Kocjan Janusz. The effects of extracorporeal shock-wave therapy (ESWT) versus Mulligan concept of manual therapy in treating lateral epicondylitis = Efektywność terapii zewnątrzustrojową falą uderzeniową versus terapia manualna w koncepcji Mulligana w leczeniu zapalenia nadkłykcia bocznego. Journal of Education, Health and Sport. 2016;6(7):411-418. eISSN 2391-8306. DOI http://dx.doi.org/10.5281/zenodo.58333
http://ojs.ukw.edu.pl/index.php/johs/article/view/3705

The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation. Part B item 755 (23.12.2015).
755 Journal of Education, Health and Sport eISSN 2391-8306 7

The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 15.06.2016. Revised 09.07.2016. Accepted: 21.07.2016.

THE EFFECTS OF EXTRACORPOREAL SHOCK-WAVE THERAPY (ESWT) VERSUS MULLIGAN CONCEPT OF MANUAL THERAPY IN TREATING LATERAL EPICONDYLITIS

EFEKTYWNOŚĆ TERAPII ZEWNĄTRZUSTROJOWĄ FALĄ UDERZENIOWĄ VERSUS TERAPIA MANUALNA W KONCEPCJI MULLIGANA W LECZENIU ZAPALENIA NADKŁYKCIA BOCZNEGO

Janusz Kocjan

Medical University of Silesia, Doctoral Studium of School of Medicine, Katowice, Poland

Śląski Uniwersytet Medyczny, Studium Doktoranckie Wydziału Lekarskiego w Katowicach

SUMMARY

Extracorporeal shockwave therapy (ESWT) is a conservative treatment in case of many musculoskeletal disorders, including lateral epicondylitis. The aim of the study was the assessment of the efficacy of the shockwave - compare to manual therapy treatment (Mulligan concept) in a population of consecutive patients affected by tennis elbow. 26 patients who suffered from chronic persistent tennis elbow were randomly assigned to one of the two treatment groups. Group 1 (n=13, mean age=37,14±10,07) received an extracorporeal shock wave treatment (ESWT; 2,500 shocks), while Group 2 (n=13, mean age=) was undergoing manual therapy in Mulligan concept. Visual Analogue Scale (VAS) and Patient-Rated Tennis Elbow Evaluation (PRTEE) were used. The results of the study presented here shows that ESWT and Mulligan therapy are an effective treatment of lateral epicondylitis. Both groups achieved improvement in all of analysed variables, but in case of Mulligan Concept statistical significant differences were found in 4 from 6 variables. It is concluded that ESWT and Mulligan therapy appears to be a useful non invasive treatment methods

that reduces the symptoms of lateral epicondylitis.

Key words: ESWT, mulligan, tennis elbow, lateral epicondylitis.

INTRODUCTION

Lateral epicondylitis or tennis elbow is one of the widely seen lesions of the arm characterized by pain localized over lateral epicondyle which is reproduced by palpation on the above site, resisted wrist extension, resisted middle finger extension, and gripping [1,2]. Its prevalence in general population ranges between 1-3%, but this increases to 19% in 30–60 year olds and appears to be more long standing and severe in women [3,4].

Despite that the etiology of this painful condition of the elbow is not known fully, the clinical diagnosis can be simple confirmed by palpation on the facet of the lateral epicondyle and/or functional tests (Tomsen test, Mill's test, etc.) [5]. However, the treatment management remains the controversial and is based on conservative treatment as the primary choice (nonsteroidal anti-inflammatory drugs, steroid injection, functional brace). Physical therapy such as ultrasound, low-dose laser therapy are also used, but none of the previous studies no showed consistent results [6].

Extracorporeal Shockwave Therapy (ESWT) is used to treat a growing number of tendon, joint and muscle conditions, including calcifying tendonitis of the rotator cuff, humeral epicondylitis, and plantar fasciitis [7]. Although the exact physiological mechanisms are poorly understood it appears that the cells undergo microtrauma which promotes the inflammatory and catabolic processes that are associated with removing damaged matrix constituents and stimulates wound healing healing mechanisms [8]. The Mulligan concept is a relatively new method of treatment focusing on correcting altered arthrokinematics by simultaneously applied of joints mobilization during active movement generated by patient [9].

Many articles have been published regarding the treatment of tennis elbow. Over 40 different modalities of treatment, used either alone or in combination, have been reported. Due to variety of treatment options, the optimal management strategy still is not known, and more research to discover the most effective treatment is needed. Therefore the aim of this study was to determine the effectiveness of ESWT and Mulligan manual therapy in the management of patients with the diagnosis of lateral epicondylitis and to compare efficacy of results between this two methods of treatment.

