

Extracorporeal Shock Wave Therapy for the Treatment of Osteoarthritis in the knee

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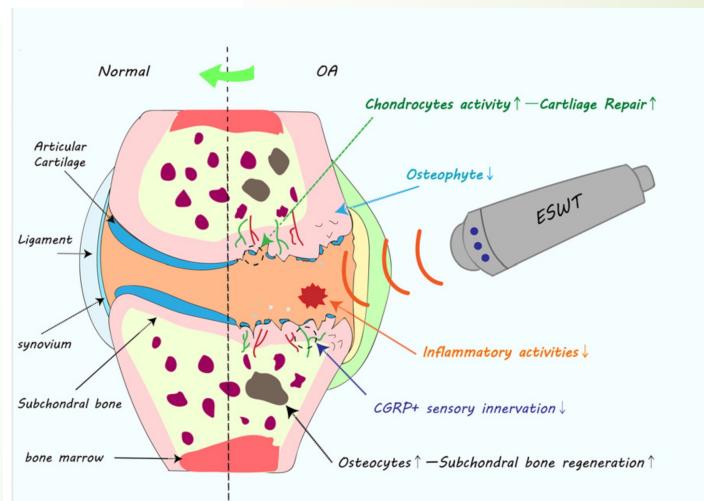
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BioScience Reports (2020) 4(8) BSR20200926
<https://doi.org/10.1042/BSR20200926>



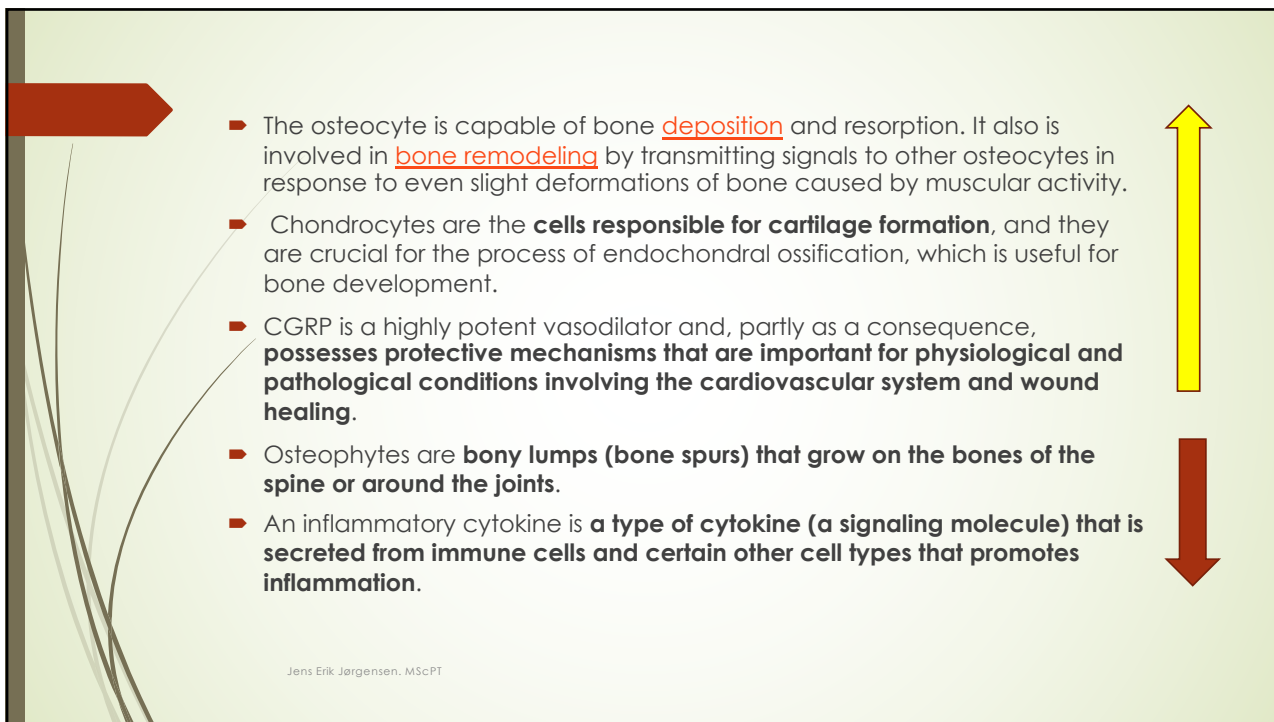
Review Article

Extracorporeal shockwave treatment in knee osteoarthritis: therapeutic effects and possible mechanism



