



## Review

## Adult osteochondritis dissecans and focussed ESWT: A successful treatment option



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### H I G H L I G H T S

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- Osteochondritis dissecans, OCD.
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### A B S T R A C T

Extracorporeal shockwave therapy (ESWT) has gained acceptance in the medical field and in the treatment of non-unions and delayed bone healing. ESWT has been used effectively for many years as a noninvasive surgical procedure. The idea of treating Osteochondritis dissecans of knee and talus arose in the middle of the 1990's. OCD is known as a pre-arthritis factor in the long-term and still there is no consistent treatment. In the literature there is still only a small number of publications but international societies for shockwave treatment are convinced that ESWT on OCD shows to be an effective and safe method in the treatment of OCD in the early stages. We want to summarize the actual data on the treatment of OCD by ESWT.

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Osteochondritis dissecans is known as a localized aseptic bone necrosis that undergoes a development from a sclerotic area to a defect of the articular surface. The OCD can also be described as a local pseudarthrotic reaction of the tissue, which leads to a local chondral destruction and the formation of a loose body. Based on this statement and the good results of ESWT on non-unions shock waves were initially indicated in OCD in 1999.

Etiology of osteochondritis dissecans So far the etiology remains unclear. Mechanical factors with repetitive impulsive stress seem to be the most likely cause but vascularization failure and traumatic injuries are discussed also. The traumatic genesis includes the mainly affected convex joint area underlying the peak pressure on the surface with formation of subchondral micro-fractures and a

prevented healing by the ongoing force of weight bearing. Of course a malformation of the joint or ligamentary instabilities have to be addressed as a cause of the disease and to be treated to gain a positive result. Osteochondritis dissecans has to be divided between the juvenile and adult form, as far as a spontaneous healing process can be seen in over 70% of the juvenile forms [1].

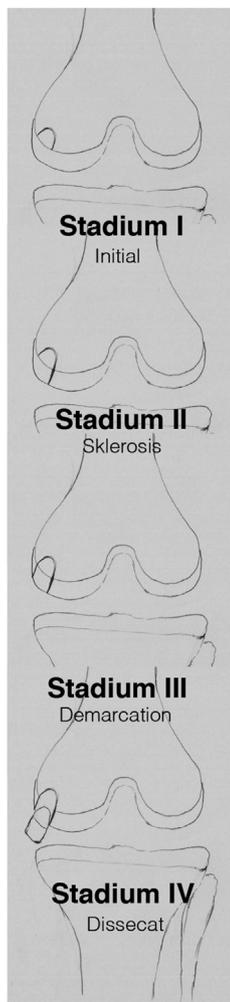
The typical pathogenesis of OCD undergoes four stages (Pic 1.1 and Table 1.1). The initial stadium shows a subchondral osteonecrosis and demarcation with a zone of condensation next to the affected area. This leads in the end to a substantial defect with the formation of an intraarticular loose body or necrotic lesion in situ.

In a long-term outcome OCD is known as a pre-osteoarthritic factor.

The actual treatment procedures are commonly stage-related and depending on patient's age, duration of symptoms, level of activity, size and accompanying circumstances [2]. Because of missing Level 1 studies that will prove efficacy of any treatment

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Pic 1.1.. OCD stages.

modality no evidence-based treatment recommendation can be determined so far.

Shockwave therapy as a treatment of Osteochondritis dissecans seems to be a reasonable option in the early stages of adult OCD. At the moment there are some conservative treatment options, supporting the spontaneous healing by immobilization and reduction of physical strain, and the surgical interventions with a broad variety of techniques. Being more or less invasive the aim is to get a revitalization of the affected area and prevent a progression and arthritis of the joint. Lauber et al. [3] showed in 2001 the effect of ESWT on bone pathology such as avascular femoral head necrosis. Because of the mechanotransductional working mechanism, it is assumed that shock waves should be effective the same way in OCD.

The patients would benefit of a treatment with ESWT, as this is a minimal invasive treatment without severe side effects.

Basic research by Wang et al. [4] showed a chondroprotective

effect of ESWT on osteoarthritis. Lyon et al. [5] were able to show in an experimental animal trial that ESWT improved the healing rate, cartilage and subchondral bone quality in the OCD rabbit model.