MATERIAL AND METHODS

26 patients who suffered from chronic persistent tennis elbow participated in this study. Patients were randomly assigned to one of the two treatment groups.

Group 1 comprised of 13 patients; 8 were males; the mean age was 37,14±10,07 years (range: 26–48 years) and the mean duration of symptoms was 5,72±2,94 months (range: 3–12 months); the right side was involved in 9 patients and the dominant side was involved in 12 patients. Patients were undergoing Extracorporeal shock wave therapy (ESWT). The points of maximum tenderness to pressure were found. Each patient received six treatment sessions with 2400 impulses per session. Shock waves were applied to the maximum pain site and an area with a radius of 5mm surrounding it.

Group 2 of participants will receive MWM mobilization as described by Mulligan [9]. Patient was placed in the supine position, with elbow in full extension and forearm in pronation. The therapist stabilised the distal part of the arm, and a sustained lateral glide of the forearm was applied. The patient was then asked to make a fist as the therapist maintained the lateral glide. Each patient received five treatment sessions and the mobilisation technique was done a total of 6 times per session. A short rest period (a few seconds) was given after every repetition. This group comprised of 13 patients; 9 were males; the mean age was 39,06±9,77 years (range: 30–49 years) and the mean duration of symptoms was 5,45±2,63 months (range: 3–11 months); the right side was involved in 11 patients and the dominant side was involved among 11 patients.

Criteria of inclusion

Established diagnosis of lateral epicondylitis of the elbow with failure of at least three months and pain was induced by:

1. Palpation of the lateral epicondyle.
2. Thomsen test
3. Chair test
4. Mill’s test

Criteria of exclusion

1. less than 18 years,
2. elbow arthritis,
3. ipsilateral shoulder dysfunction,
4. neurological abnormalities,
5. radial-nerve entrapment,
6. cardiac arrhythmia or a pacemaker,
7. pregnancy

Measures

Pain was evaluated by using a **Visual Analogue Scale (VAS)** ranging from 0 (no pain) to 10 (maximal pain). Examination included night pain, resting pain, pressure pain, Thomsen test, chair test and Mill's test. Baseline values and at after end of treatment were assessed.

Subjective patients pain level compared with that before treatment were performed according to the following criteria: Excellent - no pain, full movement, full activity; Good - occasional discomfort, full movement, full activity; Acceptable - some discomfort after prolonged activities; Poor - pain limiting activity.

Patient-Rated Tennis Elbow Evaluation (PRTEE) were also used as a valid, reliable, and sensitive outcome measure for rating pain and difficulties while performing functional activities. PRTEE, is a 15-item self-reported questionnaire to measure perceived pain and disability in people with tennis elbow. It has three subscales: pain, usual activities and specific activities. The pain subscale has five items about the intensity of pain during various activities. The specific activities subscale has six items tapping into the difficulty experienced while performing specific activities, like lifting a coffee cup. The four items in the usual activities subscale capture the difficulty experienced in performing usual daily roles like work and recreation. Each of the items of the PRTEE is scored on a 0–10 scale, where 0 is 'no pain' or 'no difficulty' and 10 is 'worst ever' or 'unable to do'. The total score ranges from 0 to 100, where high scores indicate greater pain and disability. Pain and function are equally represented in the total score (Pain score: max 50 points and Function score: max 100/2 = 50 points) [10].

Statistical analysis

STATISTICA Statistical Package in version 10.0. was used for the statistical analysis. Descriptive statistics was first performed. The independent t-test was also used to compare the baseline characteristics between the groups. To assess the treatment effect, within-group difference in outcomes and between-group difference in change scores were analysed using independent t-tests. P level of 0,05 was set for all statistical tests.

RESULTS

After the analysis of the final results, a considerable decrease in pain was observed in ESWT patients, both during rest, during touching and performing of functional tests to diagnosis of tennis elbow. A statistically significant improvement was also reported in the case of the Mulligan method, but the results were slightly worse and did not relate to all of the analyzed variables (See Table 1).

After treatment applying, a very good improvements in subjective pain level were achieved

in both groups. The results are shown in Table 2.

