

Preliminary Study of Suprascapular Nerve Block (SSNB) in Hemiplegic Shoulder Pain

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Objective: To study the effectiveness of suprascapular nerve block in hemiplegic shoulder pain for reducing pain and increasing range of motion, and compare them to treatments with therapeutic ultrasound.

Study Design: Randomized controlled trial study

Setting: Thai Red Cross Rehabilitation Center

Material and Method: Stroke patients with hemiplegic shoulder pain who met the inclusion criteria were included into the present study and allocated to the suprascapular nerve block (SSNB) and ultrasound groups by block of four-randomization technique. Patients of the SSNB group were done the nerve block twice, after pre-assessment on the first day and the next week of follow-up. For the ultrasound group, patients were treated 5 days a week. During four weeks of study, all of the patients were given the same standard program of range of motion exercise and were evaluated the VAS score of pain and range of motion every week until four weeks.

Results: Ten stroke patients were equally allocated to SSNB and US groups. There were significant improvements of VAS score at the 2nd and 4th week in the SSNB group with mean decreasing VAS scores of 40.6 ± 25.4 and 51.0 ± 20.7 , respectively. For ROM outcome of the SSNB group, the increase of flexion at the 2nd and 4th week was 17.0 ± 6.3 and 25.4 ± 10.4 and abduction was 13.2 ± 11.3 and 20.6 ± 12.5 , respectively. Statistically significant increase was detected at the 4th week in flexion motion ($p = 0.026$). SSNB produced a faster relief of pain than the ultrasound but there was no significant difference for restoration of ROM. There was no complication observed during the present study.

Conclusion: The present study suggests that suprascapular nerve block is a safe and effective treatment for hemiplegic shoulder pain. It was more rapid and effective than therapeutic ultrasound in reducing pain score but there is a similar result for improvement of ROM.

Keywords: Suprascapular nerve block (SSNB), Ultrasound, Hemiplegic, Shoulder pain

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Shoulder pain is a common complication after a stroke. The incidence has been reported varying from 16 to 84%⁽¹⁻⁹⁾. Hemiplegic shoulder pain is a problem that could affect rehabilitation outcome in a negative way⁽⁹⁻¹⁰⁾. Several studies and reviews on hemiplegic shoulder pain have been published which mainly focus on the etiology and treatment of these patients^(1,5-11). The conclusion of cause that produces hemiplegic shoulder pain and the effective treatment methods are

still controversial and inconclusive. Physiotherapy is the main treatment program, which is always prescribed in these patients, including physical modalities such as ultrasound, TENS, etc and therapeutic exercise⁽⁸⁻¹⁷⁾. Although many different mechanical methods have been reported, the result is unfavorable. Many rehabilitation physicians give additional intra-articular corticosteroid injections⁽⁹⁻¹⁸⁾. However, evidences of the effectiveness of the intra-articular steroid injection are difficult to interpret. The conventional treatment program that combine therapeutic exercise with ultrasound (US), was widely used in many rehabilitation centers.

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The effect of US in the management of soft tissue disorders of the shoulder was found to be of little or no clinical benefit⁽¹⁻¹⁹⁾. Some studies⁽³⁻²¹⁾, however, have shown US to be effective in improving the symptoms. In the authors' experience, US seems to be of some value in management of hemiplegic shoulder pain but is not effective in some cases. These inconclusive results led us to study a new more effective intervention.

Suprascapular nerve block (SSNB) is an effective and safe method for pain relief and increases range of motion (ROM) in many groups of patients who had shoulder pain such as non-specific shoulder pain⁽²³⁾, chronic shoulder pain⁽²⁴⁾, rotator cuff tendonitis⁽²⁵⁾, rheumatoid arthritis⁽²⁶⁾, frozen shoulder⁽⁹⁻²⁷⁾, and pain after arthroscopic shoulder surgery⁽¹⁻²⁹⁾. The signs and symptoms of hemiplegic shoulder pain are similar to those found in a non-hemiplegic painful stiff shoulder (capsulitis adhesive)⁽³¹⁾. From literature reviews, suprascapular nerve block has never been studied in hemiplegic shoulder pain.

