FUNCTIONAL ASSESSMENT ON THE PATIENTS WITH SHOULDER IMPINGEMENT

Faton Daci, Evgeniya Dimitrova
National Sports Academy "Vassil Levski", Sofia, Bulgaria

ABSTRACT
Introduction: The aims of our study were to identify the available functional examination tests (FET) and patient-reported outcome measures (PROM) instruments designed for subacromial impingement, to analyze and evaluate them and to develop a methodology for functional assessment of patients with shoulder impingement. Methods: A comprehensive search for all available FET and PROM and published review articles for subacromial impingement was undertaken on PubMed, PEDRO, Google Scholar, and Physiopedia up to June 2021. All full-text articles reporting evaluation, validation, surgical, and non-surgical treatment outcomes of these subacromial impingement FET and PROM were retrieved and analyzed by us, and a methodology for functional assessment of patients with subacromial impingement was developed. The methodology includes the following methods and tests: patient history, observation, palpation, examination of the movements, Visual Analogue Scale (VAS) for pain, examination of muscle balance (muscle length and tonus, isometric test, manual muscle testing), goniometry of the shoulder active range of motion (AROM), special tests (Neer test, Hawkins-Kennedy test), Shoulder Pain and Disability Index (SPADI). Results And Discussion: For a period of 1 year, we accessed 36 subjects diagnosed with primary shoulder impingement. They were randomly assigned to one of two physiotherapy groups: 1) supervised exercise only, and 2) supervised exercise with manual therapy techniques. Physiotherapy protocol involved twelve treatment sessions over a 6-weeks period. The analysis of the results confirms the positive effect of physiotherapy to decreases in pain, improved function, and increases in shoulder active range of motion. Conclusion: A methodology for functional examination of patients with subacromial impingement allows objective monitoring of the results of physiotherapy. Physiotherapy is effective in reducing pain and improving shoulder function in patients with subacromial impingement.

Keywords: *shoulder impingement syndrome, functional assessment.*

INTRODUCTION

Shoulder impingement syndrome is a common musculoskeletal complaint leading to a significant reduction in muscle strength and range of motion (ROM) of the shoulder which adversely affects the patients' quality of life (Millar et al., 2006; Hawkins, Kennedy, 1980; Neer, 1983). Physiotherapy is often the first choice of treatment. Healthcare interventions are under increasing scrutiny regarding effectiveness. Physiotherapy has been found to be effective in reducing pain and disability in patients with shoulder impingement (Bang, Deyle, 2000; Ludewig, Borstad, 2003; Desmeules et al., 2003; Ganchev et al., 2007; Sazdova, 2017; D'Hespeel, 2004; Borstad, 2006; McClure et al., 2004). Very few studies have evaluated the effectiveness of incorporating glenohumeral joint mobilizations (Bang, Deyle, 2000; Conroy, Hayes, 1998; Sole, 2003) and other manual therapy techniques. Functional examination tests (FET) and patient-reported outcome measures (PROM) have revolutionized clinical research facilitating objective interpretation and comparison across different healthcare systems.

The aims of our study were to identify the available functional examination tests and patient-reported outcome measures instruments designed for subacromial impingement, to analyze and evaluate them, and to develop a methodology for functional assessment of patients with shoulder impingement.

In this study, physiotherapy and manual therapy were applied sequentially in patients with subacromial impingement to evaluate their effects on the shoulder pain and on the function.

METHODS

A comprehensive search for all available FET and PROM and published review articles for subacromial impingement was undertaken on PubMed, PEDRO, Google Scholar, and Physiopedia up to June 2021. All full-text articles reporting evaluation, validation, surgical, and non-surgical treatment outcomes of these subacromial impingement FET and PROM were retrieved and analyzed by us, and a methodology for functional assessment of patients with subacromial impingement was developed.

