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Management Hemiplegic Shoulder Pain: Review article

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ABSTRACT
Hemiplegic shoulder pain (HSP) is considered one of the most debilitating complications following stroke. Between 30 and 65% of stroke patients may experience HSP. Pain can result from shoulder structural injury and abnormal posture which may damage the surrounding tissues over time. Impingement of rotator cuff, subluxation or capsulitis of glenohumeral joint, bicipital tendinitis, shoulder muscles spasticity, and shoulder hand syndrome are other causes for shoulder pain post stroke. Shoulder pain is demonstrated as a predictor for decrease arm functional adequacy, high levels of depression and poorer quality of life.

Keywords: *Hemiplegic , Stroke, Spasticity, Impingement*

Shoulder pain after a stroke has been termed as a group of complicated issues. The source of shoulder pain is used to make a clinical diagnosis. It includes pain sensitivity changes, shoulder-hand syndrome, and pain from tight muscles or joints. Since HSP and central after-stroke discomfort are both common in stroke patients, recognizing HSP is made more challenging by the difficulties of discriminating between the two (Kalichman and Ratmansky, 2011).

Central post-stroke discomfort is experienced by 1-12% of stroke survivors. People who have trouble with their senses are the ones who typically encounter it. Increased responses of nociceptive neurons in the central nervous system to typical afferent input may also be involved in hypersensitosis pyriformis (Klit et al., 2009).

Hemiplegic shoulder pain is frequently multifactorial. It was divided into two categories: neurological and mechanical factors. The author's advice classifying HSP variables into two groups—neurologic and mechanical—to better pinpoint the causes of hemiplegic shoulder pain. Some examples of neurological issues include spasticity, brachial plexus damage, CRPS, as well as central sensitization. Mechanical causes include direct trauma, frozen shoulder, GHJ diseases, rotator cuff tears, and subluxations of the shoulder. Recognizing that neuronal and mechanical variables may both play a role in pain's genesis is crucial (Vasudevan and Brownie, 2014).

Evaluation of shoulder abnormalities post stroke.

Evaluation of shoulder structural abnormalities:

Magnetic resonance imaging (MR) and ultrasound imaging (US) are both considered valuable diagnostic imaging tools for evaluating shoulder disorders. US is a less expensive and non-invasive imaging tool that allows for both anatomical and functional assessments of the joint. MR is regarded as a gold standard for the evaluation of shoulder disorders because it can provide anatomical and structural information about the glenohumeral joint and rotator cuff muscles. Many studies have been conducted to compare the diagnostic accuracy of ultrasound and MRI in the assessment of hemiplegic shoulder pain (Pompa et al., 2011; Dogun et al., 2014). Ultrasonography can be used instead of or in addition to MRI to diagnose hemiplegic shoulder pain (El-Sonbaty et al., 2022).

Ultrasonography is a non-invasive, widely available, and low-cost imaging technique that can be used to assess soft tissues. It combines direct multi-planar structural evaluation with dynamic movement investigation, providing the assessment with both anatomic and functional elements. It could be used to assess changes in the stroke hemiplegic shoulder (Lee et al., 2002). An anechoic region (> 2 mm) surrounding the long head of the biceps tendon in the transverse and longitudinal views is regarded as edema in the biceps tendon sheath. Ultrasonography is used to explore how the shape of the biceps and supraspinatus tendon alterations following an aggressive wheelchair exercises. Patients who have used a wheelchair for a longer period of time or shortly after locomotion are more susceptible to have a darkened, diffuse tendon look. (Collinger et al., 2009; Pong et al., 2012).

The rotator cuff, the long head of the biceps as well as tendon sheath, the rotator interval, the subacroimial bursa, the AC joint, and the posterior GHJ may all be evaluated with ultrasound. The presence of liquid in the bursa, as well as a rise in thickness of more than 2 mm and hyperaemia as revealed by power Doppler imaging, verified bursitis. (fig.1)(Lee et al., 2002).

Fig (1): SASD bursa effusion in a hemiplegic 62-year-old woman. Sonogram shows fluid collection in the SASD bursa (arrow) (Idowu et al., 2017).

Supraspinatus tendon pathology is LINKED with HSP at the subacute & chronic HASES throughout the first 6 months following stroke and is an independent predictor of the development of HSP. The prevalence of supraspinatus tendinosis after stroke is 42.2% (Fig.2). Because of the increased magnitudes of weakness produced by stroke, patients are more prone to acquire pathological rotator cuff problems as they age. Following a stroke, increased muscular tone in the upper limbs may guard versus supraspinatus tendon damage (Cho et al., 2012).