Therefore, the objectives of the present study were to study the effects of SSNB in reducing pain and increasing range of motion (ROM) in hemiplegic shoulder pain and comparing these effects with therapeutic ultrasound, which is a conventional treatment program in our center.

Material and Method

The present study protocol was approved by the institutional ethical committee and written informed consent was obtained. Ten hemiplegic patients who were admitted at the Thai Red Cross Rehabilitation Center and had shoulder pain with limited ROM on paresis limb were recruited into the present study. All of the patients were diagnosed as stroke, were conscious and cooperated well. Patients were excluded if they had any contraindication for doing SSNB and ultrasound, had Visual Analog Scale (VAS) score less than 50, or had Thai Mental State Examination (TMSE) score less than 24. All included patients were allocated into either a SSNB (n = 5) or ultrasound (n = 5) group with block of 4-randomization technique by randomization table.

Suprascapular nerve block (SSNB)

10 ml of 1% lidocaine without adrenaline was injected using the technique described by Dangoisse et al⁽³²⁾. A 25G x 1.5" needle was introduced through the skin 2 cm cephaloid to the midpoint of the spine of the scapula.

The needle was advanced parallel to the blade of the scapular until bony contact was made in the floor of the suprascapular fossa. This technique has previously been demonstrated to be safe and effectively blocks the articular branches of the suprascapular nerve. The injection was done once a week and not more than twice.

Ultrasound or controlled group

1.0-2.0 watt/cm² around shoulder joint 10 min every official day (5 times/week) x 4 weeks.

Patients in both groups received standard programs of passive range of motion and stretching exercise on the paresis upper limb, occupational therapist, and ambulation training with the exception of an electrical heating pad that was used to prepare soft tissue around the shoulder joint before stretching in SSNB group.

The main outcome measurements were obtained at baseline 2 and 4 weeks of the present study. They included 1) pain score that was documented by asking the patient to place a mark on a horizontal 10 cm Pain VAS. The left end of the Pain VAS was marked "0" while the right end was marked "100". On this scale, higher numbers indicate more perceived pain. A baseline pain VAS value of 50 or more was required for study entry. 2) ROM of flexion and abduction of the painful shoulder were measured with goniometry. The recorded range was at a point that the patient began to feel pain.

Statistical analysis was performed by SPSS program version 13.0 for windows. Baseline characteristics were compared between groups by using Mann-Whitney U or Chi-Square test depends on type of data. Pain VAS score and ROM were compared between groups at 2nd and 4th week by using one-way Univariate Analysis of Covariance (ANCOVA) and a modified Bonferroni adjustment was performed to account for the two time point's measurement for reducing a type I error from multiple t-tests (significant at p-value < 0.025). Pain VAS score and ROM were compared within groups between baseline and at the 2nd or 4th week by using repeated ANOVA with significance at p-value < 0.05. Decreasing of VAS score and increasing of ROM of both groups were compared by using Mann-Whitney U test with Bonferroni adjustment.

Results

Ten stroke patients, who admitted at Thai Red Cross Rehabilitation Center between December 2007

and June 2008 and met the inclusion criteria, were recruited into the present study. They were equally allocated into two study groups by block randomization. All of the patients completed the intervention as allocated. Groups did not differ significantly at baseline for personal characteristics or main outcomes (Table 1).

Pain VAS scores were reduced in both SSNB and US groups at 2nd and 4th week after intervention

but statistically significant reducing happened earlier in SSNB at 2nd week (Table 2). Reduced pain VAS score of the SSNB group was more than the US group at both follow-up time points but statistically significant difference was only shown at 2nd week (Table 3).

