



Relationship in shoulder function for different age groups in subjects with secondary shoulder impingement after PNF application

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ABSTRACT

Study Design: Pretest – Posttest experimental group study

Objective: To determine the Relationship in shoulder function for different age groups in subjects with secondary shoulder impingement after PNF application.

Methods: 15 subjects with a diagnosis of secondary shoulder impingement were recruited from hospital setting and were divided into two groups. Group 1 aged 30 - 43 years while Group 2 aged 44 - 66 years. Both groups received intervention for a period of 3 weeks. Shoulder pain and disability index score (SPADI Score) and Overhead Reach were analysed in both groups.

Result: Both Group 1 and Group 2 showed significant improvement in SPADI Score and Overhead Reach, however no significant difference was found in between group analysis of Group 1 and 2.

Conclusion: Addition of Proprioceptive Neuromuscular Facilitation to conventional treatment brings significant improvement in Shoulder Function in subjects with secondary Shoulder impingement in different age groups.

Keywords : Proprioceptive Neuromuscular Facilitation, Shoulder Function, Secondary shoulder impingement.

Introduction

In human beings, most of the activities of daily living are unimaginable without the use of shoulder. The prevalence of shoulder symptoms have been reported to range from 20-35%¹ and sex and age matched incidence of shoulder pain was 9.5 per 1000.²

The most commonly occurring problems include rotator cuff disease or tendinopathy, which can progress to rotator cuff tear and glenohumeral joint instability and adhesive capsulitis.³ Shoulder impingement accounts for 44 to 65% of shoulder complaints.⁴ Thus making shoulder impingement syndrome is one of the most common shoulder disorders in adults. Neer first introduced the concept of impingement in 1972.⁵

The projected medical cost incurred on shoulder impingement is estimated to be approximately 1- 2 billion dollars annually.⁶

Secondary impingement results from a characteristic pattern of muscle imbalance including weakness of the lower and middle trapezius, serratus anterior, infraspinatus and deltoid, coupled with tightness of the upper trapezius, pectorals and levator scapula.⁴

Physical therapy has been found to be effective in reducing pain and disability in patients with shoulder impingement. Effective interventions include therapeutic exercises focusing on strengthening the rotator cuff and scapular stabilizing musculature, stretching to decrease capsular tightness, scapular taping techniques, and patient education of proper posture.⁷ A dilemma currently exists for the best physiotherapy treatment of secondary shoulder impingement.

PNF is an approach to therapeutic exercise that combines functionally based diagonal patterns of movement with techniques of neuromuscular facilitation to evoke motor responses and improve neuromuscular control and function. It is used

to increase strength, flexibility, and ROM.⁸ PNF incorporates mass functional movement patterns that are diagonal and spiral in nature and often cross the midline of the body. Everyday tasks and skills, from picking up a bottle of water to throwing and kicking naturally utilize diagonal and spiral movements.⁹

Subjects

Fifteen subjects, meeting the inclusion and exclusion criteria were selected. Each subject signed an informed consent and was detailed about the benefits and risks of study.

Inclusion Criteria

1. Male/Female
2. Age group: 30-56 years
3. Presence of secondary shoulder impingement
4. Positive Neer's sign
5. Positive Hawkins-Kennedy Test

Exclusion criteria

1. Primary shoulder impingement
2. Bilateral shoulder impingement
3. History of Any Surgical procedure to the affected upper extremity
4. History of Trauma to the shoulder less than 12 weeks
5. History of Shoulder instability, shoulder dislocation, cervical rib etc.
6. History of infection, tumours, congenital anomalies etc.
7. History of Reflex sympathetic dystrophy and related syndromes
8. History of Corticosteroid injection in the shoulder region less than 12 weeks
9. Non cooperative subjects
10. History of Any Systemic illness for example rheumatoid arthritis, ankylosing spondylitis, diabetes etc. diagnosed by physician.

Dependant Variables

We measured the patient’s perception of shoulder function using shoulder pain and disability index and Overhead Reach using measuring tape.

Procedure

The study was conducted over 9 therapy sessions in a 3-week period. SPADI Score and Overhead Reach measurements were carried on 3rd, 6th and 9th treatment session.

