Poststroke Shoulder Pain: Inevitable or Preventable?

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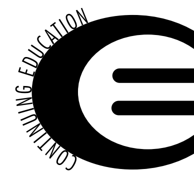


KEY WORDS

rehabilitation
shoulder pain
stroke

Cerebral vascular accident or stroke is recognized as the leading cause of disability in the United States; consequently, it is important that all healthcare professionals working with this population develop competency of care to promote functional recovery. One of the most profound effects of stroke is upper-extremity dysfunction. With correct handling, proper positioning, and ongoing patient-caregiver education, healthcare professionals can positively influence upper-extremity recovery and prevention of poststroke shoulder pain. In doing so, they will help patients avoid the mass effect that pain can impart on daily routines. The purposes of this article are to describe poststroke shoulder pain, discuss possible causes of shoulder pain, and detail best practices nurses can use to prevent or minimize poststroke shoulder pain.

Stroke is one of the most recognized causes of disability in the United States (Centers for Disease Control and Prevention, 2007). A person's ability to master his or her environment, participate in social roles, and engage in daily occupations can be influenced significantly by the sensorimotor, cognitive, and perceptual deficits that frequently result from stroke. Effective stroke rehabilitation is essential to positively influence quality of life in stroke survivors who sustain functional limitations after stroke. Loss of upper-extremity control is common after stroke, with 88% of stroke survivors having some level of upper-extremity dysfunction (Pendleton, Schultz, & Krohn, 2006). Multiple factors can affect a patient's ability to integrate the affected upper extremity into functional tasks. These factors may include pain, contracture and deformity, loss of selective motor control, weakness, superimposed orthopedic limitations, loss of postural control to support upper-extremity control, loss of biomechanical alignment of joints, and inefficient or ineffective movement patterns (Pendleton et al.). This article describes poststroke shoulder pain, discusses possible causes of shoulder pain, and details nursing strategies to prevent or minimize poststroke shoulder pain.

Functional shoulder motion is fundamental for effective hand use during activities of daily living; consequently, it is healthcare professionals' ethical responsibility to actively address early prevention and management of poststroke shoulder pain. Shoulder pathology with resulting pain is common in people who develop hemiplegia after stroke or brain injury (Gamble, Barberan, Bowsher, Tyrrell, & Jones, 2000; Paci, Nannetti, Taiti, Baccini, & Rinaldi, 2007; Teasell, Foley, & Bhogal, 2008). According to Van Ouwenaller and colleagues (1986), shoulder pathology occurs in up to 85% of patients with spasticity and up to 18% of patients with flaccid symptoms. Various clinical trials document the prevalence of shoulder pain (Dromerick, Edwards, & Kumar 2008, Gamble et al., 2002; Leung et al., 2007; Lindgren, Jonsson, Norrving, & Lingren, 2007). To prevent shoulder pain and maximize potential for motor recovery at the onset of hemiplegia, preventive techniques should be initiated by the entire rehabilitation team, including nurses, therapists, rehabilitation aides, nurse aides, and physicians.

Studies have shown that shoulder pain significantly influences motor recovery and upper-extremity function after stroke (Gamble et al., 2002; Lindgren et al., 2007). Motor relearning or learning to use the more affected extremity for specific functional tasks can be extremely challenging for people with poststroke hemiplegia (Gillen & Burkhardt, 1998). The entire motor-recovery process can be exhausting and tedious. Because effective motor recovery requires a lot of time and energy, patients experiencing extreme poststroke shoulder pain may feel defeated and have diminished motivation (Gillen & Burkhardt). Clinicians may find these patients commonly disassociate from the painful extremity, which also decreases patients' motivation to regain motor recovery in the affected upper extremity. In clinical situations, another common response to poststroke shoulder pain is personification, in which the patient develops an abnormal fixation on the "bad" extremity, such as guarding the extremity as if it were a wounded individual (Bundick & Spinella, 2000). When pain becomes a constant in a person's daily routine, feelings of depression may occur. Depression is commonly associated with chronic pain (Tunks, Crook, & Weir, 2008), and poststroke shoulder pain frequently develops into a chronic condition. The association of chronic pain and depression can result in less activity and greater disability (Keogh, McCracken, & Eccleston, 2006).

