

World Journal of *Methodology*

World J Methodol 2018 November 29; 8(3): 17-50





EDITORIAL

- 17 Precision medicine allergy immunoassay methods for assessing immunoglobulin E sensitization to aeroallergen molecules
Popescu FD, Vieru M
- 37 Can extracorporeal shock-wave therapy be used for the management of lateral elbow tendinopathy?
Stasinopoulos D
- 40 Microembolic signal detection by transcranial Doppler: Old method with a new indication
Muengtaweepongsa S, Tantibundhit C

ORIGINAL ARTICLES

Retrospective Study

- 44 Assessment of quality control system by sigma metrics and quality goal index ratio: A roadmap towards preparation for NABL
Verma M, Dahiya K, Ghalaut VS, Dhupper V

ABOUT COVER

Editorial Board Member of *World Journal of Methodology*, Amir Azarpazhooh, DDS, PhD, Assistant Professor, Department of Dental Public Health, Department of Endodontics, Faculty of Dentistry, University of Toronto, Toronto ON M5G1G6, Canada

AIM AND SCOPE

World Journal of Methodology (*World J Methodol*, *WJM*, online ISSN 2222-0682, DOI: 10.5662) is a peer-reviewed open access academic journal that aims to guide clinical practice and improve diagnostic and therapeutic skills of clinicians.

The primary task of *WJM* is to rapidly publish high-quality original articles, reviews, and commentaries that deal with the methodology to develop, validate, modify and promote diagnostic and therapeutic modalities and techniques in preclinical and clinical applications. *WJM* covers topics concerning the subspecialties including but not exclusively anesthesiology, cardiac medicine, clinical genetics, clinical neurology, critical care, dentistry, dermatology, emergency medicine, endocrinology, family medicine, gastroenterology and hepatology, geriatrics and gerontology, hematology, immunology, infectious diseases, internal medicine, obstetrics and gynecology, oncology, ophthalmology, orthopedics, otolaryngology, radiology, serology, pathology, pediatrics, peripheral vascular disease, psychiatry, radiology, rehabilitation, respiratory medicine, rheumatology, surgery, toxicology, transplantation, and urology and nephrology.

INDEXING/ABSTRACTING

World Journal of Methodology is now abstracted and indexed in PubMed, PubMed Central, China National Knowledge Infrastructure (CNKI), and Superstar Journals Database.

EDITORS FOR THIS ISSUE

Responsible Assistant Editor: *Xiang Li*
Responsible Electronic Editor: *Yun-XiaoJian Wu*
Responsible Science Editor: *Fang-Fang Ji*
Proofing Editorial Office Director: *Jin-Lei Wang*
Proofing Editor-in-Chief: *Lian-Sheng Ma*

NAME OF JOURNAL
World Journal of Methodology

ISSN
 ISSN 2222-0682 (online)

LAUNCH DATE
 September 26, 2011

FREQUENCY
 Continuous

EDITOR-IN-CHIEF
Gerhard Litscher, MSc, PhD, Doctor, Professor,
 Research Unit for Complementary and Integrative Laser Medicine, Research Unit of Biomedical Engineering in Anesthesia and Intensive Care Medicine, and TCM Research Center Graz, Medical University of Graz, Graz 8036, Austria

EDITORIAL BOARD MEMBERS
 All editorial board members resources online at <http://www.wjgnet.com/2222-0682/editorialboard.htm>

EDITORIAL OFFICE
 Jin-Lei Wang, Director
World Journal of Methodology
 Baishideng Publishing Group Inc
 7901 Stoneridge Drive, Suite 501, Pleasanton, CA 94588, USA
 Telephone: +1-925-2238242
 Fax: +1-925-2238243
 E-mail: editorialoffice@wjgnet.com
 Help Desk: <http://www.f6publishing.com/helpdesk>
<http://www.wjgnet.com>

PUBLISHER
 Baishideng Publishing Group Inc
 7901 Stoneridge Drive,
 Suite 501, Pleasanton, CA 94588, USA
 Telephone: +1-925-2238242
 Fax: +1-925-2238243
 E-mail: bpgoffice@wjgnet.com
 Help Desk: <http://www.f6publishing.com/helpdesk>
<http://www.wjgnet.com>

PUBLICATION DATE
 November 29, 2018

COPYRIGHT
 © 2018 Baishideng Publishing Group Inc. Articles published by this Open-Access journal are distributed under the terms of the Creative Commons Attribution Non-commercial License, which permits use, distribution, and reproduction in any medium, provided the original work is properly cited, the use is non commercial and is otherwise in compliance with the license.

