SHOULDER PAIN IN HEMIPLEGIC PATIENTS

HEMİPLEJİK HASTALARDA OMUZ AĞRISI

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ABSTRACT

Aim: This study was designed to investigate the association between hemiplegic shoulder pain (HSP) and relevant factors as well as outcome of inpatient rehabilitation.
Methods: Medical charts of 1000 hemiplegic patients after a first stroke were reviewed retrospectively. Age, gender, education level, side of paresis and lesion characteristics on admisson were recorded for each patient.
Results: Hemiplegic shoulder pain was positive in 548 patients (55%). Fifty two percent of those had shoulder subluxation, 33.4% had reflex sympathetic dystrophy, 33.4% had adhesive capsulitis, 14.8% had subacromial impingement syndrome, 1.1% had central post-stroke pain and 0.9% had heterotopic ossification. HSP was more frequent in women, older patients with lower educational status and left sided hemiplegics.
Conclusion: The aetiology of the HSP varies and this problem represents a multifactorial pathology. During routine rehabilitation program the possible causes of HSP should be evaluated carefully and preventative measures and appropriate treatment should be performed as early as possible for each patient individually.
Key words: Cerebrovascular accident, Hemiplegia, Shoulder pain, rehabilitation

ÖZET

Amaç: Bu çalışma hemiplejik omuz ağrısı (HOA) ile klinik değişkenler ve yatan hasta rehabilitasyon sonuçları arasındaki ilişkiyi araştırmak amacıyla yapıldı.
Metod: İlk inme sonrası hastaneye yatan 1000 hemiplejik hastanın dosyası retrospektif olarak incelendi. Yatıştaki yaş, cins, eğitim düzeyi, parezi tarafı ve lezyon özellikleri kayıt edildi.
Bulgular: Hemiplejik omuz ağrısı 548 hastada (%55) pozitifti. Bu hastaların %52'sinde omuz subluksasyonu, %33,4'ünde refleks sempatik distrofi, %33,4'ünde adezif kapsülit, %14,8'inde subakromiyal sıkışma sendromu, %1,1'inde inme sonrası santral ağrı ve %0,9'unda heterotopik ossifikasyon bulundu. HOA kadınlarda, düşük eğitim düzeyli yaşlılarda ve sol hemiplejiklerde daha sıktı.
Sonuç: HOA etyolojisi çok değişkenlidir ve multifaktöryel bir patolojisi vardır. Rutin rehabilitasyon programı sırasında HOA için olası nedenler dikkatlice araştırılmalı ve her hasta için koruyucu önlemlere ve uygun tedaviye bir an önce başlanmalıdır.
Anahtar kelimeler: Serebrovasküler olay, hemipleji, omuz ağrısı, rehabilitasyon

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INTRODUCTION

Cerebral vascular accident (CVA) is a major cause of disability in industrialized countries. About half of all hemiplegic survivors will be left with a non-functional arm[1]. Development of a painful shoulder is one serious complication that can interfere with the patient's entire rehabilitation program. The incidence of hemiplegic shoulder pain (HSP) varies from 5% to 84% in stroke patients[2]. There is considerable controversy about its etiology and appropriate treatment. Most of the etiologic agents commonly mentioned in the literature have been suggested rather than statistically esished and although many different methods of treatment are applied and many different preventative measures are recommended, none have yet been proved to be effective[3]. HSP may be preventable if risk factors can be identified and appropriate prophylaxis applied. A clearer understanding of the relationship between spesific variables and shoulder pain is, therefore, warranted. This study was undertaken to determine the incidence of shoulder pain, to identify the factors predisposing to shoulder pain and to examine the extent to which shoulder pain interferes with functional activities and their restoration in Turkish patients with hemiplegia.