Review of Basic Shoulder Anatomy

A basic understanding of upper-extremity anatomy is essential for understanding the cause and prevention of poststroke neuromuscular shoulder pain. The skeletal structure of the shoulder girdle includes the humerus, clavicle, and scapula. Biomechanics of the shoulder joint include a relatively small joint articulation. Along with skeletal structure, the rotator cuff muscles and the glenohumeral ligaments are responsible for forming the glenohumeral joint. As the humerus is elevated, the scapula glides with a 3:1 ratio. If proximal upper-extremity musculature is flaccid or hypotonic after stoke, the scapulohumeral rhythm can be significantly disturbed. Inferior and anterior glenohumeral subluxation is a common result of proximal upper-extremity hypotonia; however, glenohumeral subluxation alone has not been shown to be a direct cause of shoulder pain. Nevertheless, external forces applied to the hypotonic upper extremity can lead to subacromial impingement, rotator cuff injury, and bicipital tendonitis. When the scapulohumeral rhythm is further compromised by increased flexor tone or an imbalance in muscle tone, patients are at high risk for soft-tissue damage, especially if they are incorrectly handled or positioned (Davies, 2000).

Types of Shoulder Pain

The cause of pain must be identified to effectively address poststroke shoulder pain. Shoulder pain can occur as early as 2 weeks or up to 1 year after stroke (Rajaratnam, Venketasubramanian, Kumar, Goh, & Chan, 2007), with earlier occurrence being more detrimental to long-term recovery. The most common type of poststroke pain, neuromuscular pain, can begin at any stage after a stoke occurs; however, it usually occurs during the subacute recovery phase. Neuromuscular pain frequently results from abnormal posturing, immobilization, incorrect mobilization, or poor positioning, with the absence of normal active motion in the affected upper extremity. An imbalance in ligament laxity and muscle length occurs when the head of the humerus is pulled anteriorly by flexor muscles, which allows the humerus to droop inferiorly with the pull of gravity. Neuromuscular pain often is described as a dull ache such as that caused by tendonitis or a sharp radiating pain such as that caused by glenohumeral impingement (Gould & Barnes, 2009). Without effective treatment, poor positioning (e.g., affected arm unsupported when the stroke survivor is sitting, standing, or turned in bed) frequently leads to impingement at the glenohumeral joint. See **Table 1** for a review of proper upper-extremity positioning techniques.

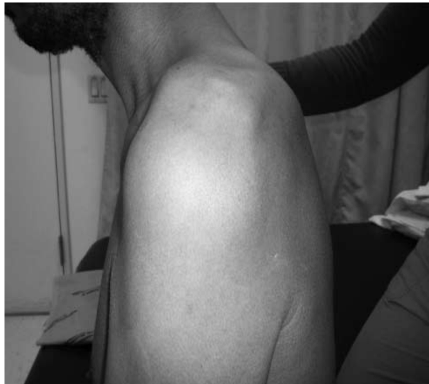
In contrast to neuromuscular pain, neuropathic pain, or central pain, refers to a variety of chronic pain syndromes, including complex regional pain syndrome and thalamic pain syndrome (Gould &

Table 1. Poststroke Proper Handling and Positioning Techniques for Hemiplegic Upper Extremities

