CHAPTER V

DISCUSSION

The clinical technique used to assess scapular upward rotation demonstrated moderate to excellent repeatability between test sessions. Borsa (13) reported excellent reliability of angular of scapular rotation at resting position and moderate reliability during 90 degrees of arm elevation, which was measured using a Saunders Digital Inclinometer. Our measures showed a trend toward lower test-retest repeatability of angular of scapular rotation at 90 degrees of arm elevation. We ascribed this decreased repeatability at this range of shoulder elevation to increased difficulty in bony landmark palpation from thick and firm muscles, and a lack of consistency in points in a few subjects. To ameliorate repeatability, we recommend that the examiner have adequate practice with the palpating technique before to ensure precise results.

The purposes of this study were to describe and compare scapular and humeral alignment as well as length of muscles crossing the shoulder joint complex in SP and NSP. The VAS at the shoulder during arm movement was moderate pain. Only two subjects in SP reported shoulder pain during resting position. However, we did not observe a painful facial expression of this patient during evaluation. None of patients in SP reported their hemiplegic shoulder pain as a chief complaint. The resting shoulder pain may result from repetitive injury of soft tissues around the shoulder joint during GH elevation. Therefore, our subjects presented shoulder pain resulted from mechanic process, in which pain was occurred during motion.

The SP and NSP demonstrated downward scapular rotation at rest. In this study, the resting position of the scapula did not differ between SP and NSP. These results further substantiate those results previously reported in normal subjects and hemiplegic (hypotonia and hypertonia) of the affected upper extremity (20, 21). The present study showed poor motor recovery in both groups, and showed mild spasticity and flaccidity in SP and NSP, respectively. The scapular rotation was assessed in a seated position, in which the gravity force may contribute downward rotation of the scapula. The paralysis, abnormal muscle tone, and tightness of shoulder muscles such as rhomboid major and minor may decrease or disturb stabilizing of scapula on the thorax.

The scapulohumeral rhythm in both SP and NSP groups was not significant difference. The mean ratio of GH to ST motion during shoulder elevation was 2:1 (67, 68), 2.4:1 (32) and 1.7:1 (14) in normal subjects. The present study found a decreased ratio of ST when the arm was passively elevated in both hemiplegic groups when compared with previous studies. Ebaugh and Mclure (12) demonstrated less upward rotation of the scapula when the shoulder was elevated passively. Our studies confirmed the decreased scapular upward rotation during passive arm elevation in both groups. The reduction of ST motion during passive arm elevation in hemiplegia may result from abnormal tone and laxity of other soft tissues around the GH.

Scapular orientation and motion during arm elevation has also been used to identify scapular impairment syndrome (4). In this study, we found that SP and NSP demonstrated downward scapular rotation at rest. In addition, decreased upward scapular rotation during passive arm elevation was observed in both groups. Although there was no significant difference observed between groups, downward scapular rotation at rest and decrease upward scapular rotation during arm elevation may predispose the hemiplegic patient to scapular downward rotation syndrome.

This study found a significant difference only in the shoulder internal rotator muscle length between the groups. Moreover, all shoulder muscles in both groups were tight compared with the normal range of motion. Our study corresponded with previous studies that demonstrated patients with stroke having decreased shoulder external rotation in the affected side (23, 69).

In patients with intact neurological system, the presence of excessive movement in specific direction associated with limited muscle length in the opposite direction has been used to classify movement impairment (4). For example, the presence of GH internal rotation during arm elevation associated with a decrease in length of the shoulder internal rotator has been used to identify the GH medial rotation syndrome (4). In this study, active GH internal rotation during arm elevation was unable to evaluate in both subject groups due to poor motor recovery of the affected arm. However, we found that the length of the GH internal rotator was shorter in hemiplegic patients with SP than the NSP. Although the length of the pectoralis major, which is one of GH internal rotators, of the hemiplegic patients with SP was not shorter than the NSP at $P < 0.05$. The P-value of the pectoralis major was at 0.09. The pectoralis major muscle may be significantly shorter in SP than NSP group with the larger number of subjects participated in the study.

Soft tissue restrictions are characterized by changes in the muscular cross bridge connections, sarcomeres and other connective tissues (2, 26). A decrease length of the GH internal rotator contributes to shoulder pain by disrupting the normal external rotation of the GH during arm elevation (23, 69). Limited GH external rotation has been shown to cause impingement of the humeral head against the coracoacromion arch resulting in anterior shoulder pain (2, 14).

Collectively, these results suggest that shoulder pain observed in this cohort of hemiplegic patients may be categorized as the GH medial rotation syndrome. However, abnormal scapulohumeral rhythm should also be considered. Hemiplegic patients with flaccidity or mild spasticity of shoulder adductors may develop mechanical shoulder pain from multi-contributed factors. Inappropriate scapulohumeral rhythm and GH internal rotators were involved. However, shortening of the shoulder internal rotator muscles seems to be one of the sensitive factors which facilitates shoulder pain.

CONCLUSION

We found that hemiplegic patients with moderate shoulder pain demonstrated significantly shorter length of the glenohumeral internal rotator as compared to age- and gender-matched hemiplegic patients without shoulder pain. Scapular rotation and horizontal and vertical positions at rest and during passive glenohumeral abduction in scapular plane, and length of other tested muscles were not significantly different between groups. These results suggest that shoulder internal rotator length may be a significant contributing factor to shoulder pain in hemiplegic patients. Consequently, careful assessment of the muscle lengths of the shoulder internal rotator should be important components of any shoulder examination in patients with hemiplegia.

LIMITATION

The number of patients included in this study is limited. Muscle length of pectoralis minor was measured at rest without passive stretching. Finally, we did not recorded specific pain area of the shoulder joint in SP group.

FUTURE STUDY

The present study suggested that the length of GH internal rotators was a sensitive factor for hemiplegic shoulder pain. We proposed that this muscular impairment may contribute to GH medial rotation syndrome in patients with hemiplegia. However, scrutinized shoulder examination such as area of shoulder pain and intervention research is required to verify this assumption. Increased length of shoulder internal rotators should relate to the shoulder pain level.