Moretti et al. [6] published a single-case-report on a 14-year female volley-ball player with bilateral knee osteochondritis dissecans treated with extracorporeal shockwave therapy in 3 sessions with an electromagnetic device in a very low energy flux density of 0.04 mJ/mm<sup>2</sup> gaining pain free return to sports within 6 months. The authors describe the procedure as reasonable, safe and uncomplicated.

In an arthroscopic controlled single-case report [7] and an own study with out-patient treatment suffering from adult OCD I or II of the knee or talus we were able to show the following results using an electrohydraulic high-energy shockwave device approved for bone-indication.

A number of 40 patients (22 male and 18 female) with 29 affected knee- and 11 ankle-joints were included (Table 1.2). All received a single high-energy shockwave-treatment with 0.35 mJ/mm and 2500 applied Impulses in general anesthesia. As evaluation scores we took a subjective Score and a VAS-Score as well as the Larson and the Brückl-Score for the knee-joint and the Mazur-Score for the ankle-joint. The follow-up was performed 2 and 6 weeks, 3, 6 and 12 months after treatment.

The assessed subjective score (Table 1.3) showed very good results. While 60% of the patients suffered from bad pain in rest and soft exercises at the starting point, the patients had no pain after the treatment and only in 38% a little pain during hard exercises. Nobody showed pain while rest after the treatment. Before the treatment 62% suffered from swelling of the joint, after the treatment only 13% showed signs of swelling. More than 72% of the

Table 1.2  
OCD-study (Berlin).

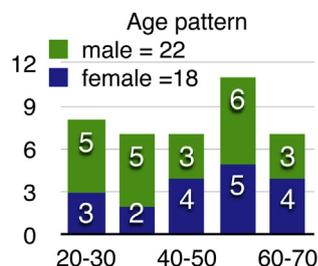


Table 1.3  
Subjective score of OCD-Study (Berlin).

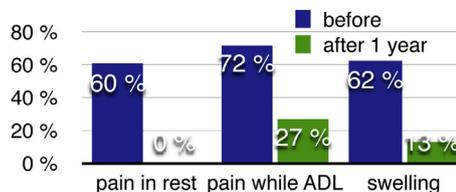


Table 1.1  
Imaging of OCD.

Stage	X-ray	MRI with	ASK
I	Normal	Osteolysis, bone marrow edema	Cartilage intact, with normal function
II	Subchondral Sclerosis	Sclerosis and Osteolysis/Osteonecrosis	Cartilage intact, signs of pitting, circular demarcation
III	Dissect in situ, beginning dissection of sclerosis	Dissect in situ, liquid, chondral disconuity	Dissect in situ partly fixed, can be undermined
IV	Loose body dissociated	Dissociated loose bode, effusion	Intraarticular loose body

patients had pain in ADL before the treatment, after the one-year follow-up only 27% showed little pain during daily living and only 10% bad pain doing hard exercises.

The VAS (Table 1.4) showed a highly significant decrease over time of follow-up and a significant decrease within every point of follow-up to the following. The highest VAS-reduction could be seen in between second and sixth week and between sixth week and three months for the knee-joint and from third to sixth months for the ankle-joint.

Larson-Score developed from 63.22 to 87.22 of 95 points one year after ESWT and the Brückl- Score decreased from 6 to 2.31 for the knee joint. This shows a highly significant increase for the Larson score over the whole period and in between the controls time period and correlating a highly significant change for the Brückl-Score.

The Mazur-Score for the ankle-joint shows an increase of good and very good results and the results over the period of one year are

significant and show the highest increase in the periods of 2–6 weeks and 6weeks to 3 months and 3–6 months.

A MRI-follow-up (Pics 1.2 and 1.3) was performed after one year showing a complete recovering within 40% of the patients. Another 30% showed a regression of the defect and the grading of the OCD could be lowered from II to I.

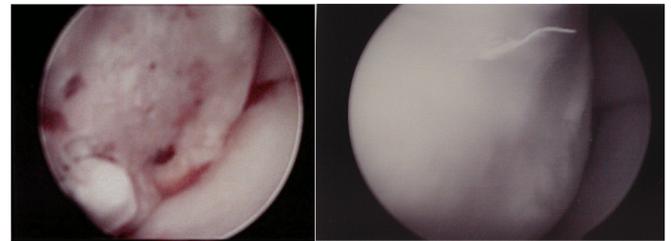
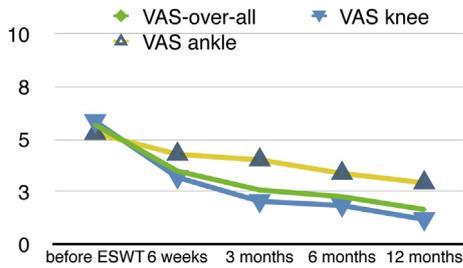
No side effects occurred and overall 10% of the patients showed no signs to get any better.

