non-operative treatment.

Clinical evaluation of the orthopedic status was performed in all patients. Pain intensity was evaluated on the visual analog scale (VAS) [10, 11].

The impact of neck pain on the patients' lives was assessed using the NDI-RU questionnaire [12–14].

CS radiography was performed in standard anterior-posterior and lateral projections (100%). Functional radiography of the cervical spine was not ordered: it would have provided no valuable information because of the pain syndrome the patients suffered from and because it would have been impossible to maintain identical conditions during each examination.

To investigate the sagittal profiles of CS, we performed postural digital radiography of the spine in the lateral and anterior-posterior projections in 198 patients (49.5%) [5]. This type of imaging allows to evaluate both cervical spinal balance and the so-called global alignment (Fig. 2) [7, 15–20].

To understand the condition of intervertebral discs and to exclude cervical spinal stenosis, an MRI examination was ordered for all the patients (T1/T2-weighted and STIR scans in closed 1.5 Tesla machines with standard Pfirrmann grading) [21].

RESULTS

All patients complained of neck pain. Pain intensity on the VAS scale was mild in 18 patients (4.5%), moderate in 312 patients (78%), fairly severe and severe in 70 patients (17.5%). Average score for pain intensity was 5.6 ± 0.45 points.

The NDI-RU questionnaire revealed mild self-measured disabilities in 85 patients (21.3%), moderate, in 290 patients (72.5%) and severe, in 25 (6.2%) patients.

Physical examinations were carried out to assess the overall condition of the spine, search for the abnormalities in the cervical spine, and estimate the range of motion in the latter (Table 2).

Radiography detected the following local symptoms (Table 3).

In the frontal plane the cervical spinal axis looked undeformed.

Table 4 shows the findings of postural digital radiography performed to assess cervical sagittal balance.

MRI scans were suggestive of intervertebral disc degeneration in the studied zone in all the patients (Pfirrmann's types I and II) [21]; their vertebral bodies were intact. No signs of cervical spinal stenosis were observed.

DISCUSSION

Our study was conducted in 400 patients with previous injury to the pectoral girdle who had developed clinical signs of cervicgia in the post-injury period. The symptoms included local pain, myofascial pain, and the restricted range of motion in the cervical spine. Radiography did not detect severe degeneration or dystrophic changes in the spine. The sagittal balance profile obtained for 198 patients (49.5%) did not reveal severe biological or mechanical damage to the

Table 1. Distribution of patients based on sex and age

	Male	Female
18–44	125 (31.3%)	101 (25.2%)
45–59	88 (22%)	86 (21.5%)
Total	213 (53.3%)	187 (46.7%)

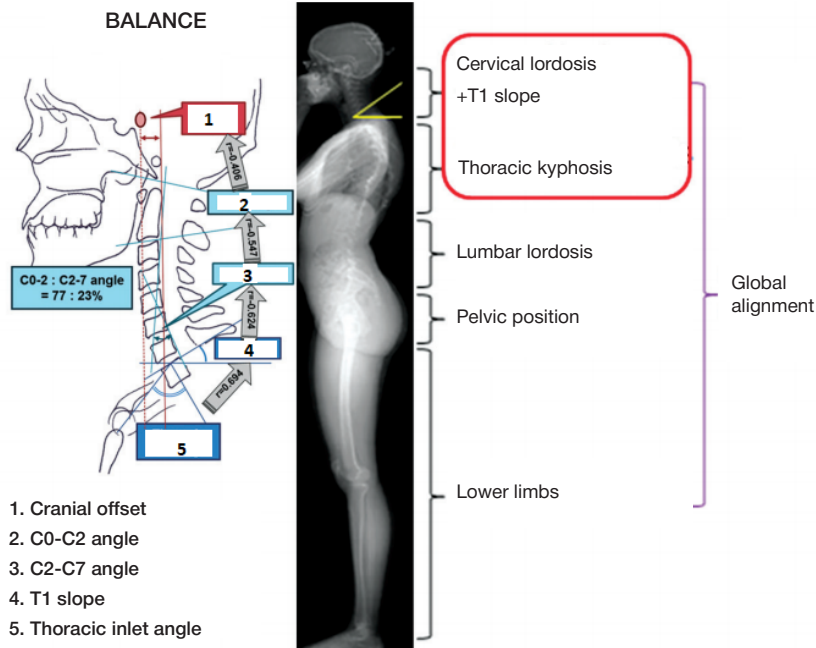


Fig. 2. Radiographic parameters of sagittal balance [15, 19, 20]

Table 2. Results of clinical examinations

Symptom	Number of patients
General health of the spine	
Flat back (loss of cervical and lumbar lordosis or thoracic kyphosis)	98 (24.5%)
Round back (thoracic hyperkyphosis)	47 (11.7%)
Flat-concave back (thoracic hyperkyphosis and lumbar lordosis)	29 (7.3%)
Thoracolumbar scoliosis	247 (61.8%)
Pelvic misalignment	198 (49.5%)
Changes in the cervical spine	
Cervical hyperlordosis	186 (46.5%)
Loss of cervical lordosis	199 (49.8%)
Hypertonia of paraspinal muscles	359 (89.3%)
Restricted flexion	373 (93.3%)
Restricted extension	340 (85%)
Restricted rotation	381 (95.3%)
Restricted lateral flexion	391 (97.8%)

Table 3. Radiographic findings

Symptom	Number (%)
Loss of disc height (relative to neighboring discs)	49 (12.3%)
Stepladder instability of vertebral bodies (the posterior vertebral body line is interrupted)	273 (68.3%)
Facet joint arthrosis	23 (5.8%)
Local deviation of the spinous process	379 (94.8%)
Inclination of zygapophyses (facet subluxation. broken Hadley's S curve)	367 (91.8%)
Spondylosis	12 (3%)

Table 4. Parameters of cervical sagittal balance

Parameter	Value	Mean [1, 15, 18]
C0-C2 angle	-29° ± 1.3°	-30°
C2-C7 angle	-9.8° ± 0.9°	-9.6
T1 slope	38.9° ± 1.2°	40°
C2-C7 SVA (sagittal vertical axis)	3.9 ± 0.5 cm	4 cm
TIA (thoracic inlet angle)	43° ± 1.4°	44°

spine, suggesting that pain originated in the neck. MRI data are suggestive of the initial stage of degenerative dystrophic changes in the functional spinal units but show no disc-root conflicts and central or lateral canal stenosis.

Therefore, the changes detected in the cervical spine are not structural, but functional, implying static and dynamic impairments, such as hypermobility or hypomobility of spinal units, which can be interpreted as a functional dislocation within the facet joint syndrome [22, 23].

Based on the static and dynamic changes detected, patients can be recommended an adequate plan of rehabilitation to alleviate cervical pain. However, further research is necessary to understand a correlation between those changes and

different types of injuries to the pectoral girdle, types of surgical treatment applicable and other structural and functional impairments of the spine and pelvis.

CONCLUSIONS

Cervical spinal pain is a common problem in patients with previous injuries to the pectoral girdle. Girdle injuries can entail functional damage to the cervical spine, causing cervicalgia. Further exploration of cervical spine dysfunctions in patients with previous pectoral girdle injuries will help to develop methods for their prevention and elaborate adequate rehabilitation plans.

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