For both SSNB and US groups, there were increased mean range of motion in both flexion and abduction position at 2nd and 4th week. However, significant change was evidenced at 4th week of the

Table 1. Demographic data

Characteristics	SSNB group (n = 5)	US group (n = 5)	p-value
Age (yr) (mean ± SD)	48.4 ± 9.2	61.4 ± 17.2	0.40
Gender (n) (male:female)	3:2	3:2	0.74
Type of stroke (n) (infarction:hemorrhage)	4:1	2:3	0.20
Affected side (n) (right:left)	1:4	2:3	0.50
Pain duration at onset (wk) (mean ± SD)	6.8 ± 3.9	7.2 ± 3.6	0.73
Brunnstrom stage (n) (stage I:II:III)	1:2:2	2:2:1	0.72
TMSE score (points) (24:25:26)	3:1:1	4:1:0	0.57
Baseline VAS score (mean ± SD)	70.8 ± 10.3	71.6 ± 12.9	0.2
Baseline ROM (mean ± SD)			
Flexion	131.4 ± 11.4	110.0 ± 27.2	0.25
Abduction	119.8 ± 30.0	92.2 ± 7.7	0.08

Table 2. Mean score of pain visual analog (Pain VAS) and range of motion (ROM) at baseline, 2nd and 4th week of study groups

Variables	SSNB (n = 5) Mean ± SD	US (n = 5) Mean ± SD	p-value between groups
VAS at baseline	70.8 ± 10.3	71.6 ± 12.9	0.92*
VAS at 2 nd wk	30.2 ± 19.3	59.4 ± 7.5	0.02**
p-value within group	0.01***	0.31***	
VAS at 4 th wk	19.8 ± 15.4	50.0 ± 2.6	0.004**
p-value within group	0.001***	0.006***	
ROM of flexion at baseline	131.4 ± 11.4	110.0 ± 27.2	0.25*
ROM of flexion at 2 nd wk	149.6 ± 13.9	120.6 ± 30.4	0.22**
p-value within group	0.116***	1.00***	
ROM of flexion at 4 th wk	156.4 ± 12.5	128.0 ± 26.6	0.25**
p-value within group	0.026***	0.99***	
ROM of abduction at baseline	119.8 ± 30.0	92.2 ± 7.7	0.08*
ROM of abduction at 2 nd wk	133.0 ± 32.3	101.0 ± 12.5	0.70**
p-value within group	1.00***	0.86***	
ROM of abduction at 4 th wk	140.4 ± 25.9	111.0 ± 16.6	0.56**
p-value within group	0.87***	0.10***	

* Comparison baseline between groups, significant at p-value < 0.05

** Comparison across group at 2nd or 4th week, significant at p-value < 0.025

*** Comparison between baseline and 2nd or 4th week within group, significant at p-value < 0.05

Table 3. Mean score of decreasing Pain VAS and increasing ROM from baseline at 2nd and 4th week of both groups

Variables	SSNB (n = 5) Mean ± SD	US (n = 5) Mean ± SD	p-value* between groups
Decreasing VAS at 2 nd wk	40.6 ± 25.4	12.4 ± 9.5	0.016
Decreasing VAS at 4 th wk	51.0 ± 20.7	23.2 ± 14.4	0.028
Increasing ROM of flexion at 2 nd wk	17.0 ± 6.3	10.6 ± 6.6	0.044
Increasing ROM of flexion at 4 th wk	25.4 ± 10.4	18.0 ± 10.4	0.168
Increasing ROM of abduction at 2 nd wk	13.2 ± 11.3	9.0 ± 6.5	0.071
Increasing ROM of abduction at 4 th wk	20.6 ± 12.5	19.0 ± 11.0	0.834

* Significant at p-value < 0.025

SSNB group (Table 2). There was no significant difference of increasing ROM between the SSNB and US group neither flexion nor abduction position (Table 3).

There was no complication or adverse event detected during the study period. Patients who had SSNB did not complain about post-injection soreness. All of them accepted the second nerve block in the other week well.

Discussion

The result showed suprascapular nerve block (SSNB) with 1% lidocaine by indirect technique described by Dangoisse et al⁽³²⁾ was effective, safe and with good compliance, especially for reducing pain in hemiplegic's shoulder pain. Compared to the therapeutic ultrasound, SSNB was significantly better for reducing pain at the second and fourth week after treatment. Although, SSNB was reported by many studies to be a valuable method to control shoulder pain in a variety of conditions⁽²³⁻³⁰⁾, its effect still could not clearly explain why the pain relieving effects of regional anesthetic block outlast its pharmacological blocking effect. Gado⁽³³⁾ suggested that the prolonged analgesic effect might be due to an effect on C fibers that interrupts the cycle of feedback amplification that can occur in chronic pain. Wassef⁽²⁸⁾ studied SSNB in frozen shoulder with reflex sympathetic dystrophy and concluded that sympathetic blockade at the level of the suprascapular nerve for the management of the frozen shoulder of RSD proved to be a highly specific procedure, in terms of sympathetically mediated shoulder pain.