SPECIAL STATEMENT
 All articles published in journals owned by the Baishideng Publishing Group (BPG) represent the views and opinions of their authors, and not the views, opinions or policies of the BPG, except where otherwise explicitly indicated.

INSTRUCTIONS TO AUTHORS
<http://www.wjgnet.com/bpg/gerinfo/204>

ONLINE SUBMISSION
<http://www.f6publishing.com>

Can extracorporeal shock-wave therapy be used for the management of lateral elbow tendinopathy?

Dimitrios Stasinopoulos

Dimitrios Stasinopoulos, Department Health Sciences, School of Sciences, European University Cyprus, Nicosia 1516, Cyprus

ORCID number: Dimitrios Stasinopoulos (0000-0002-7725-8742).

Author contributions: Stasinopoulos D solely contributed to this manuscript.

Conflict-of-interest statement: None conflict of interest.

Open-Access: This article is an open-access article which was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>

Manuscript source: Invited manuscript

Corresponding author to: Dimitrios Stasinopoulos, PhD, Associate Professor, Director of Cyprus Musculoskeletal and Sports Trauma research centre (CYMUSTREC), Department Health Sciences, School of Sciences, European University Cyprus, 6, Diogenes Str. Engomi, Nicosia 1516, Cyprus. d.stasinopoulos@euc.ac.cy
Telephone: +357-22-713044

Received: July 30, 2018

Peer-review started: July 30, 2018

First decision: August 20, 2018

Revised: September 7, 2018

Accepted: October 10, 2018

Article in press: October 10, 2018

Published online: November 29, 2018

Abstract

Lateral elbow tendinopathy (LET) is one of the two most common tendinopathies of the upper limb. The

most effective treatment in the management of LET is the exercise program. Clinicians combine exercise program with other physiotherapy, electrotherapeutic and no, techniques. Extracorporeal shock wave therapy (ESWT) is one of the most common recommended electrotherapeutic modalities for the management of LET. Further research is needed to find out the optimal treatment protocol of ESWT in the management of LET

Key words: Lateral elbow tendinopathy; Extracorporeal shock wave therapy; Exercise program; Electrotherapy; Tennis elbow; Lateral epicondylitis; Physiotherapy; Calcific tendinopathy

© **The Author(s) 2018.** Published by Baishideng Publishing Group Inc. All rights reserved.

Core tip: Extracorporeal shock wave therapy (ESWT) is one of the most common recommended electrotherapeutic modalities for the management of lateral elbow tendinopathy (LET). ESWT does not use as a substitute for exercise but as a supplement to exercise program. More research is needed to find out the optimal treatment protocol of ESWT in the management of LET.

Stasinopoulos D. Can extracorporeal shock-wave therapy be used for the management of lateral elbow tendinopathy? *World J Methodol* 2018; 8(3): 37-39 Available from: URL: <http://www.wjgnet.com/2222-0682/full/v8/i3/37.htm> DOI: <http://dx.doi.org/10.5662/wjm.v8.i3.37>

Lateral elbow tendinopathy (LET) commonly referred as lateral epicondylitis or tennis elbow is a common sports/musculoskeletal injury. LET is usually defined as a syndrome of pain in the area of the lateral epicondyle which may be degenerative rather than inflammatory. The main complaints of patients with LET are de-

creased function and pain both of which may affect daily activities. Pain and function can be assessed by a variety of outcomes like gripping activities, palpation on the facet of the lateral epicondyle and specific clinical tests like middle finger extension and mill's test. Moreover, the Patient - Rated tennis elbow evaluation questionnaire provides a quick, standardized and easy quantitative description of functional disability and pain in LET patients. Physiotherapy is usually proposed for the treatment of LET. Many physiotherapy maneuvers, electrotherapeutic and non-electrotherapeutic modalities, has been recommended for the rehabilitation of LET. These treatments have different theoretical mechanisms of action, but all have the same aim, to improve function and reduce pain. Thus, there is need for more research in order to find out the most effective treatment technique in LET patients since this variety of treatment modalities suggests that the most proper treatment approach is not known.