Treatment

Conventional Treatment^{5,7}

Week 1

1. Cold pack to the shoulder for 10 minutes.
2. Isometric Exercises– external rotation, internal rotation ,deltoid (anterior, middle, posterior) 3 sets of 10 repetitions and a 60 sec rest period

Week 2 and 3

Same as for week 1.

Flexibility exercises

1. Anterior shoulder
2. Posterior shoulder musculature

Each stretch is held for 30 seconds and performed 3 times and with a 10 seconds rest period.

Strengthening program

Use of weights 3 sets of 10 repetitions and a 60 sec rest period

1. Supraspinatus strengthening-: Empty can position
2. Internal rotation and external rotation with the arm adducted to side
3. Seated press-up
4. Elbow push up plus a period of 10 seconds.

Followed by PNF procedures¹³

Subjects were instructed to actively move through the PNF flexion-abduction external-rotation diagonal pattern for 3 sets of 10 repetitions with manual facilitation.

Data analysis

The effect of addition of Proprioceptive Neuromuscular Facilitation to the conventional protocol in subjects with secondary shoulder impingement was tested with independent t test for between group comparisons and repeated measures analysis of variance (ANOVA) for Within group analysis. The α level was set at 0.05 for all analyses. Data analysis was accomplished with the following software packages: STATA: version 12. SPSS (version 16.0), EXCEL (Professional EDITION 2007)

Results

Statistical analysis revealed that both groups showed statistically significant difference at significance level of <0.001 for SPADI Score and Overhead Reach, however no significant difference was found in between group analysis of Group 1 and 2 (Table 1).

Discussion

This study was designed to determine the significance of incorporating PNF in secondary shoulder impingement in different age groups

SPADI Score

The results of our study showed that in within group analysis, both groups showed a significant reduction in SPADI Score. In a small scale experimental interventional study of 11 subjects, Kline et al. examined the impact of PNF on physical function. A beneficial effect of PNF training was found for flexibility (ROM shoulder flexion, ankle dorsiflexion) and isometric strength (hip extension, ankle flexion and extension). Measures of physical function (sit-to-stand) also improved.¹⁴

The mechanism behind this finding in could also be attributed to the fact that active exercises help in maintaining joint and

soft tissue integrity, enhance synovial movement for cartilage nutrition and diffusion of materials in the joint, to maintain mechanical elasticity of muscle and motor learning to normalize dysfunctional patterns of motion.¹⁵

In within group analysis, both groups showed significant improvement at a significance level of $p < 0.0001$. The mechanism behind this finding in could be attributed to body’s neuromuscular components being adaptable or plastic; and that functional movement occurs in patterns which are spiral in nature. Proprioceptive neuromuscular facilitation techniques are used to target all aspects of muscle training, to mobilize muscle groups thus improving range of movement and/or reduce pain, functional patterns and handling techniques to facilitate both co-ordination and stability in muscle groups.¹⁴ Previous reviews stated that the addition of pragmatic manual therapy was shown to be effective in reducing pain intensity compared to exercise alone (Bang and Dyle 2000).⁷ In a study by S. Citaker, 2005, it was observed that mobilization and proprioceptive neuromuscular facilitation methods are both similarly effective.¹⁶ Thus we can conclude that we can replace mobilization with PNF in treatment of shoulder impingement.

Overhead Reach

A reduction in pain and disability is definitely associated with an increase in Overhead Reach. The mechanism behind this finding in experimental group could be attributed to four mechanisms autogenic inhibition, reciprocal inhibition, stress relaxation, and the gate control theory.¹³

Results of our study are in concordance with previously mentioned studies. Previous researches Godges et al. (2003)¹⁸ found significant increases in glenohumeral rotation and overhead reach ROM with PNF as an adjunct to soft tissue mobilization alone.

Blakeley and Palmer reported in their study with 10 patients that PNF techniques increase ROM and decrease pain in the patients with shoulder pathology.¹⁸

Age Groups

No significant difference was found between group 1 and 2. This could be attributed to similar pathologic process of secondary shoulder impingement and similar effect of PNF on all age groups.

Conclusion

The results of the study showed that addition of Proprioceptive Neuromuscular Facilitation to conventional treatment brings significant improvement in Shoulder Function in comparison to conventional treatment only in subjects with secondary Shoulder impingement in different age groups.