MATERIALS AND METHODS

In this retrospective study, medical charts of 1000 hemiplegic inpatients with first ever, unilateral stroke were reviewed. Age, gender, education level, side of paresis and lesion characteristics on admisson were recorded for each patient. The patients were categorized by their education level as; primary school graduate or higher educational status. Duration between stroke onset and admission to rehabilitation center (duration until admission), length of stay in rehabilitation hospital (hospitalization duration) and Computed Brain Tomography findings (cortical or subcortical lesion) were also noted for each patient. Clinically important five preexisting medical conditions such as hypertension, coronary heart disease, valvular disease, diabetes mellitus, and lung disease were recorded. Sensory dysfunction and spasticity were recorded both on admission and discharge. The Ashworth scale[4] was used to measure the severity of spasticity. The motor recovery level was assessed and recorded according to the stage of Brunnstrom classification system (BR)[5]. The Barthel Index[6] and Functional Ambulation Category (FAC)[7] were used for the assessment of the activity of daily living and ambulation status.

Tablo-I

Characteristics of the patients

	N=1000
Sex	
• Male	47%
• Female	53%
Age (year)	61.07 (±12.28)
Side of hemiplegia	
• Right	51.7%
• Left	48.3%
Etiology	
• Ischemia	71.8%
• Hemorrhage	28.2%
Duration until admission (days)	104.07 (+152)
Hospitalization duration (days)	38.14 (±21.16)
Sensory dysfunction	
• light touch	34.2
• proprioceptive	26.2
CT Findings	
• Cortical lesion	84%
• Subcortical lesion	16 %

The presence of shoulder pain and the range of shoulder motion(ROM) were also noted. ROM was classified as; full ROM without pain, marked pain and limitation at the end of the actual ROM, marked pain and limitation in the middle of the actual ROM. Presence and grade of subluxation were assessed from anteroposterior radiographs, using a 5-point categorization; defined by Van Langenberghe and Hogan[8]. Clinical subluxation was detected with palpation of the subacromial area. Diagnosis of reflex sympathetic dystrophy syndrome (RSDS) was primarily based on the clinical entity and Kozin's diagnostic criteria[9].

Pain in the shoulder and severe limitation of the passive movements of the shoulder, especially of the external rotation, were the clinical signs on which the diagnosis of adhesive capsulitis of the shoulder is based. Impingement syndrome was diagnosed by clinical evaluation and ultrasonographic findings. Neuropsychologic and cognitive evaluations of the patients were performed by our psychologists, and occupational therapists. An experienced resident reviewed each patients' medical records and documented these values.

All data was compiled in a database for statistical analysis (SPSS, version 11,5 for Windows; SPSS Inc, Chicago; IL). Demographic results were descriptive and expressed as percentage or as mean±standard error of the mean. Comparison of the numeric variables between the groups were performed by using Student's t test and Mann Whitney U test. The categoric variab-

les were compared between the groups by using Chi-square test and Fisher's exact test. Finally Fisher's exact test was used to analyse the relation between HSP and its possible causes. The level of statistical significance was set at $p< 0.005$ for all tests.

RESULTS

Table 1 presents the baseline characteristics of the patients. Fifty four percent of the 1000 patients had shoulder pain. The relationship between shoulder pain and gender was significant. The presence of shoulder pain in females was significantly higher than in males (p=0.036). There was a positive correlation between age and shoulder pain. With increasing age there was an increase in the incidence of HSP (p=0.004). Shoulder pain was significantly more frequent in left sided hemiplegics (p=0.042). Duration until admission and HSP were also strongly and positively correlated (p=0.001). Significant relationship was found between education level and presence of SP. HSP was most frequent in the lower education group (p=0.001). There were also significant relationships between concomittant diseases like DM and coronary artery disease and HSP (p=0.041, p=0.006 respectively). Neglect was another factor related to HSP (p=0.018). There was a strong negative correlation between upper extremity and hand BR stages and HSP (p=0.001, p=0.001); and a strong positive correlation between tonus and HSP (p=0.001).

