

SHOULDER PAIN IN SPINAL CORD INJURED PATIENTS IN REHABILITATION PROGRAM WITH ELECTRICAL STIMULATION

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Abstract

In this study we performed clinical and radiographic evaluation of the shoulder of tetraplegic and paraplegic patients who attend rehabilitation program with electrical stimulation. The objective was to establish the usefulness of radiography as a trial exam for shoulder pain in spinal cord injured patients. Thirty two shoulders of sixteen patients were evaluated by clinical exam and radiography. Patients were divided into two groups: paraplegic and tetraplegic. A control group of 16 normal volunteer subjects was selected. Shoulder pain was reported in 88.89% of tetraplegic and 42.85% of paraplegic. The time of injury ranged from 1.5 – 22 years (mean 7.88 years); patients had a mean age of 34.68 years (range, 21-57 years). The acromioclavicular joint space ranged from 0.03-0.7cm on the right side and 0.15-0.7cm on the left side, with a mean of 0.37 and 0.41cm respectively. No correlation was found between shoulder pain and gender, age or time since injury. There was a trend to correlation between shoulder pain and type of injury with tetraplegic having a tendency to pain symptoms. On average, tetraplegic had smaller acromioclavicular joint.

Keywords: shoulder, pain, tetraplegia, paraplegia, acromioclavicular joint, radiography.

Introduction

Shoulder pain is the most common painful process among spinal cord injury (SCI) patients with pain in the upper extremity (UE) (71%), followed by pain in the wrist (53%), hands (43%) and elbows (35%).¹ The high incidence of shoulder pain in this population is due to the greater strain placed on the joint because they use their UE in daily activities (DA). On the other hand, persons with severe high SCI have no muscle support or sensation around their shoulders and therefore may be prone to injuries.²

Campbell and Koris³ described several etiologies for shoulder pain in these patients⁴ Because these diseases can be easily identified with clinical history and physical exam, it is very important to emphasize the central role of anamnesis and physical examination, including all specific tests that are reliable according to the literature.

Because shoulder pain is very common in SCI patients leading to decrease in life quality, and because rehabilitation is necessary to improve this scenario, it is mandatory that the physician early recognizes the patient in the initial stage of the

painful process or even detect a subclinical situation avoiding pain to overcome. This study intend to find signs on plain radiographs that could be related to shoulder pain and therefore this inexpensive and available exam could be used to predict risk factor for developing shoulder pain among patients in rehabilitation program, leading to preventive measures.

Material and Methods

The Biomechanics and Locomotor-System Rehabilitation Laboratory of the University Hospital of UNICAMP (State University of Campinas) offers a gait-training program with neuromuscular stimulation. For the tetraplegic it consists of sessions in which the patients' trunk is stabilized by a harness support and then steps are taken with the help of a device that alternately contracts both quadriceps, followed by a withdraw reflex that is achieved through the stimulation of the fibular nerve. For the paraplegic the same stimulation pattern is applied but they use walkers since they can have trunk control alone^{5,6} (fig 1). Sixteen patients from the Spinal Cord Injuries' Rehabilitation Ambulatory (outpatient clinic)

participated in this study and sixteen normal subjects voluntarily composed the control group. The study was approved by the local ethics committee.



Fig 1: Electrical stimulation for paraplegic (A) and tetraplegic (B) gait-training program.

Shoulder pain was not an inclusion criteria since the intention was to identify subclinical lesions. Exclusion criteria were indisposition for a clinical assessment or for the radiography of the shoulders. All subjects follow a rehabilitation program of two periods of one hour and a half through two different days.

All clinical history and physical exams were performed by the same doctor. Local inspection was performed and exam continued with judicious palpation of the bony prominences and soft tissues, looking for sites of tenderness, which could suggest specific pathologies. Assessment of the shoulder range of motion (ROM) was performed passively and actively. Specific shoulder tests were performed for pain and instability.

Plain film radiography was acquired from both shoulders of all subjects in the true anteroposterior (AP), Zanca, axillary and lateral scapular incidences.

The measurement of the ACJ space was performed considering the distance between the medial tip of the acromion and the lateral border of the clavicle (fig 2A). The acromio-humeral interval was measured from a thin line of dense cortical bone marking the inferior aspect of the acromion at a point directly above the humeral head and recorded as the smallest distance between this line and the articular cortex of the humeral head (fig 2B). The subacromion space was considered to be either greater than or less than 7mm.