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- The osteocyte is capable of bone **deposition** and resorption. It also is involved in **bone remodeling** by transmitting signals to other osteocytes in response to even slight deformations of bone caused by muscular activity.
- Chondrocytes are the **cells responsible for cartilage formation**, and they are crucial for the process of endochondral ossification, which is useful for bone development.
- CGRP is a highly potent vasodilator and, partly as a consequence, **possesses protective mechanisms that are important for physiological and pathological conditions involving the cardiovascular system and wound healing**.
- Osteophytes are **bony lumps (bone spurs) that grow on the bones of the spine or around the joints**.
- An inflammatory cytokine is **a type of cytokine (a signaling molecule) that is secreted from immune cells and certain other cell types that promotes inflammation**.

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International Journal of Surgery 82 (2020) 64–75

Contents lists available at ScienceDirect

International Journal of Surgery

journal homepage: www.elsevier.com/locate/ijso

Review

Extracorporeal shockwave therapy improves pain and function in subjects with knee osteoarthritis: A systematic review and meta-analysis of randomized clinical trials

Juan Avendaño-Coy^a, Natalia Comino-Suárez^{b,c}, Jesús Grande-Muñoz^a, Carlos Avendaño-López^a, Julio Gómez-Soriano^a

Pain Medicine 21(4): 2020; 822–835
doi:10.1089/jpm.2020.0022

Advance Access Publication Date: 18 October 2019
Original Research Article

REHABILITATION & REGENERATIVE MEDICINE SECTION

Efficacy and Safety of Extracorporeal Shockwave Therapy for Treatment of Knee Osteoarthritis: A Systematic Review and Meta-analysis

Ying-Chun Wang, MD, ^{a,1} Hsuan-Ti Huang, MD, ^{a,1,2} Peng-Ju Huang, MD, ^{1,3} Zi-Miao Liu, PhD, ¹ and Chia-Lung Shih, PhD¹

International Orthopaedics (2020) 44:877–884
<https://doi.org/10.1007/s00264-020-04489-x>

REVIEW ARTICLE

Extracorporeal shockwave therapy for the treatment of knee osteoarthritis: a meta-analysis

Chi-Kun Hsieh¹ · Chao-Jui Chang¹ · Zhao-Wei Liu² · Ta-Wei Tai^{1,2}

Hindawi
BioMed Research International
Volume 2020, Article ID 1907821, 15 pages
<https://doi.org/10.1155/2020/1907821>

Review Article

Extracorporeal Shock Wave Therapy for the Treatment of Osteoarthritis: A Systematic Review and Meta-Analysis

Lu Chen^{a,1}, Ling Ye^{a,1}, Hui Liu,¹ Pingliang Yang^{a,2} and Bangxiang Yang¹

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International Journal of Surgery 94 (2020) 136–137

Contents lists available at ScienceDirect

International Journal of Surgery


journal homepage: www.elsevier.com/locate/ijso

Invited Commentary

Invited commentary on “Extracorporeal shockwave therapy improves pain and function in subjects with knee osteoarthritis: A systematic review and meta-analysis of randomized clinical trials”

ARTICLE INFO

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Chen: Conclusions. Extracorporeal shockwave therapy could be recommended in the treatment of osteoarthritis as a noninvasive therapy with safety and effectiveness, but the grade of recommendations needs to be discussed in a further study.

Avendaño-Coy: ESWT is an effective treatment for improving pain and functionality in patients with KOA in the short term with few minor side effects.

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Wang: The use of ESWT for treatment of knee OA had a beneficial effect on pain relief and physical function improvement for up to 12 months, and only minor complications occurred after ESWT treatment.

However, there remains a lack of clarity regarding the frequency and dosage levels of ESWT required to achieve the maximum improvement.

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Clinical Trial/Experimental Study

Medicine[®]

OPEN

The effect of extracorporeal shock wave therapy on the treatment of moderate to severe knee osteoarthritis and cartilage lesion

Yongming Xu, MD^a, Kun Wu, MD^b, Yu Liu, MD^b, Huan Geng, MD^b, Haochong Zhang, MD^b, Shuitao Liu, PhD^c, Hongying Qu, MD^d, Gengyan Xing, PhD^{b,*}

Xu Y, Wu K, Liu Y, et al. The effect of extracorporeal shock wave therapy on the treatment of moderate to severe knee osteoarthritis and cartilage lesion. *Medicine (Baltimore)*. 2019;98(20):e15523. doi:10.1097/MD.00000000000015523

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Radial Extracorporeal Shock Wave. (rESWT)

Different flexion angles : based on the different site of cartilage injury

Tenderness points in knee joint were used as the therapeutic points after positioning based on the body surface anatomical markers with the pain points.