In clinical practice, therapeutic ultrasound has to be treated in a physical therapy unit, so there is poor compliance in some cases. However, SSNB has

an advantage for this point; the patients could receive a home program for range of motion exercises after nerve block and follow-up every two weeks.

Although this study has a small group of subjects, the statistic was significant difference for reducing visual pain score in SSNB group. However, for increasing ROM, it is not significant difference when compare to ultrasound group. The other study may include more subjects to clarify this advantage.

Conclusion

This preliminary study indicates that suprascapular nerve block (SSNB) can be more effective than therapeutic ultrasound for reducing pain of hemiplegic shoulder pain. Nevertheless, it has a similarity of increasing range of motion. However, this outcome was concluded from small sample of the preliminary study, a larger sample size is recommended in a next study.

References

1. Griffin JW. Hemiplegic shoulder pain. *Phys Ther* 1986; 66: 1884-93.
2. Roy CW, Sands MR, Hill LD. Shoulder pain in acutely admitted hemiplegics. *Clin Rehabil* 1994; 8: 334-40.
3. Van Ouwenaller C, Laplace PM, Chantraine A. Painful shoulder in hemiplegia. *Arch Phys Med Rehabil* 1986; 67: 23-6.
4. Jespersen HF, Jorgensen HS, Nakayama H, Olsen TS. Shoulder pain after a stroke. *Int J Rehabil Res* 1995; 18: 273-6.
5. Najenson T, Yacubovich E, Pikielni SS. Rotator cuff injury in shoulder joints of hemiplegic patients. *Scand J Rehabil Med* 1971; 3: 131-7.
6. Roy CW. Shoulder pain in hemiplegia: a literature