The association between pain and decrease in range of shoulder motion in all planes were also significant (p=0,000). No significant or clinically relevant differences were found between the two groups with and without pain regarding their etiologies, CT findings and sensory disorders (p=0.142, p=0.321, p=0.080, respectively). As causative factors to shoulder pain, we found that 52% of patients had subluxation, 33.4% RSDS, 33.4% adhesive capsulitis, 14.8% impingement syndrome, 1.1% thalamic pain, and 0.9% had heterotopic ossification. All of these factors were significantly related to HSP (p=0.001).

Forty four percent of the patients with HSP were using arm slings. While 77.9% of patients with subluxation were using arm slings, 6.8% of patients without subluxation were also using slings for prevention. 55,7% of the patients with HSP were treated with physical agents shown in table 2. 20% of the patients with HSP were given joint and/or soft tissue injections. Of these 9,1% were intraarticular, 9,1%were periarticular and 1,6% were suprascapular injections. Only 0,36% had BtxA injections and only 0,9% received FES for treatment of HSP. Hospitalization duration was significantly longer in patients with HSP (p=0.001). Finally; discharge upper extremity and hand BR stages, FAC and Barthel scores in the HSP group were significantly lower than the group without shoulder pain (p=0.001, p=0.001, p=0.001, p=0.012, respectively).

Tablo-II

Physical agents used in the treatment of HSP

	n	%
Hotpack	36	6.6
Ultrasound	7	1.3
TENS	268	48.9
Diadinamyc	19	3.5
Contrast bath	64	11.7

Tablo-III

Medication used in the treatment of HSP

	n	%
Paracetamol	24	4.3
NSAID	141	25.7
Baclofen	5	0.9
Calsitonin	140	25.5
Corticosteroids	3	0.5

DISCUSSION

Hemiplegic shoulder pain is an important factor that may hamper progress in rehabilitation process, and affect outcome measures. Despite the extensive interest there continues to be uncertainty about its etiology and appropriate treatment. It has been reported with an incidence ranging from 5% to 84% in stroke patients[2]. Variability in reported incidences may be due to the differences among investigators in defining hemiplegic shoulder pain[10]. We defined shoulder pain as complaint of pain at rest or with movement and found the incidence as 54.8%.

Increasing age may increase the risk also. Probably because most patients over 50 years of age have significant degenerative changes around the glenohumeral joint[10]. Although it has been stated that HSP is independent of sex, we found HSP more frequent in women[1]. Educational status was another factor related to shoulder pain. Due to proper handling of the affected arm and adequately performed exercises, HSP was rare in the higher education level group. Likewise Joynt[2] and Poulin de Courval and associates[11], we also found

that pain was significantly more frequent in patients with left hemiplegia. The higher incidence of problems in left hemiplegia raise the possibility that perception may also play a role in the pathogenesis of the pain.

Duration of hemiplegia appears to be significantly related to HSP. Although HSP can develop in the early weeks after stroke, Brocklehurst et al. and Liao et al. also noted significant correlation between HSP and the duration of hemiplegia[10].

Strength was related to the presence of HSP, with the weakest patients having the highest incidence of HSP[2]. In the absence of muscle function the only structures left to protect and provide support for the glenohumeral joint (GHJ) are the joint capsule and ligaments. The downward traction may cause damage to all supporting structures of the shoulder[12]. Najenson et al. and Fugl Meyer et al. also reported positive association between HSP and loss of motor functions[10].

Many experts believe that shoulder pain does not become a problem until spasticity develops[13-15]. Spastic muscles are painful when stretched. Spasticity itself can also be painful at rest. Spasticity can cause irritation of soft tissues, notably various ligaments and muscles of the shoulder girdle, which are particularly prone to pain in view of the high concentration of neuroreceptors in this region[1].