2.0bar, 0.25mJ/mm², and 8Hz/s for twice a week for 4 weeks continuously.

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X-RAY

X-ray: normal knee

X-ray: knee osteoarthritis (red circle)

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Archives of Physical Medicine and Rehabilitation
 journal homepage: www.archives-pmr.org
 Archives of Physical Medicine and Rehabilitation 2019;100:1695-702

ORIGINAL RESEARCH

A Randomized Controlled Trial on the Effects of Low-Dose Extracorporeal Shockwave Therapy in Patients With Knee Osteoarthritis


Zongye Zhong, MSc,^a Bangzhong Liu, PhD,^{a,b} Guanghua Liu, MSc,^a Jun Chen, BS,^a Yun Li, MSc,^a Jianxin Chen, MSc,^a Xinxin Liu, MSc,^a Yiwen Hu, PhD^c

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- rESWT once a week for 4 consecutive weeks (4 sessions in total).
- Patients stayed supine with the target knee flexed at 90 degrees in each session.
- The physical therapist determined the pain points of the target knee by palpation and marked the pain points and the patellofemoral and tibiofemoral borders.
- Dosage: 2000 pulses of 8-Hz frequency at 2.5 bars
- The first 1000 pulses were evenly distributed to pain points (the maximum number of pain points is 4).
- The remaining pulses were slid back and forth on the patellofemoral and tibiofemoral borders.



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JOURNAL OF SURGICAL RESEARCH 185 (2013) 661–666

Available online at www.sciencedirect.com

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journal homepage: www.JournalofSurgicalResearch.com

Efficacy of extracorporeal shockwave therapy for knee osteoarthritis: a randomized controlled trial

Zhe Zhao, MD,^a Rufang Jing, MD,^b Zhan Shi, PhD,^a Bin Zhao, MD,^a Quan Ai, MM,^a and Gengyan Xing, MD^{a,*}

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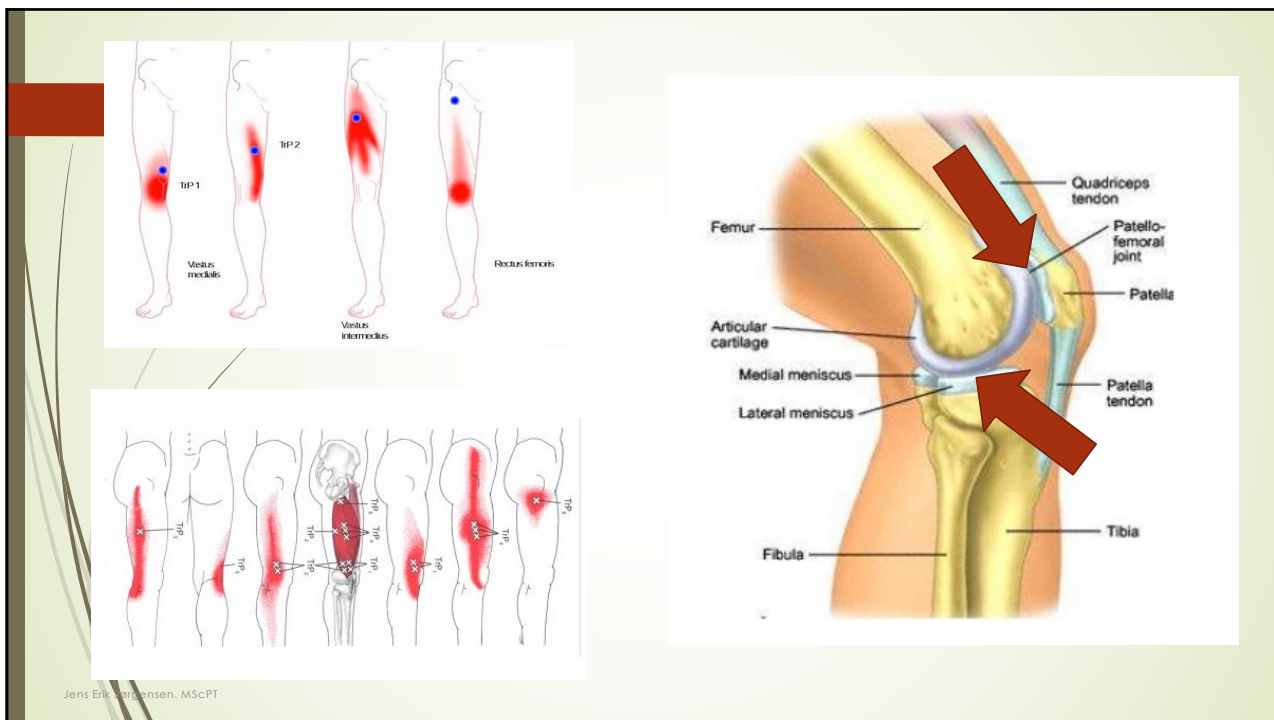
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Treatment with fESWT