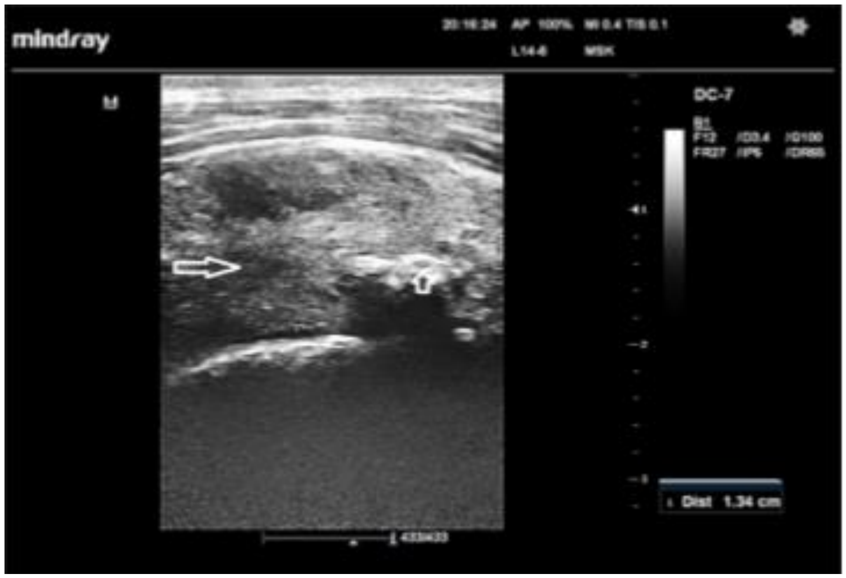

Fig (2): Supraspinatus tendinosis in a hemiplegic 58-year-old woman (Idowu et al., 2017).

After an acute stroke, biceps tendon sheath edema is a very common abnormality seen on US examination (Fig.3). A thickened hypoechoic area with increased power Doppler flow around the biceps tendon indicates biceps tenosynovitis (Pong et al., 2012). Collinger et al. looked examined ultrasonography alterations in the morphology of the biceps and supraspinatus tendon during an aggressive wheelchair activity. Participants with a longer length of wheelchair usage or soon after the propulsion exercise had a darkened, diffuse tendon look (Collinger et al., 2010).

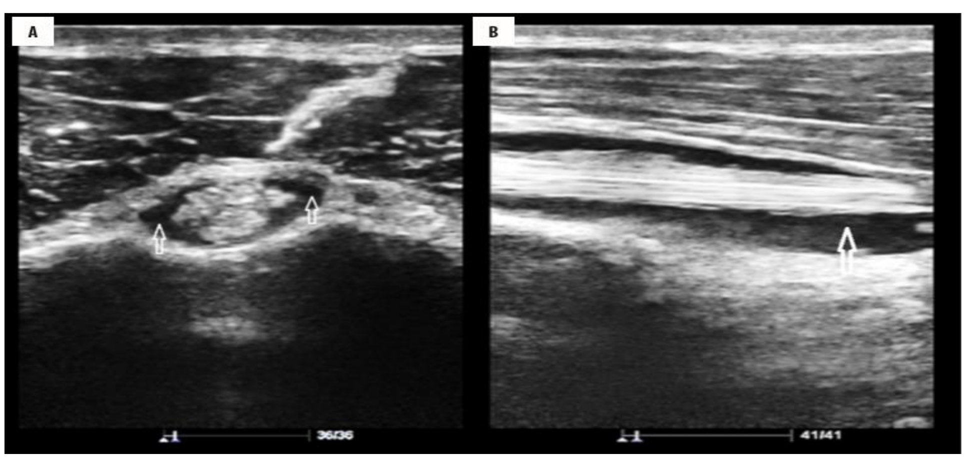

Fig (3): (A) LHBT sheath effusion in a 60-year-old man (Idowu et al., 2017).

In post-stroke patients, subluxation of the affected shoulder is accompanied with nerve injuries and muscle weakness. Kumar et al. (2014) the intra-rater reproducibility of (AGT) distances in different arm postures were examined. They found that ultrasonographic measures of AGT distance were inaccurate are reliable and valid in the assessment of glenohumeral subluxation (GHS) in stroke patients. On the healthy side, there was no shoulder subluxation, whereas on the affected side, instability occurred in 25.3% of the patients (Pop, 2013). Supraspinatus tendonitis is predicted by lateral shoulder subluxation (Huang et al., 2012). US is a method for assessing the glenohumeral joint's laxity and stiffness (Tsai et al., 2013).

The number of abnormal subscapularis tendon sonographic findings was significantly higher throughout the chronic stage than the acute stage (Huang et al., 2012). Stretching and ROM) exercises that are performed incorrectly can result in muscular damage. In individuals with shoulder discomfort, shoulder stabilization exercise increases pain alleviation and functional improvement (Park et al., 2013). HSP sonography also detects partial thickness rotator cuff tears, complete thickness rotator cuff tears AND GH effusion (Kim et al., 2014).