- review. *Clin Rehabil* 1988; 2: 35-44.
7. Wanklyn P, Forster A, Young J. Hemiplegic shoulder pain (HSP): natural history and investigation of associated features. *Disabil Rehabil* 1996; 18: 497-501.
 8. Broeks JG, Lankhorst GJ, Rumping K, Prevo AJ. The long-term outcome of arm function after stroke: results of a follow-up study. *Disabil Rehabil* 1999; 21: 357-64.
 9. Suethanapornkul S, Kuptniratsaikul PS, Kuptniratsaikul V, Uthensut P, Dajpratha P, Wongwisethkarn J. Post stroke shoulder subluxation and shoulder pain: a cohort multicenter study. *J Med Assoc Thai* 2008; 91: 1885-92.
 10. Snels IA, Dekker JH, van der Lee JH, Lankhorst GJ, Beckerman H, Bouter LM. Treating patients with hemiplegic shoulder pain. *Am J Phys Med Rehabil* 2002; 81: 150-60.
 11. Bruton JD. Shoulder pain in stroke patients with hemiplegia or hemiparesis following a cerebrovascular accident. *Physiotherapy* 1985; 71: 2-4.
 12. Krotenberg R. Shoulder pain in hemiplegia. *Adv Clin Rehabil* 1990; 3: 189-96.
 13. Wanklyn P. The painful hemiplegic shoulder: pathogenesis, diagnosis and management. *Rev Clin Gerontology* 1994; 4: 245-51.
 14. Griffin J, Reddin G. Shoulder pain in patients with hemiplegia. A literature review. *Phys Ther* 1981; 61: 1041-5.
 15. Leandri M, Parodi CI, Corrieri N, Rigardo S. Comparison of TENS treatments in hemiplegic shoulder pain. *Scand J Rehabil Med* 1990; 22: 69-71.
 16. Yelnik AP, Colle FM, Bonan IV, Vicaut E. Treatment of shoulder pain in spastic hemiplegia by reducing spasticity of the subscapular muscle: a randomised, double blind, placebo controlled study of botulinum toxin A. *J Neurol Neurosurg Psychiatry* 2007; 78: 845-8.
 17. Walsh K. Management of shoulder pain in patients with stroke. *Postgrad Med J* 2001; 77: 645-9.
 18. Snels IA, Beckerman H, Lankhorst GJ, Bouter LM. Treatment of hemiplegic shoulder pain in the Netherlands: results of a national survey. *Clin Rehabil* 2000; 14: 20-7.
 19. Van Der Heijden GJ, Leffers P, Wolters PJ, Verheijden JJ, van Mameren H, Houben JP, et al. No effect of bipolar interferential electrotherapy and pulsed ultrasound for soft tissue shoulder disorders: a randomised controlled trial. *Ann Rheum Dis* 1999; 58: 530-40.
 20. Downing DS, Weinstein A. Ultrasound therapy of subacromial bursitis. A double blind trial. *Phys Ther* 1986; 66: 194-9.
 21. Mao CY, Jaw WC, Cheng HC. Frozen shoulder: correlation between the response to physical therapy and follow-up shoulder arthrography. *Arch Phys Med Rehabil* 1997; 78: 857-9.
 22. Ebenbichler GR, Erdogmus CB, Resch KL, Funovics MA, Kainberger F, Barisani G, et al. Ultrasound therapy for calcific tendinitis of the shoulder. *N Engl J Med* 1999; 340: 1533-8.
 23. Taskaynatan MA, Yilmaz B, Ozgul A, Yazicioglu K, Kalyon TA. Suprascapular nerve block versus steroid injection for non-specific shoulder pain. *Tohoku J Exp Med* 2005; 205: 19-25.
 24. Shanahan EM, Ahern M, Smith M, Wetherall M, Bresnihan B, FitzGerald O. Suprascapular nerve block (using bupivacaine and methylprednisolone acetate) in chronic shoulder pain. *Ann Rheum Dis* 2003; 62: 400-6.
 25. Di Lorenzo L, Pappagallo M, Gimigliano R, Palmieri E, Saviano E, Bello A, et al. Pain relief in early rehabilitation of rotator cuff tendinitis: any role for indirect suprascapular nerve block? *Eura Medicophys* 2006; 42: 195-204.
 26. Emery P, Bowman S, Wedderburn L, Grahame R. Suprascapular nerve block for chronic shoulder pain in rheumatoid arthritis. *BMJ* 1989; 299: 1079-80.
 27. Jones DS, Chattopadhyay C. Suprascapular nerve block for the treatment of frozen shoulder in primary care: a randomized trial. *Br J Gen Pract* 1999; 49: 39-41.
 28. Wassef MR. Suprascapular nerve block. A new approach for the management of frozen shoulder. *Anaesthesia* 1992; 47: 120-4.
 29. Ritchie ED, Tong D, Chung F, Norris AM, Miniaci A, Vairavanathan SD. Suprascapular nerve block for postoperative pain relief in arthroscopic shoulder surgery: a new modality? *Anesth Analg* 1997; 84: 1306-12.
 30. Tan N, Agnew NM, Scawn ND, Pennefather SH, Chester M, Russell GN. Suprascapular nerve block for ipsilateral shoulder pain after thoracotomy with thoracic epidural analgesia: a double-blind comparison of 0.5% bupivacaine and 0.9% saline. *Anesth Analg* 2002; 94: 199-202.
 31. Rizk TE, Christopher RP, Pinals RS, Salazar JE, Higgins C. Arthrographic studies in painful hemiplegic shoulders. *Arch Phys Med Rehabil* 1984; 65: 254-6.
 32. Dangoisse MJ, Wilson DJ, Glynn CJ. MRI and clinical study of an easy and safe technique of

suprascapular nerve blockade. Acta Anaesthesiol Belg 1994; 45: 49-54.

33. Gado K, Emery P. Modified suprascapular nerve

block with bupivacaine alone effectively controls chronic shoulder pain in patients with rheumatoid arthritis. Ann Rheum Dis 1993; 52: 215-8.