The most common physiotherapy treatment for LET is a supervised or in clinic exercise programme. One program consisted of isometric exercises of extensor carpi radialis brevis (ECRB), the most common site injury of LET, as well as isotonic (concentric and eccentric mainly) and static stretching exercises of ECRB is usually recommended^[1]. The exercise program should include exercises not only for ECRB strengthening but also for supinator strengthening^[2]. In addition, rotator cuff and scapular muscles strengthening is also needed^[3]. Finally, therapists should use techniques to improve the proprioception since LET patients have also reduced proprioception^[4].

Electrotherapeutic modalities, have also been recommended in the management of LET. Extracorporeal shock wave therapy (ESWT) is one of the most common recommended electrotherapeutic modalities for the management of LET. The available literatures on the use of ESWT therapy for LET have revealed contradictory results. ESWT does not use as a substitute for exercise but as a supplement to exercise program. The mechanism of this method is not yet completely understood, but many mechanisms have been described in clarifying its effects, including direct stimulation of healing, neovascularization, direct suppressive effects on nociceptors and a hyper stimulation mechanism that would block the gate control mechanism. It seems that it can increase the number of neovessels at the normal tendon-bone junction, through the release of growth factors and some other active substances^[5]. Therefore, ESWT does not reverse the pathology of LET (disorganized collagen, an increased presence of fibroblasts, the absence of prostaglandins and inflammatory cells) but it can improve the symptoms of LET. The question that arises is whether ESWT can be used for any kind of LET, *i.e.*, acute, chronic and calcification.

ESWT is not applied in acute LET when the inflammatory signs are active. It is recommended in the management of chronic LET. However, the term chronic

LET is not clear in the literature. The term chronic LET is ranged in the literature from 4 wk to 6 mo after the first onset. A patient with 4 wk of LET does not have the same symptoms with a patient with 6 mo of LET, so the ESWT is applied in a different way in a patient with four weeks of LET and in a patient with 6 mo of LET. There is not a standard protocol in the management of chronic LET using the ESWT. There is not a standard protocol in the management of chronic LET because the medical society does not define the term chronic LET. If the medical society defines the term chronic LET, a standard recommended protocol of ESWT in the management of chronic LET will be applied.

ESWT is usually recommended when the symptoms persist for more than 6 mo or all the other types of conservative therapy fail. However, there is lack of strong evidence in the literature to support the above recommendations. Why someone recommend the use of ESWT 6 mo after the first onset? Can it be used earlier than 6 mo after the first onset? I think the above will be solved when the medical society defines the term chronic LET. Moreover, the exercise program is the most effective conservative treatment approach in the management of LET, as mentioned above. The ESWT is recommended when the exercise program fails or other conservative techniques fail. It is known that all the other types of conservative therapy are less effective than the exercise program in the management of LET. In addition, ESWT does not use as a substitute for exercise but as a supplement to exercise program, as mentioned previously.

Although there are conflicting results on the effectiveness of ESWT in the management of chronic (need definition as mentioned previously) LET, it cannot be ruled out from research, as it is a dose-response modality and the optimal treatment dose (ESWT parameters such as focused or radial ESWT, anaesthesia or not, energy flux density, frequency, number of sessions, and impulses) has obviously not yet been discovered in order to be used in rehabilitation protocols^[6]. It is worth to mention one more time that ESWT does not use as a substitute for exercise but as a supplement to exercise program. The optimal protocol can be formulated taking information from RCTs, reviews (systematic and narrative) and experts opinion.

The ESWT is usually recommended in the management of calcific tendinopathies (CT). The majority of research on ESWT for CT that has been carried out involved calcific shoulder tendinopathy (CST). One of the mechanisms of the therapeutic effect of ESWT for the treatment of CST is destruction of calcifications^[7]. There is a lack of *in vitro* studies to explain how the increasing pressure produced by ESWT causes fragmentation and cavitation effects inside amorphous calcifications, leading to disorganization and disintegration of the deposits^[8]. Alternatively, disintegration of calcifications in shoulder tendinopathy after ESWT has been shown in *in vivo* studies^[8]. High-energy ESWT under anaesthesia effectively treats

(strong and moderate evidence) CST in the short, mid, and long terms^[9]. Focus on the calcific deposit is more effective (moderate evidence) than focus on the tuberculum majus^[9]. However, further studies are needed to standardize ESWT parameters (energy flex density, number of sessions, and impulses) to be used in rehabilitation protocols^[10]. It is believed that ESWT is an effective treatment approach for LET with calcification using the same, under investigation, parameters for CST. However, more research is needed to support this belief.