Measurement of pain pressure threshold:

Somatosensory changes have been linked to chronic pain from HSP, and peripheral and central hypersensitivity has been linked to the affected shoulder in those with HSP (Gamble et al., 2000;Gamble et al., 2002; Widar et al., 2002; Lindgren et al.,2007; Roosink et al., 2011). Central hypersensitivity is defined by a rise in the activity of neuronal and pathways in nociceptive pathways, that can result in pain from harmless stimulation or increased pain perception from low-level noxious stimulus. It is a result of the flexibility of the somatosensory nervous system's reaction to inflammation and neural damage (Latremoliere and Woolf, 2009).

Pain perception has been demonstrated to be enhanced in both tissues near to the site of damage (peripheral or central) and tissues far from the injury location (far hypersensitivity). The current methods of evaluation not discriminate among peripheral or central hypersensitivity. Organ hypersensitivity distant to the damaged tissues shows central hypersensitivity (Curatolo et al., 2006).

Central hypersensitivity is linked to a variety of other chronic pain syndromes, including whiplash-related neck pain, fibromyalgia, carpal tunnel syndrome, osteoarthritis, tension-type headache, temporomandibular joint pain, and subacromial impingement syndrome. All of these studies found that patients experienced exaggerated pain perception distal to the site of injury in unaffected, healthy tissues, implying the involvement of a central process (Arendt-Nielsen et al., 2010).

A link between broad central hypersensitivity and HSP sheds light on probable origins of this syndrome and may have consequences for therapy. Detecting mechanical hyperalgesia using the pressure-pain threshold is one approach of effectively measuring central hypersensitivity (PPT). PPT is the level pressure that a pressure sensation becomes uncomfortable. Evidence of reduced pain thresholds has been observed in persons who have ongoing pain disorders (Schneider et al., 2010). The pressure pain threshold is termed as the minimum amount of pressure that a pressure feeling becomes uncomfortable. Pressure algometry has been shown to reliably quantify deeper somatic tissue sensitivity inside and across raters (Hoo et al., 2013).

Evaluation of shoulder pain and disability.

They can be evaluated via many questionnaires: the Dutch Shoulder Disability Questionnaire (SDQ-NL); the United Kingdom Shoulder Disability Questionnaire (SDQ-UK); the Shoulder Pain and Disability Index (SPADI) and the Shoulder Rating Questionnaire (SRQ) (Bot et al., 2004).

The visual analogue scale (VAS) is a well-known pain measurement that can be used in a number of settings. Its usage on stroke patients has been asked due to its inability to capture the difficulty of pain. The visual analogue scale is utilized in combination with other types of assessment to measure pain and is rarely used alone (Adey-Wakeling et al., 2015).

Several studies have recommended using the Shoulder Pain and Disability Index (SPADI) (Bot et al., 2004; Roy et al., 2009). The SPADI is a disease-specific instrument that is commonly used in primary care settings. It is simple to complete, convenient to use, and takes little time to complete. Many languages have been translated and validated (via hypothesis testing). (Angst et al., 2007; Membrilla et al., 2015).

The shoulder pain and disability index (SPADI) is a self-administered questionnaire designed to assess functional disability. These patient-reported outcome measures are frequently used in clinical and research settings. It evaluates functional status and assesses patients' perceived levels of disability and the impact of the disease on daily activities. (Mintken et al., 2009).

SPADI's Arabic- version shows exceptional internal consistencyStrong correlation among Arabic SPADI, Quick DASH, NRS, a well as active ROM of the shoulder joint were used to demonstrate test-retest reliability with construct validity. The SPADI is advised for people with shoulder discomfort. (Alsanawi et al., 2015).

Measurement of shoulder range of motion (ROM).

A variety of instruments, including goniometry and inclinometry, can be used to evaluate shoulder mobility. Goniometry is a widely accepted technique for measuring joint range of motion (ROM) with reliable and valid measurement devices, most notably the universal goniometer (UG). Inclinometers are a practical alternative to goniometers because they do not frequently require device realignment during measurement. It can be held with one hand while the other hand of the examiner is free for stabilization. Digital measurement devices have recently challenged the use of manual devices for physical therapy measurements, such as ROM, which is more objective and precise (Clarkson, 2005).

In many research studies, inclinometric measurements were used to collect data (; therefore, clinicians and researchers should be familiar with both the benefits and limitations of these instruments). Prices for inclinometers vary depending on whether they are digital or gravity-based (Hoving et al, 2002; Da Silva et al, 2015; Hazel. 2013).

One of the methods that have become well recognized as a highly standardized, accurate and reliable technique for determining joint ROM is the digital-goniometer that transforms the displacements of the joint in to electrical impulses readout generated in a basic digital form with precision 2 in the range of 90. (Hazel, 2013; Milanese et al., 2014; Sobel et al., 2014).

Several studies on different body regions have evaluated and proven the validity and reliability of digital goniometers, one of which was the study conducted by Da Silva et al. (2015) to compare the electro goniometer and the universal goniometer in terms of intra-examiner and inter-examiner reliability as well as inter-device reliability while testing wrist range of motion. When compared to a universal goniometer, they concluded that an electro goniometer is a more reliable measurement tool for clinical use (Da silva et al., 2015).

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