It has to be discussed that the knee-joint shows better results than the ankle-joint and we think this is due to the fact that the aiming is more precise for the knee. While reaching the OCD of the knee-joint shows no complications the ankle-joint with less mobility cannot be reached in every case.

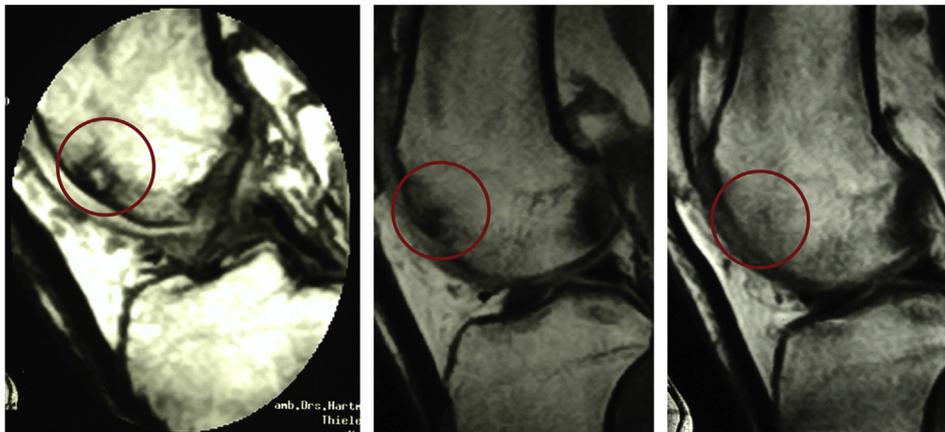
In a single-case report, published in 2003 [7], the opportunity was given to get an arthroscopic follow-up showing a complete recovering of the cartilage defect Stage III–IV (Pic 1.4). Only six weeks after treatment the VAS-Score showed a decrease from 7 to 2 followed by zero pain in the follow up at six and twelve months.

**Table 1.4**

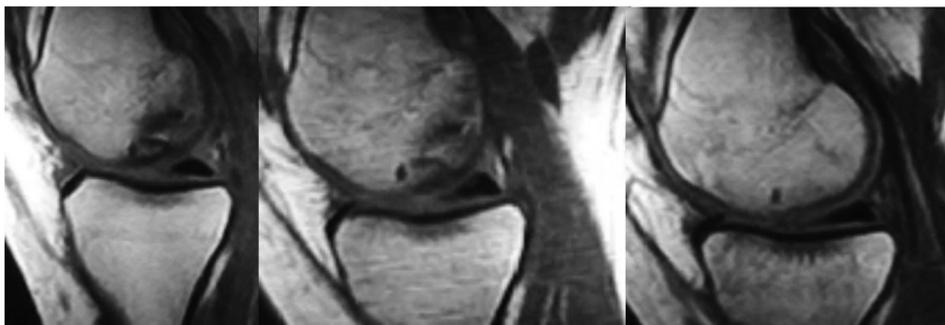
VAS-score of OCD-study (Berlin).



**Pic 1.4.** Intraarthrosopic findings single-case-report (Berlin).



**Pic 1.2..** MRI-images OCD-study (Berlin).



**Pic 1.3..** MRI-images OCD-study (Berlin).

Finally the authors conclude that ESWT in adult OCD seems to be an effective and excellent option to use. Because of the high efficiency rate without significant side effects shock wave treatment should be indicated before any interventional option such as surgery in any technique. Further studies are required to determine long-term effects and the level of evidence.

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None.

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#### Author contribution

**Dr. med. R. Thiele MD** – data collections, analysis, conception, final approval, guarantor.

**S. Thiele MD** – data collections, writing, design, analysis, conception, final approval, guarantor.

**Prof. Dr. med. Ludger Gerdsmeyer MD, PhD** – data collections, analysis, final approval.

#### Conflict of interest

None.

#### Guarantor

S. Thiele MD and Dr. med. R. Thiele MD.

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