Variables	F-value	t-value	Sig(2-tailed)
SPADI0	9.230	-0.643	0.531
SPADI1	3.304	0.007	0.994
SPADI2	0.927	-0.782	0.448
SPADI3	0.901	-1.164	0.266
OHR0	0.083	0.387	0.705
OHR1	0.437	-0.072	0.944
OHR2	0.080	0.909	0.380
OHR3	0.012	0.857	0.407

Table 1: Between subject for all variables

REFERENCES

1. Vander Windt DA, Koes BW, De Jong BA, Bouter LM.(1995)Shoulder disorders in general practice; incidence, patient characteristics and management. *Ann Rehum Dis*;54:959-64. | 2. Ostor AJK, Richards CA, Prevost AT, Speed CA, Hazleman BL.(2005) Diagnosis and relation to general health of shoulder disorders presenting to primary care.*Rheumatology*;44:800-5. | 3. Bigliani, Levine WN. Subacromial Impingement Syndrome.(1997) *Journal of bone and joint surgery (Am)*;79:1854-68. | 4. Page P.(2011) Shoulder Muscle Imbalance and Subacromial Impingement Syndrome in Overhead Athletes. *The International Journal of Sports Physical Therapy*;6(1):51-8. | 5. ChangWK.(2004) Shoulder impingement syndrome. *Phys Med Rehabil Clin N Am* 15;493-510. | 6. Flanagan SR, Zaretsky HH, Moroz A. *Medical aspects of disability*, 4th ed. New York:Springer;296 | 7. Bang MD, Deyle GD.(2000) Comparison of Supervised Exercise With and Without manual Physical Therapy for Patients With Shoulder Impingement Syndrome. *Journal of Orthopaedic and Sports Physical Therapy*;30(3):126-37. | 8. Engle RP, Canner GC.(1989) Proprioceptive Neuromuscular Facilitation (PNF) and Modified Procedures for Anterior Cruciate Ligament (ACL) Instability. *The Journal of Orthopaedic and Sports Physical Therapy*;230-6. | 9. Burton L, Heidi Brigham H. (2011) Proprioceptive Neuromuscular Facilitation: The Foundation of Functional Training. Screening. | 10. Roach KE, Budiman-Mak E, Songsirdej N, Lertratanakul Y.(1991) Development of a shoulder pain and disability index. *Arthritis Care Res*;4:143-9. | 11. Hill CL, Lester S, Taylor AW, Shanahan ME, Gill TK.(2011) Factor structure and validity of the shoulder pain and disability index in a population-based study of people with shoulder symptoms. *BMC Musculoskeletal Disorders*; 12:8. 15. | 12. Hayes K, Walton JR, Szomor ZL, Murrell GAC.(2001) Reliability of five methods for assessing shoulder range of motion. *Australian Journal of Physiotherapy*; 47:289-94. | 13. Gorges JJ, Mattson-Bell M, Donna Thorpe, Shah D.(2003) The Immediate Effects of Soft Tissue Mobilization With Proprioceptive Neuromuscular Facilitation on Glenohumeral External Rotation and Overhead Reach. *JOSPT*;713-8. | 14. Westwater-Wood S, Nicola Adams, Roger Kerry. (2010) The use of proprioceptive neuromuscular facilitation in physiotherapy practice. *Physical Therapy Reviews*;15(1):15-23. | 15. Nellutla NMM, Giri P, Vyvienne RP, Patel MHC.(2009) PNF movement patterns compared to the use of conventional free exercises to improve joint ROM in chronic peri-arthritis of the shoulder. *Indian Journal of Physiotherapy and Occupational Therapy - An International Journal*;3(4):31-4. | 16. Citaker S, Taskiran H, Akdur H.(2005) Comparison of the mobilization and proprioceptive neuromuscular facilitation methods in the treatment of shoulder impingement syndrome. *The Pain Clinic*;27:197-202. | 17. Hindle KB, Whitcomb TJ, Briggs WO,Hong J.(2012) Proprioceptive Neuromuscular Facilitation (PNF): Its Mechanisms and Effects on Range of Motion and Muscular Function. *Journal of Human Kinetics*;31:105-13. | 18. Blakely RL, Palmer ML.(1986) Analysis of Shoulder Rotation Accompanying a Proprioceptive Neuromuscular Facilitation Approach. *PHYS THER.*;66:1224-7.