- Patients were positioned in a supine position with the affected knee unbent or flexed at 90°.
- The shockwave probe was held stationary on a trigger point around the knee or at the patellofemoral and tibiofemoral borders of the target knee
- Four treatments at weekly intervals
- Shockwaves of 4000 pulses in total
0.25 mJ/mm² and a frequency of 6 Hz/s.
- No bed rest was required after treatment, but a low level of physical activity was recommended for 48 h.

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ORIGINAL RESEARCH

Extracorporeal Shockwave Therapy for Chronic Knee Pain: A Multicenter, Randomized Controlled Trial

Tian-shu Wang, MM; Peng Guo, MB; Gang Li, MB; Jian-wei Wang, MB

Wang TS, Guo P, Li G, Wang JW. Extracorporeal Shockwave Therapy for Chronic Knee Pain: A Multicenter, Randomized Controlled Trial. *Altern Ther Health Med.* 2020 Mar;26(2):34-37. PMID: 31221934.

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Treatment with fESWT

Lying in a prone position and to extend both legs fully, without bent knees.

4000 pulses
0.25 mJ/mm²
frequency of 15 Hz/s.

3 times weekly for a total of 10 weeks.

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Article

Comparative Effectiveness of Focused Extracorporeal versus Radial Extracorporeal Shockwave Therapy for Knee Osteoarthritis—Randomized Controlled Study

Nai-Yu Ko ¹, Chih-Ning Chang ¹, Chu-Han Cheng ¹, Hui-Kung Yu ² and Gwo-Chi Hu ^{1,3,*}

All the patients received three sessions of shockwave treatment at weekly intervals.

For the treatment, patients remained in a supine position with the knee joints flexed at 90°.

The shockwave probe was administered directly on the most tender areas of the medial tibial plateau and the patellofemoral border of the knee joint.

Both knees received the same treatment.

During each session, 2000 pulses (1000 shocks in the medial tibial plateau and 1000 shocks in the patellofemoral border) were delivered at 5 Hz. The intensities that were used during f-ESWT (0.10 mJ/mm²) and r-ESWT (3.0 Bar) were comparable because when air pressure generated by r-ESWT can be converted to energy flux density

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Variables	Time Point	f-ESWT Group	r-ESWT Group
		Mean ± SD	Mean ± SD
VAS score	Baseline	6.3 ± 1.8	5.9 ± 1.6
	4-week follow-up	1.8 ± 1.5	3.3 ± 2.6
	8-week follow-up	2.4 ± 2.4	3.3 ± 2.0
WOMAC score	Baseline	37.5 ± 14.7	33.6 ± 12.7
	4-week follow-up	13.9 ± 6.3	24.4 ± 9.2
	8-week follow-up	12.2 ± 9.4	21.7 ± 9.8
Range of motion (degrees)	Baseline	114.1 ± 12.3	115.6 ± 12.2
	4-week follow-up	121.2 ± 10.2	124.6 ± 10.6
	8-week follow-up	126.4 ± 10.9	125.9 ± 12.5
Six-minute walk test (meters)	Baseline	403.1 ± 117.6	416.9 ± 107.9
	4-week follow-up	490.4 ± 94.6	448.6 ± 113.0
	8-week follow-up	491.7 ± 97.2	448.1 ± 106.9

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Article

Comparison of Extracorporeal Shockwave Therapy with Non-Steroid Anti-Inflammatory Drugs and Intra-Articular Hyaluronic Acid Injection for Early Osteoarthritis of the Knees

Shun-Wun Jhan ^{1,2}, Ching-Jen Wang ^{1,2}, Kuan-Ting Wu ^{1,2}, Ka-Kit Siu ³, Jih-Yang Ko ^{1,2}, Wen-Chiung Huang ², Wen-Yi Chou ^{1,2,*} and Jai-Hong Cheng ^{2,4,*}