ESWT is applied only in the area of pain, in the case of LET in the ECRB. I wonder if it can be applied in a different way, like scanning the whole area for example muscles of the forearm or parallel to the elbow joint line. Perhaps, the combination of the above two ways of application, scanning and painful (sensitive) point, leads to a better clinical result. More research is needed to support the above recommendation.

Finally, the aim of this editorial is two-fold, which suggests the following: First, future studies are needed to standardize ESWT parameters in the management of LET (chronic and calcific), and secondly, well-conducted trials are needed to find out the effectiveness of ESWT in the treatment of any kind of LET. A cost-effectiveness analysis should be incorporated into the analysis of the effectiveness of such a treatment approach in future trials.

REFERENCES

- 1 **Stasinopoulos D**, Stasinopoulos I. Comparison of effects of eccentric training, eccentric-concentric training, and eccentric-concentric training combined with isometric contraction in the treatment of lateral elbow tendinopathy. *J Hand Ther* 2017; **30**: 13-19 [PMID: 27823901 DOI: 10.1016/j.jht.2016.09.001]
- 2 **Stasinopoulos D**. Strengthening of supinator in the management of Lateral Elbow Tendinopathy. *AMJ* 2017; **10**: 373-374 [DOI: 10.21767/AMJ.2017.2974]
- 3 **Stasinopoulos D**. Scapular and rotator cuff strengthening in patients with lateral elbow tendinopathy. *HKPJ* 2017; **37**: 25-26 [DOI: 10.1016/j.hkpj.2017.01.001]
- 4 **Juul-Kristensen B**, Lund H, Hansen K, Christensen H, Danneskiold-Samsøe B, Bliddal H. Poorer elbow proprioception in patients with lateral epicondylitis than in healthy controls: a cross-sectional study. *J Shoulder Elbow Surg* 2008; **17**: 72S-81S [PMID: 18036844 DOI: 10.1016/j.jse.2007.07.003]
- 5 **Notarnicola A**, Moretti B. The biological effects of extracorporeal shock wave therapy (eswt) on tendon tissue. *Muscles Ligaments Tendons J* 2012; **2**: 33-37 [PMID: 23738271]
- 6 **Stasinopoulos D**, Johnson MI. Effectiveness of extracorporeal shock wave therapy for tennis elbow (lateral epicondylitis). *Br J Sports Med* 2005; **39**: 132-136 [PMID: 15728688 DOI: 10.1136/bjsm.2004.015545]
- 7 **Mouzopoulos G**, Stamatakos M, Mouzopoulos D, Tzurbakis M. Extracorporeal shock wave treatment for shoulder calcific tendonitis: a systematic review. *Skeletal Radiol* 2007; **36**: 803-811 [PMID: 17415561 DOI: 10.1007/s00256-007-0297-3]
- 8 **van der Worp H**, van den Akker-Scheek I, van Schie H, Zwerver J. ESWT for tendinopathy: technology and clinical implications. *Knee Surg Sports Traumatol Arthrosc* 2013; **21**: 1451-1458 [PMID: 22547246 DOI: 10.1007/s00167-012-2009-3]
- 9 **Huisstede BM**, Gebremariam L, van der Sande R, Hay EM, Koes BW. Evidence for effectiveness of Extracorporeal Shock-Wave Therapy (ESWT) to treat calcific and non-calcific rotator cuff tendinosis--a systematic review. *Man Ther* 2011; **16**: 419-433 [PMID: 21396877 DOI: 10.1016/j.math.2011.02.005]
- 10 **Ioppolo F**, Tattoli M, Di Sante L, Venditto T, Tognolo L, Delicata M, Rizzo RS, Di Tanna G, Santilli V. Clinical improvement and resorption of calcifications in calcific tendinitis of the shoulder after shock wave therapy at 6 months' follow-up: a systematic review and meta-analysis. *Arch Phys Med Rehabil* 2013; **94**: 1699-1706 [PMID: 23499780 DOI: 10.1016/j.apmr.2013.01.030]

P- Reviewer: El Amrousy D, Wan TTH **S- Editor:** Ji FF

L- Editor: A **E- Editor:** Wu YXJ





Published by **Baishideng Publishing Group Inc**
7901 Stoneridge Drive, Suite 501, Pleasanton, CA 94588, USA
Telephone: +1-925-223-8242
Fax: +1-925-223-8243
E-mail: bpgoffice@wjgnet.com
Help Desk: <http://www.f6publishing.com/helpdesk>
<http://www.wjgnet.com>