การศึกษานำร่อง: การฉีดยาชาาระงับการนำกระแสประสาท suprascapular ในภาวะปวดหัวไหล่ของร่างกายข้างที่อ่อนแรงครึ่งซีก

ปวีณา บุญส่ง, อารยา เจริญอารมณ์วัฒนา, จริญญา บุญหงษ์

วัตถุประสงค์: เพื่อศึกษาประสิทธิภาพของการฉีดยาชาาระงับการนำกระแสประสาท suprascapular ในการรักษาภาวะปวดหัวไหล่ในผู้ป่วยอ่อนแรงครึ่งซีก ในแง่การลดอาการปวดและการเพิ่มพิสัยข้อ และเปรียบเทียบผลที่ได้กับการรักษาด้วยเครื่องมือกายภาพชนิด ultrasound

การออกแบบการศึกษา: การทดลองแบบสุ่มชนิดมีกลุ่มเปรียบเทียบ

สถานที่: ศูนย์เวชศาสตร์ฟื้นฟู สภากาชาดไทย

วัสดุและวิธีการ: ผู้ป่วยอ่อนแรงครึ่งซีกจากโรคหลอดเลือดสมองร่วมกับภาวะปวดหัวไหล่ข้างที่อ่อนแรง ซึ่งตรงกับเกณฑ์คัดเข้าจะถูกสุ่มโดยวิธี block of four เข้าสู่กลุ่มทดลองฉีดยา (SSNB) และกลุ่ม ultrasound ผู้ป่วยในกลุ่มฉีดยาจะได้รับการฉีดยาชาาระงับการนำกระแสประสาทสองครั้ง คือวันแรกหลังการตรวจวัดประเมิน และหนึ่งสัปดาห์ถัดมาหลังการตรวจประเมินครั้งที่สองกลุ่ม ultrasound ผู้ป่วยจะได้รับการรักษาด้วยเครื่องมือกายภาพดังกล่าว 5 วันต่อสัปดาห์ ในช่วงสี่สัปดาห์ของการศึกษาผู้ป่วยทั้งหมดจะได้รับโปรแกรมมาตรฐานของการออกกำลังกายเหยียดข้อทุกวัน และได้รับการประเมินอาการปวดและพิสัยของข้อไหล่ทุกสัปดาห์

ผลการศึกษา: ผู้ป่วยจำนวน 10 คน ได้รับการสุ่มเข้าสู่กลุ่มทดลองฉีดยาชา และ ultrasound จำนวนเท่า ๆ กัน อาการปวดไหล่ดีขึ้นในกลุ่มฉีดยาตั้งแต่สัปดาห์ที่สองและคงอยู่ในสัปดาห์ที่สี่ โดยมีคะแนน VAS ลดลงเฉลี่ย 40.6 ± 25.4 และ 51.0 ± 20.7 ในสัปดาห์ที่สองและสี่ตามลำดับ พิสัยข้อของกลุ่มฉีดยาในท่า flexion เพิ่มขึ้น 17.0 ± 6.3 องศา และ 25.4 ± 10.4 องศา ในท่า abduction เพิ่มขึ้น 13.2 ± 11.3 องศา และ 20.6 ± 12.5 องศา ในสัปดาห์ที่สองและสี่ตามลำดับ การเพิ่มขึ้นของพิสัยข้อมีนัยสำคัญทางสถิติเฉพาะท่า flexion สัปดาห์ที่สี่ ($p = 0.026$) การฉีดยาชาาระงับการนำกระแสประสาท suprascapular ให้ผลลดปวดได้เร็วและดีกว่าการรักษาด้วย ultrasound แต่ไม่แตกต่างในการเพิ่มพิสัยข้อไหล่

สรุป: จากการศึกษพบว่า การฉีดยาชาาระงับการนำกระแสประสาท suprascapular ปลอดภัยและมีประสิทธิภาพดีในการรักษาภาวะปวดหัวไหล่ในผู้ป่วยอ่อนแรงครึ่งซีก และให้ผลเร็วกว่าและดีกว่าการใช้ ultrasound ในด้านลดอาการปวด แต่ให้ผลไม่แตกต่างกันในการเพิ่มพิสัยข้อ แต่เนื่องจากผลที่ได้นี้สรุปจากการศึกษาเบื้องต้นซึ่งขนาดตัวอย่างค่อนข้างน้อย จึงควรทำการศึกษาในกลุ่มประชากรที่ใหญ่ขึ้นในครั้งต่อไป