Table 1. Comparison of treatment results across ESWT and Mulligan groups. Values are means ± standard deviations obtained in VAS scale (0-10 points)

Test/Variables	Time	ESWT	Manual therapy
Night pain	Before treatment	3,7±1,5	3,5±1,4
	After treatment	1,0±0,4	1,3±0,6
	P value	**0,011**	**0,044**
Rest pain	Before treatment	2,5±1,2	2,5±1,4
	After treatment	0,5±0,2	0,9±0,4
	P value	**0,031**	0,074
Pressure pain	Before treatment	6,6±2,4	6,3±2,5
	After treatment	1,2±0,6	3,1±1,7
	P value	**<0,001**	0,087
Thomsen test	Before treatment	5,9±2,6	6,1±2,3
	After treatment	1,7±0,9	2,6±1,2
	P value	**0,006**	**0,019**
Chair test	Before treatment	6,1±2,9	6,2±2,2
	After treatment	1,8±0,8	2,5±1,0
	P value	**<0,001**	**0,009**
Mill's test	Before treatment	4,7±1,9	5,0±1,5
	After treatment	1,0±0,5	1,6±1,0
	P value	**<0,001**	**0,037**

Table 2. Comparison of subjective pain level between ESWT and manual therapy groups

Variables	ESWT			Manual therapy		
	Number of subjects (%)		P value	Number of subjects (%)		P value
	before	after		before	after	
Excellent	0 (0%)	9 (69%)	**0,007**	0 (0%)	7 (54%)	**0,016**
Good	0 (0%)	4 (31%)		0 (0%)	6 (46%)	
Acceptable	3 (23%)	0 (0%)		2 (15%)	0 (0%)	
Poor	10 (77%)	0 (0%)		11 (85%)	0 (0%)	

Mean values recorded in the PRTEE scale before therapy and after its completion were as follows: SWT group (52,7±20,4 vs 6,9±2,7; p<0,001), Mulligan group (53,6±19,9 vs 9,0±3,4; p=0,018). In PRTEE Pain Score following results were obtained: SWT group (34,3±12,1 vs

3,6±0,7; p<0,001), Mulligan group (33,5±13,2 vs 5,7±2,4; p=0,014), while in PRTEE Function score results were as follows: SWT group (18,4±9,7 vs 3,3±1,4; p=0,007), Mulligan group (20,1±10,3 vs 5,5±2,0; p=0,014).

DISCUSSION

Effectiveness of extracorporeal shock wave therapy in the treatment of lateral epicondylitis has been evaluated in a recent systematic review [20]. Five studies show that pain, function and grip strength was the same or slightly more improved with shock wave therapy than with fake therapy. Four studies show more improvement with shock wave therapy. But when the results from some of the studies were pulled together, overall shock wave therapy improved symptoms just as well as fake therapy. One study compared shock wave therapy to steroid injections. It shows that steroid injections may improve symptoms more than shock wave therapy [20]. However, the clear conclusion cannot be drawn from this review because of the small number of included studies. Two other systematic reviews, evaluated the effectiveness of physiotherapy and conservative treatments in the management of tennis elbow respectively, but not included the effects of ESWT [21,22].

Manipulation has been a recommended treatment for tennis elbow since the 1920s, beginning with techniques advocated by Mills and Cyriax [23]. Further manipulative techniques include Kaltenborn and Stoddard's varus thrust, Mennell's extension thrust, and Mulligan's mobilization with movement [24,25].

The results of the study presented here shows that ESWT and Mulligan therapy are an effective treatment of lateral epicondylitis. According to data presented in Table 1, the overall results obtained in ESWT group were better in 5 from 6 analysed variables - compared to Mulligan group. Similar results were demonstrated in Chair test, where improvement was very significant. Although after treatment in Mulligan group the mean values in VAS scale was admittedly lower than the output values in each cases, however statistically significant improvement was no found in case of rest pain and pressure pain.

Positive outcomes have been also reported in subjective assessment of pain level (table 2). The majority of patients in both groups (69% and 54% respectively) reported excellent (no pain, full movement, full activity) results of treatment. Overall results from excellent to good (occasional discomfort, full movement, full activity) at the end-treatment were noted among all patients (100%). This results should be take into account with caution, because in this study was evaluated only subjective patients assessment immediately after the end of treatment. 3-months, 6-months and 1 year follow up was not performed. Positive outcomes have been also reported in subjective assessment of pain level (table 2). The majority of patients in both groups (69% and 54% respectively) reported excellent (no pain, full movement, full activity) results of treatment. Overall results from excellent to good (occasional discomfort, full movement, full activity) at the end-

treatment were noted among all patients (100%). This results should be take into account with caution, because was evaluated only subjective patients assessment immediately after the end of treatment. 3-months, 6-months and 1 year follow up was not performed. Comparison with other studies, ESWT at one year was about 60% excellent to good and about 35% fair to poor. A substantial improvement of symptoms was achieved between three to 12 weeks after treatment and this improvement was maintained at the one year follow-up [26-28]. However similar efficacy was also obtained by Grundberg and Dobson among patients after tenotomy [29].