Positioning	Suggested Approaches
1. Keep the affected upper extremity supported at all times, especially if the shoulder is subluxed at the glenohumeral joint.	1. Place the extremity on a pillow when in bed, on an arm trough when in a sitting position, and in a sling or pocket when standing.
2. Never raise the affected upper extremity above 90 degrees' shoulder flexion unless instructed in proper approximation techniques by a qualified professional.	2. When dressing, follow the sequence of weaker arm, head, then stronger arm. Limit humeral elevation during upper-body dressing and bathing.
3. Assist the patient with obtaining full, pain-free, shoulder joint range of motion (especially external rotation), using proper approximation techniques on a daily basis to prevent soft-tissue contractures that lead to shoulder joint malalignment.	3. While in bed, guide the patient to clasp the hands together with thumbs up and lift the hands to shoulder level until elbows are fully extended. Discontinue activity if any pain occurs.
4. Keep the affected upper extremity in front of the patient's body (scapular protraction with slight shoulder flexion) when assisting the patient with rolling in bed.	4. Place the patient's hand and arm across their chest (like making a pledge). After rolling, make sure the arm and hand are supported.
5. Facilitate trunk symmetry and weight bearing of the affected upper extremity when assisting a patient with self-care tasks at the edge of a bed.	5. Have the patient place his or her affected hand palm down on the bed (or his or her affected forearm on a pillow beside the body) to be used as a stabilizer during bedside bathing or dressing.
6. Encourage extensor muscle strengthening (opposite of flexor synergy pattern) during functional tasks.	6. If the patient has any active range of motion, encourage reaching away from the body, extending the elbow, and opening the hand.

Figure 1. Case Example: A 45-Year-Old Man 4 Weeks' Status Post-Cerebrovascular Accident

Clinical presentation: Decreased trunk control, decreased midline orientation, decreased cognition, decreased visual-perception skills, left inattention, left hemiplegia, left anterior/inferior glenohumeral subluxation, and mild left shoulder pain

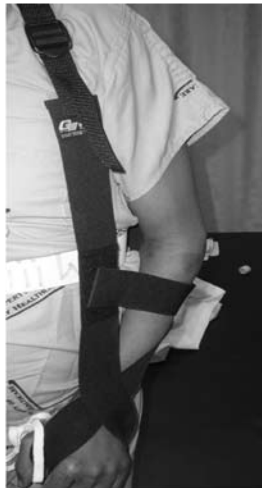


Unsupported glenohumeral subluxation

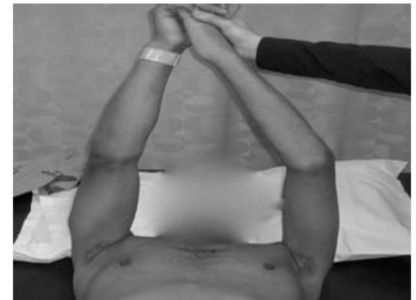
Weight bearing on affected upper extremity while seated on bed for self-care tasks

Supportive hemiplegic arm positioning in supine

Supportive hemiplegic arm positioning in sidelying



Supportive hemiplegic arm positioning when standing or walking



Active-assisted mobilization of a subluxed hemiplegic shoulder

Barnes, 2009). Neuropathic pain typically is described as a constant burning sensation, and this type of pain is more difficult to alleviate with range of motion and positioning because of its origin in the central nervous system. In some neuropathic pain cases, afferent pathways are damaged, leading to the transmission of false sensory feedback. This can result in the sensation of pain. This type of pain, paresthesia, is described as a more generalized "odd" or painful sensation. Physicians may prescribe medications to alleviate neuropathic pain (Vuagnat & Chantraine, 2003; Turner-Stokes & Jackson, 2002) so patients can tolerate therapy addressing functional recovery of the hemiplegic extremity.

Shoulder Pain Assessment and Prevention

Because injury and pain to a hemiplegic shoulder can occur within 1 year after a stroke, healthcare professionals in both acute and chronic care settings are responsible for awareness, prevention education, and assessment of shoulder pain. Educating patients, caretakers, and other healthcare providers about the risk associated with injuring a hemiplegic shoulder and proper joint positioning, joint protection, and range of motion techniques is essential to prevent pain. A hemiplegic arm is at risk for injury when a person performs simple daily activities such as rolling in bed, donning a shirt, or transferring to a toilet. Proper handling techniques can help reduce shoulder pain after stroke.