The methodology includes the following methods and tests:

- Patient history (each subject filled out a demographic survey for statistical reporting of gen-

der, age, hand dominance, symptom duration, medications, and the current as well as a history of shoulder dysfunction).
- Observation and palpation (superiolateral shoulder pain).
- Examination of passive and active movements.
- Visual Analogue Scale (VAS) for pain – maximum pain over the preceding 24-hour period graded by a visual analog scale (VAS, 0-10 cm; 0 means no pain, 10 means severe pain).
- Examination of muscle balance (muscle length and tonus, isometric test, manual muscle testing).
- Goniometry – pain-free active ROM measured with a standard goniometer for flexion and scaption according to a standard procedure (Norkin, White, 2003).
- Special tests (Neer test, Hawkins-Kennedy test).

  - *The Neer impingement test* (Neer, 1983), conducted by passive forward elevation and internal rotation of the humerus with the scapula stabilized, is deemed positive if the patient reports pain, usually above 120° of shoulder elevation when the critical zone of the rotator cuff tendon is compressed against the subacromial arch (Hawkins, Abrams, 1987; Valadie et al., 2000).
  - *The Hawkins-Kennedy test* (Hawkins, Kennedy, 1980; Hawkins, Abrams, 1987) is performed by positioning the arm passively at 90° of shoulder flexion followed by the examiner forcibly internally rotating the arm—a maneuver that also directs the critical zone against the coracoacromial ligament. The sensitivity of this maneuver has also been found to be good (Park et al., 2005).

- Functional status was evaluated by using Shoulder Pain and Disability Index (SPADI) – m a self-administered shoulder-specific questionnaire including two subscales; pain and disability. The pain subscale consists of 5 items and the disability subscale consists of 8 items. Patients were asked to answer using 0-100 mm VAS for each item. The score of SPADI was ranged from 0 to 100. Higher scores indicate a high level of disability. The numerically scaled SPADI (Williams et al., 1995), has been shown to have good test-retest reliability, responsiveness, and/or validity (Michener, Leggin, 2001). Overall functional results: excellent (0 to 33 points), good (34 to 66 points), medium (67 to 100 points), and poor (101 points to 130 points).

One physical therapist with 10 years of clinical experience performed the pre- and post-treatment assessment measurements.

RESULTS AND DISCUSSION

For a period of 1 year, we accessed 36 subjects diagnosed with primary shoulder impingement. They were randomly assigned to one of two physiotherapy groups: 1) supervised exercise only, and 2) supervised exercise with manual therapy techniques.

Inclusion criteria included superiolateral shoulder pain and two out of four specified objective signs and symptoms:
- age 18-65
- a positive (painful) Neer impingement test
- a positive (painful) Hawkins-Kennedy impingement test
- painful limitation of active shoulder elevation (flexion, abduction, scaption)
- pain or limitation with the functional movement patterns of hand-behind-back or hand-behind-head.

Exclusion criteria included:
- adhesive capsulitis
- grade III rotator cuff tear
- calcific tendonitis confirmed by radiology
- systemic or neurological disorder
- cervical radiculopathy
- a history of shoulder surgery
- corticosteroid injection within the past month
- subjects who had received physiotherapy treatment for their shoulder within the past three months.

A recent systematic review reveals these inclusion and exclusion criteria have been used in many clinical trials (Michener et al., 2004).
All subjects signed consent forms approved by the Department of Theory and Methods of Physiotherapy, NSA, Sofia, Bulgaria.

Physiotherapy protocol involved twelve treatment sessions over a 6-weeks period.
Participants in *Group 1*, the exercise-only group, performed exercises under the direct one-on-one

supervision of the physiotherapist. Physiotherapy interventions include therapeutic exercises focusing on strengthening the rotator cuff and scapular stabilizing musculature, stretching to decrease capsular tightness, and patient education on proper posture.

Participants in *Group 2*, the exercise + manual therapy group, received the standard exercise protocol as per Group 1 with the addition of joint mobilization techniques, mobilization with movement (MWM), and manual muscle relaxation and stretching techniques.

Patients were instructed to perform a home exercise program once a day mimicking the exercises performed in the clinic. Patients were also educated on the etiology of shoulder impingement syndrome and the importance of proper posture, and they were instructed to modify overhead activities.

The total SPADI score *at baseline* was like the scores found in other studies investigating shoulder complaints. The pain sub-score was markedly higher than the value for functional restriction.

