EPIDEMIOLOGY OF HEMIPLEGIC SHOULDER PAIN AFTER STROKE

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Abstract
Introduction
Hemiplegic shoulder pain has been reported to delay upper limb functional recovery after stroke.

Aim
A review of articles was conducted to determine the incidence, risk factors and causes of hemiplegic shoulder pain after stroke.

Methodology
The search of articles was identified using MEDLINE, SCIRUS, CINAHL, SCIENCE DIRECT and manual search. A total of 23 references were used in this study.

Results
The study reviewed that 80% of stroke patients complained of hemiplegic shoulder pain. The associated risk factors to hemiplegic shoulder pain were: neglect/ loss of sensibility, repeated trauma, depression, spasticity and limited range of motion in external rotation of the affected shoulder. However, subluxation was not associated to hemiplegic shoulder pain in this study. The causes were adhesive capsulitis, injury to rotator cuff muscles and subacromial bursitis.

Conclusion
Early identification of risk factors and causes of hemiplegic shoulder pain would help to plan for treatment and reduce the high incidence shoulder pain.

Key words
Hemiplegic shoulder pain, incidence, risk factors and causes

Introduction
Shoulder pain is a very common and troublesome complication after stroke that hampers functional recovery, eventually leading to disability. It has been reported that prevalence of shoulder pain varies from 5 % to 84 % in stroke patients (Joynt, 1992; Tuner-Stokes & Jackson, 2002) but its true incidence is unknown. The variation in prevalence is probably as a result of differences in recruitment criteria for patients with hemiplegic shoulder pain (Lo, Chen, Lin, Jim, Meng & Kao 2003). Studies have speculated about the risk factors of shoulder pain in hemiplegia but have failed to establish a relationship between the cause and the effect (Gould, 2002). Possible risk factors such as rotator cuff injuries, capsular tears, adhesive capsulitis, neglect, spasticity and
subluxation have been documented but their role in its aetiology remains unclear (Gamble, Barberan, Laasch, Bowshe, Tyrrell & Jones, 2002). It has also been reported that shoulder pain raises problems for clinicians and therapists because of poor understanding of aetiology and lack of proven prevention and treatment strategies (Ratnasabapathy, Broad, Baskett, Pledger, Marshall & Bonita, 2003). The objectives of this study were to review articles describing the incidence, causes and the risk factors associated with hemiplegic shoulder pain.

Search strategy

The review is based on a computerized search of the following databases, MEDLINE (n = 8), SCIRUS (n=2), CINAHL (n = 2), SCIENCE DIRECT (n = 1) and MANUAL SEARCH (n = 7) from 1984 – 2004. The following keywords were used for all databases: (a) Shoulder pain, Stroke, (b) Shoulder pain, cerebrovascular accident or disease, (c) shoulder pain, hemiplegia or hemiparesis, (d) shoulder subluxation or dislocation, stroke, (e) shoulder subluxation, cerebrovascular accident, (f) shoulder subluxation, hemiplegia, (g) hemiplegic shoulder, stroke, (h) hemiplegic shoulder, cerebrovascular accident, (i) hemiplegic shoulder, hemiplegia.

The references of the selected articles were also studied to identify additional eligible studies. Further selection was based on the titles and abstracts. The articles included survey (n = 3), cohort (n = 12) and case control (n =7) and were included if they met the following inclusion criteria: (a) hemiplegia caused by stroke in the majority of the patients, (b) articles that reviewed the risk factors for hemiplegic shoulder pain,

(c) the prevalence (incidence) of shoulder pain in stroke patients and (d) articles published in English. Exclusion criteria were (a) pain in the hemiplegic shoulder caused by fracture, history of tumor, rheumatoid arthritis and (b) all articles that were not published in English.

Results

Incidence of Hemiplegic shoulder pain

The incidence of hemiplegic shoulder pain in this study (Table 1) varies from 20% to 80%. These results do not correlate with findings of Turner-Stokes (2002) although the incidence still remains high. There could be a number of reasons for this variation. Pain was not consistently described in most studies. Some studies reported pain, which occurred spontaneously (Roy, Sands & Hill, 1994; Zorowitz, Hughes, Ikai & Johnston, 1996), while others reported pain on passive movements (Gamble et al, 2002; Bohannon, Larkin, Smith & Horton, 1986; Bohannon, 1988; Joynt, 1992; Shai, Ring, Costeff & Solzi, 1984; Zorowitz et al, 1996). The incidence was also difficult to compare, as there was no standard sample size used in the studies, which could also influence the results. Therefore, the method of assessments and the study designs used in shoulder pain can affect the reported incidence (Bender & McKenna, 2001) as pain is a subjective symptom which is difficult to measure even in patients with sensorimotor, cognitive and communication facility (Turner-Stokes & Jackson, 2002). It also appears that there is no consensus or agreement on the definition of hemiplegic shoulder pain or the accurate method to measure it.
Table 1  Incidence of Hemiplegic shoulder pain