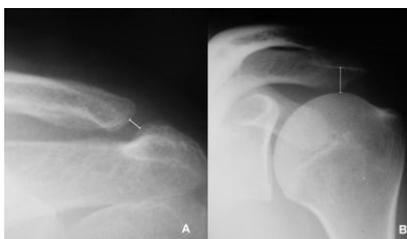
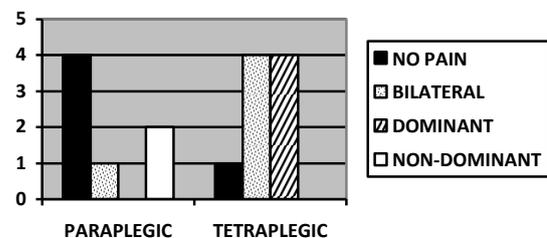


Fig 2: (A) ACJ measurement; (B) subacromial space

Results

Among the sixteen patients, there were 7 paraplegics and 9 tetraplegics. Three patients from the paraplegic and 8 from the tetraplegic group complained of shoulder pain (graph 1). There were 4 women and 12 men. Two women and 9 men had shoulder pain. All patients had chronic pain (mean 16.8 months). The time of injury ranged from 1.5 - 22 years (mean 7.88 years). The patients had a mean age of 34.68 years (range, 21-57 years). None of the patients presented physical exam suggestive of RC tear, impact syndrome, shoulder instability, capsular contracture or capsulitis. The ACJ space ranged from 0.03-0.7cm on the right and 0.15-0.7cm on the left side, with a mean of 0.37 and 0.41cm for the right and left side respectively. All acromio-humeral intervals were greater than 7mm. On average, the tetraplegic group had ACJ measures smaller than the other two groups. There was no difference between shoulder pain and gender ($p=0.4927$), age ($p=0.3537$) or time since injury ($p=0.7612$) and the effect of the side was also not significant. There was a trend to correlation between shoulder pain and the type of lesion ($p=0.0597$), with tetraplegic patients having a tendency to pain symptoms. Regarding shoulder pain, the radiographic measurement was not able to discriminate the subjects ($p=0.4521$).



Graph 1: Incidence of shoulder pain in the two groups: paraplegic and tetraplegic

Discussion

It is general consensus that UE pain is common in 1/3-1/2 of SCI population, most frequently on the shoulder.^{1,2,7,8,9,10} This might be because the UE is needed for DA and therefore is submitted to increased stress.¹ This scenario may interfere with their function and independence, because UE pain usually limits shoulder mobility.⁷

Overall, 68.75% (11/16) of the studied patients presented shoulder complaints, being 88.89% (8/9) of the tetraplegic patients, and 42.85% (3/7) of the paraplegic patients,

corroborating the finding reported by literature of a higher incidence of complaints in SCI, particularly tetraplegic patients.^{7,8,10,11}

The shoulder, particularly the scapular-humeral joint, is primarily designed for providing mobility and to position hand in space. Whenever this complex joint mechanism starts to act as a load supporting joint, as in the case of SCI patients, degenerative changes manifest early making DA difficult.^{10,12}

As in our study, other authors have reported no significant difference in time since injury between patients with and without UE pain.^{1,7,8,9} We found no correlation between shoulder pain and age as Samuelsson et al¹³ also described.

SCI patients place greater strain on the shoulder. The cause of pain is related to the absence of muscle support or sensation in patients with severe high SCI, making these patients prone to injuries. It is also related to muscle imbalance explaining why tetraplegic have more shoulder pain than paraplegic.²

Our study showed that tetraplegic had smaller ACJ space. Lal⁷ found 100% of involvement of the ACJ and attributed to the badly transmitted forces on the shoulder joint in wheelchair activities the cause of rapid progression of degenerative changes leading to an increase incidence of radiographic changes in older than 30 years old, with predilection of the ACJ.

Difficulties were found while performing the physical examination of the tetraplegic patients since some of them, because of the level of injury, were not able to do the tests that required active motion. Therefore, for those patients it becomes rather important that they are constantly assessed and a complementary exam performed to identify a shoulder lesion.

Conclusion

There is a need for UE pain prevention and management programs for SCI patients in the early phases of rehabilitation and during ongoing care even for decades. It is very complex since SCI patients are unable to rest their shoulders since they are used for DA. It is paramount to eliminate damaging patterns, manage the early signs of strain and overuse, teach alternative techniques of DA, strengthen muscles acting around the shoulder and optimize posture to achieve a normal alignment of shoulder, head and spine. Environmental changes are necessary.

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