Healthcare providers also must assess stroke survivors for shoulder pain to initiate proper referral and treatment. A common method to assess pain in clinical practice is to have patients rate the severity of their pain on a scale of 0 to 10 at least once a day. Dromerick and colleagues (2008) found that self-report of shoulder pain was underestimated when simple questioning was used, therefore they recommended assessing shoulder pain during physical

Key Practice Points

1. Effective stroke rehabilitation is essential for positively influencing quality of life in stroke survivors, especially when considering the extensive functional limitations that commonly result from stroke.
2. Functional shoulder motion is fundamental for effective hand use during activities of daily living; it is, therefore, an ethical responsibility of healthcare professionals to actively address early prevention and management of hemiplegic shoulder pain.
3. To prevent shoulder pain, as well as maximize potential for motor recovery at the onset of hemiplegia, preventive techniques should be initiated by the entire rehabilitation team, including nurses, therapists, rehabilitation aides, nurse aides, and physicians.
4. Educating patients, caretakers, and other healthcare providers about the risks associated with injuring a hemiplegic shoulder and measures for proper joint positioning, joint protection, and range of motion techniques are important for pain prevention.

examination of the affected shoulder. After pain has been assessed, the clinician needs to document and communicate to other healthcare providers whether the patient is experiencing constant pain, occasional pain, pain at rest, or pain with movement of the upper extremity. When a referral is made for occupational or physical therapy, the therapist will observe movement and perform an evaluation to determine the need for skilled therapeutic intervention. No single intervention has been identified as the gold standard to treat hemiplegic shoulder pain, and interventions for prevention and treatment vary widely among nurses and therapists (Pomeroy, Niven, Barrow, Faragher, & Tallis, 2001). Shoulder pain guidelines (National Guideline Clearinghouse, 2006) are noted for lacking a strong evidence base. To address individualized functional outcomes, therapists may treat shoulder pain through various techniques such as use of electrical modalities, thermal modalities, cryotherapy, manual treatment techniques (range of motion, stretching, soft-tissue massage, joint mobilizations), inhibition training to decrease muscle activity in the overbearing flexor muscle groups, motor-relearning strategies to increase muscle activity in weak extensor muscles, and patient and family education regarding independence with a customized treatment program to relieve and prevent shoulder pain.

Because of managed care and reimbursement issues, the amount of direct treatment between therapists and clients is limited. According to the Centers for Medicare & Medicaid Services (2007), patients in an acute rehabilitation facility should receive approximately 3 hours of therapy per day (including occupational, physical, and, possibly, speech therapy) at least 5 days per week. Twenty-four-hour management is essential to prevent shoulder pain and optimize motor recovery in a hemiplegic upper extremity following stoke. Nurses are the primary practitioners who provide ongoing education to patients and family members about proper handling of a hemiplegic upper extremity. Education should include a review of range of motion and positioning techniques (Table 1 and **Figure 1**) to prevent and manage poststroke shoulder pain (National Guideline Clearinghouse, 2006). Interdisciplinary team collaboration and patient and family education are essential for effective and efficient management of poststroke shoulder pain. Seneviratne and colleagues (2005) described how nurses need to lead collaborative efforts with physical and occupational therapists to provide optimal care early in the poststroke period to prevent shoulder subluxation and associated pain. Shoulder pain does not have to be an inevitable stroke condition. Early prevention techniques (e.g., range of motion exercises, support for the affected extremity, positioning, transferring) should be initiated by all team members (nurses, therapists, technicians, and physicians) at the onset of hemiplegia to prevent shoulder pain. In preventing poststroke shoulder pain, the ultimate goal is to facilitate optimal motor recovery, increase functional independence, and improve quality of life for all stroke survivors.

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