<table>
<thead>
<tr>
<th>Author /Year</th>
<th>Sample size</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>McLean et al, 2004</td>
<td>133</td>
<td>26%</td>
</tr>
<tr>
<td>Kong et al, 2004</td>
<td>107</td>
<td>71%</td>
</tr>
<tr>
<td>Gamble et al, 2002</td>
<td>205</td>
<td>40%</td>
</tr>
<tr>
<td>Dursun et al, 2000</td>
<td>70</td>
<td>78.6%</td>
</tr>
<tr>
<td>Gamble et al, 2000</td>
<td>123</td>
<td>25%</td>
</tr>
<tr>
<td>Broeks et al, 1999</td>
<td>54</td>
<td>20%</td>
</tr>
<tr>
<td>Zorowitz et al, 1996</td>
<td>20</td>
<td>45%</td>
</tr>
<tr>
<td>Wanklyn et al, 1996</td>
<td>108</td>
<td>84%</td>
</tr>
<tr>
<td>Jesperson et al, 1985</td>
<td>173</td>
<td>22%</td>
</tr>
<tr>
<td>Roy et al, 1994</td>
<td>76</td>
<td>72%</td>
</tr>
<tr>
<td>Kumar et al, 1990</td>
<td>28</td>
<td>25%</td>
</tr>
<tr>
<td>Bohannon et al, 1986</td>
<td>50</td>
<td>72%</td>
</tr>
<tr>
<td>Van Ouwenaller et al, 1986</td>
<td>219</td>
<td>72%</td>
</tr>
</tbody>
</table>

Risk factors

Many risk factors have been associated with hemiplegic shoulder pain. Table 2 shows the risk factors in relation to shoulder pain. Subluxation has been reported to be one of the risk factors. Six studies (Dursun, Dursun, Eksi & Cakci, 2000; Kong et al, 2004; Lo et al, 2003; Roy et al, 1994; Shai et al, 1984; Van Ouwenaller, Laplace & Chantraine, 1986) related subluxation to hemiplegic shoulder pain although the mechanism was not clear. However, Kaplan (1995) documents that subluxation does not cause pain directly but may exert traction stress to the peri-articular soft tissue with subsequent pain. The other five studies (Zorowitz et al, 1996; Wanklyn, Forster & Young 1996; Joynt 1992; Ikai Tei, Yoshida, Miyano & Yonemoto, 1998; Rizk, Christopher, Pinals, Salazar & Higgins, 1984) didn’t find any relationship. The result of this review correlate with studies by others where subluxation was not related to hemiplegic shoulder pain (Snels, Beckerman, Lankhorst & Bouter, 2002; Bender & McKenna, 2001). The confusion arises from failure to define subluxation (Turner-Stokes & Jackson, 2002), sample sizes and the methods used to measure subluxation (Bender & McKenna, 2001). For example, eight studies (Roy et al, 1994; Shai et al, 1984; Van Ouwenaller, 1986; Dursun et al, 2000; Ikai et al, 1998; Lo et al, 2003; Kong et al, 2004; Rizk et al, 1984) used x-ray to measure subluxation that can easily miss it in the early stages of stroke. However, Turner-Stokes and Jackson (2002) documents that at the moment, clinical assessment by palpation and erect X-ray taken in antero-posterior and oblique views as soon as this becomes feasible are probably the mainstay for routine assessment of subluxation. Nevertheless, a number of studies have also reported pain in both patients with and without subluxation making it difficult to associate it to hemiplegic shoulder.

Spasticity has been associated with hemiplegic shoulder pain due to muscle imbalance. Seven studies investigated the relationship between
spasticity and hemiplegic shoulder pain and four studies (Kong et al, 2004; Roy et al, 1994; Poulin De Courval et al, 1990; Ouwenaller et al, 1988) related it to hemiplegic shoulder while, two studies (Bohannon et al, 1986, Joynt, 1992 & Rizk et al, 1984) didn’t find any relationship. Although the mechanism is not very clear, Turner-Stokes and Jackson (2002) documents that spasticity in the shoulder girdle with muscles, particularly subscapulans, pulling the arm into medial rotation may cause pain by traction on the periosteum at the muscle insertion.

Neglect and loss of sensation may increase the risk of repeated trauma, resulting in tissue lesions. According to Snels et al. (2002) patients with sensory deficits, visual field deficits, or neglect experience recurrent injuries of the shoulder, possibly contributing to capsulitis. Four studies (Poulin De Courval et al, 1990; Jespersen, Jorgensen, Nakayama & Olsen, 1995; Gamble et al, 2002; Ratnasabapathy et al, 2003) investigated the relationship between neglect/loss of sensation and hemiplegic shoulder. A relationship was found in two studies (Gamble et al, 2002; Ratnasabapathy et al, 2003). However, the result does not correlate with a review conducted by Snels et al (2002). The method used to recruit patients could have resulted in this difference as the studies included patients diagnosed with acute stroke and those within 6 weeks after stroke. Repeated trauma resulting from exercising upper limbs using overhead pulleys and poor handling during transfers was also associated to hemiplegic shoulder in two studies (Kumar, Metter, Mehta & Chew, 1990; Wanklyn et al, 1996).