Repeated-measures analyses indicated that *post-treatment* subjects in both groups had significant decreases in pain, significant improvement in function, and significant increases in active ROM. The level of change from pre- to post-treatment revealed statistically significant patterns of improvement for both groups. Hence, time, exercise, and joint mobilization appeared to influence recovery from shoulder impingement. Significant differences were found between both groups on the dependent variables. Results suggest that the group receiving manual therapy in combination with supervised exercise had a higher level of change on all three of the pain intensity measures (VAS, Neer, and Hawkins-Kennedy) compared to the supervised exercise group. Conroy and Hayes (1998) and Bang and Deyle (2000) found statistically significant reductions in pain measures in subjects who received joint mobilizations in combination with supervised exercise compared to those receiving exercise alone; however, no control group was used in either study.

Results revealed appreciable change difference between groups in scaption and flexion AROM measurements.

Results also revealed that the exercise + manual therapy group had a higher level of change than the exercise-only group on the SPADI function test. The final functional results at 6 weeks follow-up were statistically verified better in patients treated by exercise + manual therapy ($p \leq 0.05$) – excellent in 12/18 cases (66.7%), good in 4/18 cases (22.2%), acceptable in 2/18 case (11.1%), compared to those in exercise-only group – excellent in 7/18 cases (38.9%), good in 5/18 cases (27.8%), acceptable in 5/18 cases (27.8%), and poor in 1/18 case (3.6%). The analysis of the results confirms the positive effect of the physiotherapy to decreases in pain, improved function, and increases in shoulder active range of motion. The outcome measures we used were valid and easy to use in daily practice.

CONCLUSION

A methodology for functional examination of patients with subacromial impingement allows objective monitoring of the results of physiotherapy. Physiotherapy is effective in reducing pain and improving shoulder function in patients with subacromial impingement.

REFERENCES

Bang, M., Deyle, G. (2000). Comparison of supervised exercise with and without manual physical therapy for patients with shoulder impingement syndrome. *J Orthop Sports Phys Ther,* Vol. 30, pp. 126–137.

Borstad, J. (2006). Resting position variables at the shoulder: Evidence to support a posture-impairment association. *J Orthop Sports Phys Ther*, Vol. 86, pp. 549–557.

Conroy, D., Hayes, K. (1998). The effect of joint mobilization as a component of comprehensive treatment for primary shoulder impingement syndrome. *J Orthop Sports Phys Ther,* Vol. 28, pp. 3–14.

Desmeules, F., Cote, C., Fremont, P. (2003). Therapeutic exercise and orthopedic manual therapy for impingement syndrome: A systematic review. *Clin J Sport Med*, Vol.13, pp. 176–182.

D'Hespeel, C. (2004). Current concepts: Rehabilitation of patients with shoulder impingement and tight posterior capsule. *Orthop Pract,* Vol. 16, pp. 9–13.

Hawkins, R., Kennedy, J. (1980). Impingement syndrome in athletes. *Am J Sports Med*, Vol. 8, pp. 151–158.

Ganchev, D., Dinova, S., Bogdanova, V. (2007). Optimizirana i intenzificirana kineziterapevtichna metodika pri periartropatii na ramoto. Sp. Sport i nauka, 6, 101-105 [Ганчев, Д., Динова, С., Богданова, В. (2007). Оптимизирана и интензифицирана кинезитерапевтична

методика при периартропатии на рамото. Сп. Спорт и наука, Бр. 6, с. 101-105].

Hawkins, R., Abrams, J. (1987). Impingement synndrome in the absence of rotator cuff tear (stages 1 and 2). *Orthop Clin North Am,* Vol.18, pp. 373–382.

Ludewig, P., Borstad, J. (2003). Effects of a home exercise program on shoulder pain and functional status in construction workers. *Occup Environ Med,* Vol. 60, pp. 841–849.

McClure, P., Bialker, J., Neff, N., Williams, G., Karduna, A. (2004). Shoulder function and 3-dimensional kinematics in people with shoulder impingement syndrome before and after a 6-week exercise program. *Phys Ther,* Vol. 84, pp. 832-848.

Michener, L., Leggin, B. (2001). A review of self-report scales for the assessment of functional limitation and disability of the shoulder. *J Hand Ther* Vol. 14, pp. 68–76.

