

[Am J Sports Med.](#) 2019 Oct;47(12):2937-2944. doi: 10.1177/0363546519871059. Epub 2019 Sep 10.**Extracorporeal Shockwave Therapy Accelerates the Healing of a Meniscal Tear in the Avascular Region in a Rat Model**Shogo Hashimoto ¹, Tsuyoshi Ichinose ¹, Takashi Ohsawa ¹, Noriyuki Kobuchi ², Hirotaaka Chikuda ³Affiliations [expand](#)

PMID: 31503505 DOI: 10.1177/0363546519871059

Abstract**Background:** The treatment of meniscal tears in the avascular region remains a clinical challenge. Extracorporeal shockwave therapy (ESWT) is a minimally invasive, safe, and effective therapy for various orthopaedic disorders. However, the therapeutic effect of ESWT on meniscal tears has not been reported.**Purpose:** To evaluate the therapeutic effect of ESWT in the treatment of meniscal tears.**Study design:** Controlled laboratory study.**Methods:** Twelve-week-old male Wistar rats were divided into 3 groups (normal, ESWT-, and ESWT+). The authors made a full-thickness 2-mm longitudinal tear in the avascular region of the anterior horn in the latter 2 groups. At 1 week after surgery, the ESWT+ group received 800 impulses of shockwave at 0.22-mJ/mm² energy flux density in a single session. The authors performed a histological examination to evaluate meniscal healing (n = 10 for each group) and immunohistochemistry to analyze the expression of bromodeoxyuridine (BrdU, n = 5 for each group) and CCN family member 2/connective tissue growth factor (CCN2/CTGF; n = 5 for each group) at 2, 4, and 8 weeks after ESWT. The mRNA levels of CCN2, SOX9, VEGF- α , aggrecan, Col2a1, and Col2a2 at the site of the meniscal tear at 4 weeks after ESWT were quantitatively evaluated by a real-time polymerase chain reaction (n = 5 for each group).**Results:** The meniscus healing scores in the ESWT+ group were significantly higher than those in the ESWT- group at 4 weeks and 8 weeks. The ratio of BrdU-positive cells was the highest in the ESWT+ group at all observation periods. The ratio of CCN2-positive cells was highest in the ESWT+ group at 4 and 8 weeks. In the ESWT+ group, real-time polymerase chain reaction revealed that the levels of CCN2, SOX9, aggrecan, and Col2a1 were upregulated (All significant data were $P < .05$).**Conclusion:** ESWT promoted the healing of meniscal tears in the avascular area. ESWT stimulated proliferation of meniscal cells and the upregulation of cartilage-repairing factors such as CCN2, with the upregulation of cartilage-specific extracellular matrix expression.**Clinical relevance:** ESWT may be an effective therapeutic option that promotes meniscal healing in the avascular region.**Keywords:** CCN2; SOX9; extracorporeal shockwave therapy (ESWT); meniscal healing; meniscal tear.[PubMed Disclaimer](#)**Enhancement of meniscal repair in the avascular zone using connective tissue growth factor in a rabbit model.**

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- RNA, Messenger / metabolism
- Rats, Wistar
- SOX9 Transcription Factor / metabolism
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- Aggrecans
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- COL2A1 protein, rat
- Collagen Type I
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