More work is needed to address the issue of educating the staff on the dangers of using the over pulley during rehabilitation of stroke patients.

Although there has not been a common consensus about the mechanism of hemiplegic shoulder pain in literature, Gamble et al (2002) postulates that both motor, somatosensory-deficits and depression are associated with shoulder pain in stroke patients. Depression could lead to hemiplegic shoulder due to repeated trauma. Two studies (Wanklyn et al, 1996; Gamble et al, 2002) associated depression to hemiplegic shoulder while the other two studies (Kong et al, 2004; Mclean, 2004) only indicated the incidence. Gamble et al (2002) further report that the secondary product of the deficits will lead to changes in muscle tone hence, predisposing the hemiplegic shoulder joint to subluxation and repeated trauma due to poor handling techniques.

Limited range of motion after stroke has been associated with hemiplegic shoulder pain. All the nine studies (Wanklyn et al, 1996; Bohannon, 1988; Ikai et al, 1988; Kumar et al, 1990; Bohannon et al, 1986; Joynt, 1992; Zorowitz et al, 1996; Lo et al, 2003; Dean, 2000) that investigated external rotation to hemiplegic shoulder were positively associated. The muscle weakness and imbalance result in less movement of the shoulder joint. According to Bohannon et al (1988), patients with muscle weakness are more prone to develop pain because their muscles lack the strength to hold the joint enough to prevent the development of adhesive capsulitis.
Table 2  Relationship between risk factors and hemiplegic shoulder pain.

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>No. Studies</th>
<th>Relation to HSP (yes)</th>
<th>Relation to HSP (no)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subluxation</td>
<td>11</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Spasticity</td>
<td>7</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Neglect/Loss of sensibility</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Repeated trauma</td>
<td>2</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Depression</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>External rotation</td>
<td>9</td>
<td>9</td>
<td>-</td>
</tr>
</tbody>
</table>

Soft tissue lesions as cause of hemiplegic shoulder pain.

Hemiplegia has been associated with the development of adhesive capsulitis and rotator cuff tears (Turner-Stokes & Jackson, 2002). In Table 3, five studies (Kong et al, 2004; Ikai et al, 1998; Lo et al, 2003; Rizk et al, 1984; Wanklyn et al, 1996) found a relationship between adhesive capsulitis and hemiplegic shoulder pain. The result of this review is similar with the findings of Turner-Stokes and Jackson (2002). The process of the adhesion formation is facilitated by delayed recovery process due to chronic injuries, inflammation, disuse atrophy, contractures and reduced movements in the shoulder joint. Early management of these factors can minimize the onset of adhesive capsulitis.

It is a common understanding that the normal mechanism that protects the rotator cuff are lost during stroke, this leads to degenerative changes within the muscles putting them at risk of rupture due to poor handling, lifting techniques and repeated trauma. The relationship between rotator cuff tears and hemiplegic shoulder pain are presented in Table 3. Three studies (Kong et al, 2004; Lo et al, 2003; Ikai et al, 1998; Jespersen et al, 1995) found a relationship between rotator cuff tears and hemiplegic shoulder. According to Poulin De Courval et al (1990), neglect increases the risk of repeated traumas of the surrounding soft tissues, leading to capsulitis, bursitis, tendinitis, rotator cuff tear or rupture which may result in hemiplegic shoulder pain. Two studies also (Kong et al, 2004; Joyce et al, 1992) correlated subacromial bursitis to hemiplegic shoulder pain. The mechanism for bursitis to cause pain in the shoulder is as explained above. Therefore, early identification, the use of physical modalities and range of motion exercises is advocated for the reduction of symptoms and prevention of later complications.
Table 3  Soft tissue lesions.

<table>
<thead>
<tr>
<th>Soft tissue-lesion</th>
<th>No studies</th>
<th>Relationship to HSP</th>
<th>Relationship to HSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adhesive capsulitis</td>
<td>4</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Rotator cuff tears/injury</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Subacromial bursitis</td>
<td>2</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

Summary and conclusion

Hemiplegic shoulder pain has been reviewed as a common condition with a prevalence of 20% to 80% in this review. Several risk factors have been associated with hemiplegic shoulder pain but the mechanism of its cause is still not clear. This could be one of the reasons why there are variations in the prevalence. There has been some evidence that overhead pulleys can cause hemiplegic shoulder pain and should not be applied for passive movements. However, there has been no evidence relating subluxation to hemiplegic shoulders, despite being highly associated among the risk factors.

It also appears that there is no agreement on the definition or the accurate method of measuring hemiplegic shoulder pain. Proper handling and use of supports have been recommended although no agreement has been made on the use of the supports. Further research to determine the causes and the mechanism of hemiplegic shoulder pain is recommended and this will give a clear picture to clinicians, therapists and caregivers in the rehabilitation of stroke patients to improve patients’ recovery. There is also an urgent need to formulate a standard measuring tool to be used in the measurement and definition of shoulder pain. This will be used as a guiding tool in management of hemiplegic shoulder to the clinicians and physiotherapists.

References