A reduced amplitude of passive shoulder ROM frequently is included as part of the definition of HSP. The most painful and limited shoulder movement is usually external rotation, which is followed in severity by abduction. The painless excursions of shoulder flexion and abduction normally decrease with age; due to postural changes and degenerative changes in articular surfaces and soft tissue that occur with age[10]. Poor handling of a hemiplegic limb may exacerbate a preexisting condition such as osteoarthritis[16]. Most studies, like us, have reported a relationship between the amount of pain and the loss of shoulder motion, but the conclusion that pain is the result of loss of ROM does not necessarily follow[2].

The hemiplegic patient with hemineglect is at a potentially increased risk for trauma to the upper arm and shoulder by his own lack of care and proper positioning of the upper extremity[11]. In our study, it was revealed that hemineglect presents more frequently, with a statistically significant difference, in hemiplegic subjects with painful shoulder than in subjects without pain.

Although subluxation of the glenohumeral joint is common in hemiplegia, there is doubt whether it is a causative factor in pain production. Several investigators have suggested that the presence of shoulder subluxation is an important factor in the developement of pain[11,14]. But some studies failed to show a statistical relationship between the presence of subluxation and either the severity of the complaint or the amount of pain[2,17].

Subluxation may mask or inhibit functional recovery by limiting the range of motion and therefore increase disability. It is likely to contribute to the pathogenesis of other painful conditions by stretching neurovascular and musculoskeletal tissues, and thus lead to immobilization and atrophy of the rotator muscles[1]. Although subluxation may not be associated with pain in the early stages of hemiplegia, if subluxation continues into the chronic spastic stage, the association of pain and limited motion may be higher[10].

In our study, subluxation seemed to be responsible for the greatest number of pain complications of the shoulder, and it appears for many reasons, that treatment of shoulder subluxation should continue to be the standard of care in many rehabilitation facilities.

The incidence of RSDS among hemiplegic patients is unclear. Diagnostic criteria requires only subjective and historical signs and symptoms. Therefore clinical communication and research homogenity is not present between the authors[18]. Diagnosis is not confirmed by objective methods even in the studies. We found the incidence of RSDS as 33,4%, according to Kozin's diagnostic criteria. It has been reported in the literature to be as high as 70%[19] and as low as 23%[20].

The classical clinical picture for adhesive capsulitis is strikingly similar to that described for HSP[10]. In several studies the occurence of glenohumeral capsulitis is postulated to play an important role in hemiplegic shoulder pain[3,21]. Investigators have noted that adhesive capsular changes are the predominant findings during artrography of hemiplegic shoulders[22,23]. We found the incidence as 33,4% and think that adhesive capsulitis is one of the major causes of HSP.

Impingement of joint structures can easily occur in the hemiplegic patient during ROM activities, because the normal scapulohumeral rhythm may become impaired by spastic depressors of the shoulder girdle[10]. No controlled studies, however, have been conducted in this area. The incidence is not known. In our study it is 14,8%.

Because the majority of persons with stroke are geriatric, referred pain of cardiac origin should always be

considered[24]. Diabetes mellitus itself can cause shoulder problems or alter the condition by causing neuropathy. We found statistically significant relationship between HSP and both DM and coronary artery heart disease. Unfortunately there are no systematic studies in this field.

HSP has been shown to affect stroke outcome in a negative way[10,16]. Pain and limited shoulder range of motion interfere with self care activities, impede balance, and create difficulty with transfers and ambulation. Liao et al found that patients with HSP demonstrated significantly less motor recovery in the upper limb and achieved less ambulatory success than comparable patients without HSP[16]. Roy et al demonstrated that the presence of hemiplegic shoulder pain is strongly associated with prolonged hospital stay and poor recovery of arm function in the first 12 weeks after stroke[25]. In our study the duration of rehabilitation of patients with HSP was longer and their Brunnstrom and FAC stages and Barthel scores were worse at discharge, significantly.