Mean duration of symptoms (close to 6 months) in both groups allows to conclude that ESWT and Mulligan therapy are effective in the treatment of chronic lateral epicondylitis. Due to no side effects observed in study groups, both methods seems to be safe and noninvasive to use. Further studies are needed, especially with long time follow-up.

CONCLUSIONS

ESWT and Mulligan therapy appears to be a useful non invasive treatment methods that reduces the symptoms of lateral epicondylitis.

REFERENCES

1. Murtagh J. Tennis elbow. Aust Fam Physician. 1988; 17: 90, 91, 94–95.

2. Haker E. Lateral epicondylalgia: diagnosis, treatment and evaluation. Critical Reviews in Physical and Rehabilitation Medicine1993; 5: 129–154.

3. Vicenzino B, Wright A. lateral epicondylalgia. I. Epidemiology, pathophysiology, aetiology and natural history. Phys Ther Rev1996; 1: 23–34.

4. Hamilton P. The prevalence of humeral epicondylitis: a survey in general practice. J R Coll Gen Pract 1986; 36: 464-465.

5. Buckup K, Buckup J. Testy kliniczne w badaniu kości, stawów i mięśni. Red. Białoszewski D, Słupik A. PZWL, Warszawa 2014.

6. Labelle H, Guibert R, Newman N, Fallaha M, Rivard CH. Lack of scientific evidence for the treatment of lateral epicondylitis of the elbow. J Bone Joint Surg Br. 1992; 74: 646–651.

7. Speed CA. Extracorporeal shock-wave therapy in the management of chronic soft tissue conditions. J Bone Joint Surg Br. 2004; 86: 165–171.

8. Waugh CM, Morrissey D, Jones E, Riley GP, Langberg H, Screen HR. In vivo biological response to extracorporeal shockwave therapy in human tendinopathy. European Cells & Materials 2015; 29: 268–280.

9. Mulligan B. Manual Therapy: NAGS, SNAGS, MWMS, etc, 5th ed. Wellington, NZ: Plane View Services; 2006.

10. Newcomer KL, Martinez-Silvestrini JA, Schaefer MP, Gay R, Arendt K. Sensitivity of the Patient-Rated Forearm Evaluation Questionnaire in lateral epicondylitis. J Hand Ther 2005; 18(4): 400–406.
11. Buchbinder R, Green S, White M, et al. Shock wave therapy for lateral elbow pain. Cochrane Database Syst Rev 2002.
12. Smidt N, Assendelft W, Arola H, et al. Effectiveness of physiotherapy for lateral epicondylitis: a systematic review. Ann Med 2003; 35: 51–62.
13. Trudel D, Duley J, Zastrow I, et al. Rehabilitations for patients with lateral epicondylitis: a systematic review. J Hand Ther 2004; 17: 243–266.
14. Wright A, Vicenzino B. Lateral epicondylalgia II: Therapeutic management. Phys Ther Rev. 1997; 2: 39–48.
15. Vicenzino B, Cleland JA, Bisset L. Joint manipulation in the management of lateral epicondylalgia: A clinical commentary. J Man Manip Ther 2007; 15: 50-56.
16. Kushner S, Reid D. Manipulation in the treatment of tennis elbow. J Orthop Sports Phys Ther. 1986; 7: 264–272.
17. Radwan YA, ElSobhi G, Badawy WS, Reda A, Khalid S. Resistant tennis elbow: shock-wave therapy versus percutaneous tenotomy. International Orthopaedics. 2008; 32(5): 671-677.
18. Ko JY, Chen HS, Chen LM. Treatment of lateral epicondylitis of the elbow with shock waves. Clin Orthop. 2001; 387: 60–67.
19. Pettrone FA, McCall BR. Extracorporeal shock wave therapy without local anesthesia for chronic lateral epicondylitis. J Bone Joint Surg Am. 2002; 87: 1297–1304.
20. Grundberg AB, Dobson JF. Percutaneous release of the common extensor origin for tennis elbow. Clin Orthop. 2000; 376: 137–140.