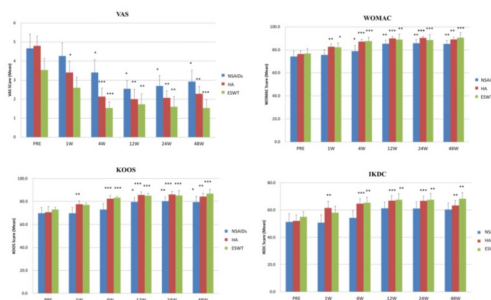
The shockwaves were applied on the subchondral bone of the medial tibia condyle of the knee at 2.0 cm below the joint line in anteroposterior view and 2.0 cm from the medial skin edge in lateral view

About 3000 impulses of shockwaves at energy level 4 (equivalent to 0.22 mJ/mm² energy flux density) were delivered to the subchondral bone of the medial tibia condyle.

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Figure 3



The trends of pain and functional scores improvement during our treatment course at 1, 4, 12, 24, and 48 week (W). * p -value < 0.05, ** p -value < 0.01, *** p -value < 0.001 as compared with the data before treatment (PRE).

ESWT group had better pain relief than NSAIDs and HA groups.

ESWT group had better therapeutic effects in the functional scores than NSAIDs and HA groups.

The **bone mineral density (BMD)** of proximal tibia is significantly increased after ESWT than the others

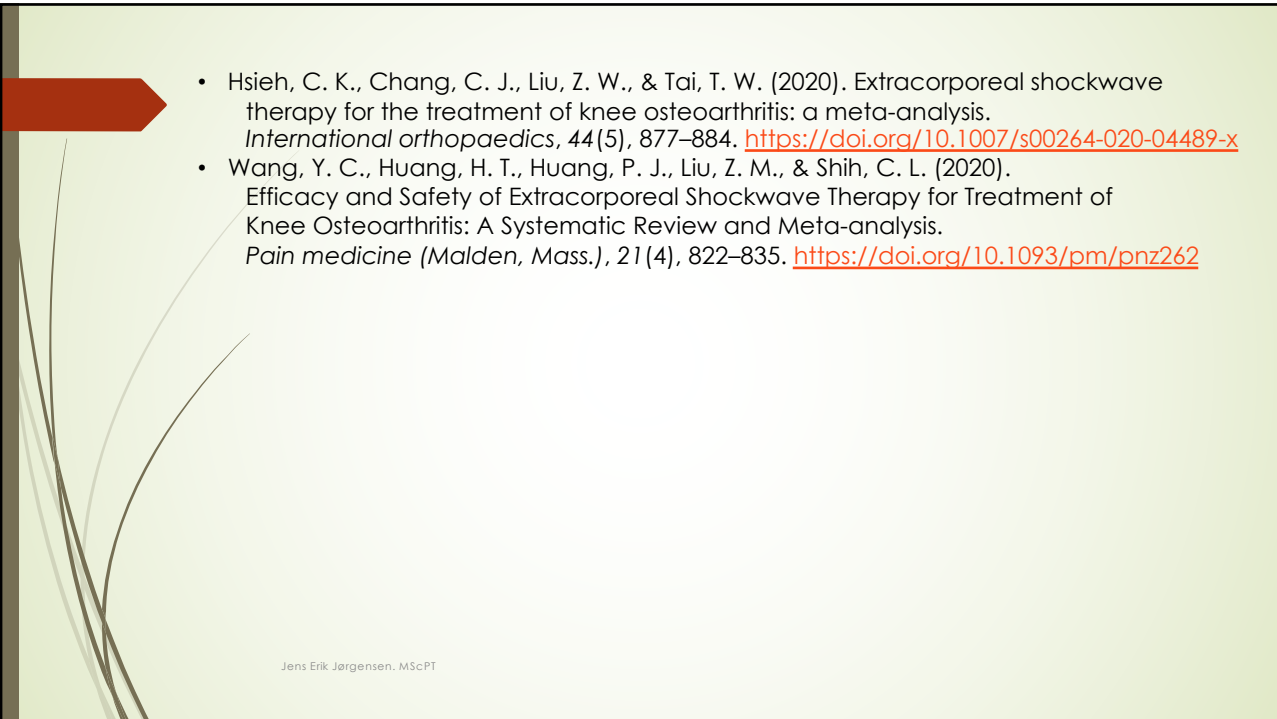
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