From the reviews and the studies that have been published, no conclusion could be drawn about the most effective method of treatment for hemiplegic shoulder pain[26]. It seems that, the ideal management of HSP is prevention. For prophylaxis to be effective it must begin immediately after the stroke. When the patient is upright, the arm should be supported and positioned to prevent unopposed gravitational stress on the soft tissue of the GHJ. External support should be discontinued when muscle tone around the GHJ is adequate to prevent subluxation[10,16]. Once the spasticity appears, the sling becomes contraindicated[1]. In our study 44,5% of patients with HSP were using slings. While 77,9% of patients with subluxation were using arm slings, 6,8% of patients without subluxation were also using slings for prevention.

Analgesic, anti-inflammatory, and antispastic drugs have all been used to treat hemiplegic shoulder pain[2,14]. Simple analgesics and non-steroidal anti-inflammatory drugs should be tried first. Antispazmodic agents may be helpful in spasticity of cerebral origin and supplement techniques in physiotherapy. Systemic administration of corticosteroids is recommended by several authorities for the management of HSP[16]. Calsitonin is stated to be an effective choice in RSDS. Our study reveals that the most preferred medication for HSP is NSAIDs. In treatment of RSDS, as a special condition, Calsitonin is the most used drug. Antispazmodic medication and corticosteroids are the least choises.

Applications of heat, cold, diathermy, ultrasound and transcutaneous electrical nerve stimulation (TENS) have been reported to be effective, but results of these procedures are contradictory[27]. Consequently there is need of further research, in order to refine or develop new techniques, in this field. TENS was the most preferred physical modality in our patients treatment.

Recently it has been demonstrated that functional electrical stimulation (FES) ,which was first suggested by Faghri et al[12], plays an important role in decreasing shoulder pain, reducing disability, particularly in shoulder subluxation- and finally improving motor function. The efficacy of FES has since been confirmed by other authors[1,28,29]. Only 0.9% of our patients with HSP had received FES and we think that this promising treatment option is missed out.

Suprascapular nerve blocks and corticosteroid injections into trigger points have been reported to be beneficial[10]. Snels et al stated that, in the 37 participants in their study, intra-articular triamcinolone injections seemed to decrease hemiplegic shoulder pain and to accelerate recovery, but this effect was not statistically significant[30]. Maybe a new and larger randomized trial should be executed to draw definite conclusions about the efficacy of triamcinolone injections and to identify subgroups of patients for whom these injections are effective. In our study group intra-articular and non-intraarticular injections were given quite frequent; as to 20% of the patients with HSP. Suprascapular nerve blocks were not used as frequent as the others.

Yelnik et al demonstrated that injection of BtxA reduces pain and improves range of motion, especially abduction and external rotation of the hemiplegic shoulder[15]. Confirming the role of spasticity in the HSP and the beneficial effects of BtxA injection into the muscles implicated in internal shoulder rotation. Only 2 of our patients were treated with BtxA; which made us think that BtxA injections are not frequently considered as a choice of treatment for HSP and that the spasticity of shoulder muscles is seldom treated though often present. We also observed that; recent improvements in rehabilitation techniques have reduced the need for surgical intervention. None of our HSP patients required surgery.

HSP is a complex subject that has not yet been approached systematically. It is very often difficult to isolate a spesific cause which is probably due to the complex functional and structural anatomy of the shoulder. When etiologic factors of the pain can be established, controlled studies of the relative effectiveness of various treatment methods are essential. A major obstacle to determining the magnitude of the problem is a lack of an accepted set of diagnostic criteria. Further-

more; hemiplegic patients admitted to rehabilitation settings differ widely in medical history and prestroke shoulder dysfunction; the time since the stroke varies among patients; and the history of shoulder trauma after the stroke often is impossible to ascertain. Such variables may account for the different responses to treatment and may make the original causes of HSP difficult to determine, especially in a retrospective study. Such difficulties might be overcome partially by beginning a longitudinal study immediately after the stroke and by including significant numbers of patients in the study. Determining the possible causes and the risk factors, some of which we pointed out, will enable us to choose the appropriate preventative measures and treatment for each patient individually; in order to avoid HSP from hampering the rehabilitation program.

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