Michener, L., Walsworth, M., Burnet, E. (2004). Effectiveness of rehabilitation for patients with subacromial impingement syndrome: A systematic review. *J Hand Ther,* Vol. 17, pp. 152–164.

Millar, A., Jasheway, P., Eaton, W., Christensen, F. (2006). A retrospective, descriptive study of shoulder outcomes in outpatient physical therapy. *J Orthop Sports Phys Ther,* Vol. 36, pp. 403–414.

Neer, C. (1983). Impingement lesions. *Clin Orthop*, Vol. 173, pp. 70–77.

Norkin, C., White, D. (2003). *Measurement of Joint Motion: A Guide to Goniometry.* 3rd ed. Philadelphia, PA: F. A. Davis.

Park, H., Yokota, A., Gill, H., El Rassi, G., McFarland, E. (2005). Diagnostic accuracy of clinical tests for the different degrees of subacromial impingement syndrome. *J Bone Joint Surg Am,* Vol. 87, pp. 1446–1455.

Sazdova, L. (2017). Closed Kinetic Chain Exercises for Training of Dynamic Stabilization in Shoulder Impingement Syndrome. International Scientific Congress "Applied Sports Sciences", 2017. *Proceeding book,* pp. 463-469.

Sole, G. (2003). A multi-structural approach to treatment of a patient with sub-acromial impingement: A case report. *J Man Manip Ther,* Vol. 11, pp. 49–55.

Valadie, A., Jobe, C., Pink, M., Ekman, E., Jobe, F. (2000). Anatomy of provocative tests for impingement syndrome of the shoulder. *J Shoulder Elbow Surg,* Vol. 9, pp. 36–46.

Williams, J., Holleman, D., Simel, D. (1995). Measuring shoulder function with the shoulder pain and disability index. *J Rheumatol* Vol. 22, pp. 727–732.

Corresponding author:
Prof. Evgeniya Dimitrova, DSc
Department of TMKT,
National Sports Academy "Vassil Levski"
Sofia, Bulgaria
Email: janydim@abv.bg

National Sports Academy "Vassil Levski"
Sofia, Bulgaria

International Scientific Congress "Applied Sports Sciences"

2–3 December 2022

PROCEEDING BOOK

Volume 2

WWW.ICASS2022.COM

INTERNATIONAL SCIENTIFIC CONGRESS "APPLIED SPORTS SCIENCES"

2 - 3 December 2022
Sofia, Bulgaria

PROCEEDING BOOK

VOLUME 2

EDITORS OF THE PROCEEDING BOOK:

Prof. Tatiana Iancheva, DSc

Assoc. Prof. Stefka Djobova, PhD

Assist. Prof. Milena Kuleva, PhD

SCIENTIFIC COMMITTEE

Members of the Editorial board from National Sports Academy „Vassil Levski"	International members of the Scientific committee
Prof. Nikolay Izov	Prof. Alexander Garcia Mas, PhD
Prof. Ivan Maznev	Prof. Juris Grants, PhD
Prof. Apostol Slavchev	Prof. Branislav Antala, PhD
Prof. Krasimir Petkov	Prof. Marta Bobo-Arce, PhD
Prof. Ognyan Miladinov	Prof. Milovan Bratic, PhD
Prof. Daniela Lyubenova	Prof. Lence Aleksovska Velickovska, PhD
Prof. Daniela Dasheva	Prof. Monica Stanescu, PhD
Prof. Kiril Andonov	Assoc. Prof. Jan Konarski, PhD
Prof. Evgenia Dimitrova	Dr Uri Schaefer
Prof. Diana Dimitrova	
Prof. Svilen Neykov	
Prof. Albena Alexandrova	
Prof. Lubomir Petrov	
Assoc. prof. Zdravko Stefanov	
Assoc. prof. Michail Michailov	

Design: Stanislav Hristov, Svetla Kostova, Radostina Angelova
Printed and bounded by: ZONA ArtPRINT Ltd.
Publisher: Scientific Publishing House NSA Press
ISBN (Online): 978-954-718-702-3
ISBN (Print): 978-954-718-701-6