

Letter to the Editor

Extracorporeal cardiac shock wave therapy: First experience in the everyday practice for treatment of chronic refractory angina pectoris

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Several alternative therapies have emerged for treating patients with chronic refractory angina pectoris, yet only a few have given rise to sufficiently published data regarding safety and effectiveness. It is imperative to establish an effective and preferably non-invasive therapy for this expanding patient cohort. We report initial experience with cardiac shock wave therapy (CSWT) in the everyday practice for refractory angina.

Ten patients with chronic refractory angina pectoris were enrolled for CSWT at our institution. All were symptomatic on minimal activity (CCS class III or IV) inspite of receiving maximally tolerated medical therapy. They showed evidence of myocardial ischemia on exercise Tc⁹⁹ SPECT perfusion scans with no possibility for coronary percutaneous intervention or bypass grafting on a recent angiogram. The patients were subjected to 9 CSWT sessions (3 cycles) over 3 months. All patients gave written informed consents. The MODULITH SLC (Storz Medical AG, Kreuzlingen – Switzerland) was used throughout this treatment. The physical principles, mechanism of action and technical details of shock waves and the above-mentioned generator have been described elsewhere [1]. Briefly, this device is able to precisely focus shock waves transthoracically on the desired segment of the heart under the guidance of an in-line 2-D echocardiography. Shock waves are applied in an R-wave triggered manner to avoid ventricular arrhythmias. The shock wave is a mechanical force that induces local shear

stress without heat production at low energy levels [2]. The energy level and amount of shock waves applied have been derived from in vitro and animal experiments [3].

Semiquantitative visual interpretation by a blinded experienced physician was performed for both baseline and follow-up myocardial tomograms by assigning each of the 17 segments of the left ventricle 0 to 4 points both at rest and during stress according to its uptake [4]. At follow-up, a reduction of ≥ 2 points compared to baseline scores was considered a substantial reduction of ischemia in that segment. Summed stress scores in the treated segments before and after therapy were compared and the mean values were tested for statistical significance. Successful CSWT was defined as an improvement of anginal symptoms to become \leq CCS class II and a substantial reduction of ischemia in the treated myocardium. A non-parametric test for paired data

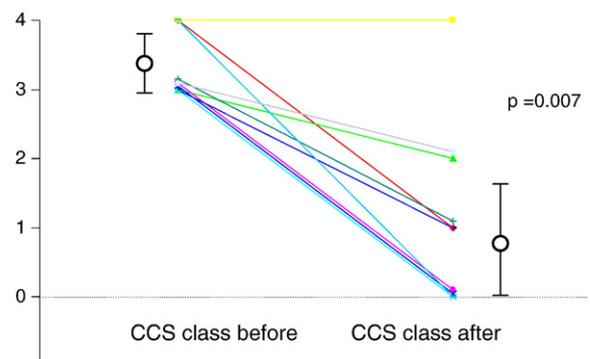


Fig. 1. Anginal symptoms of patients ($n=10$) subjected to cardiac shock wave therapy for refractory angina pectoris before and after treatment.

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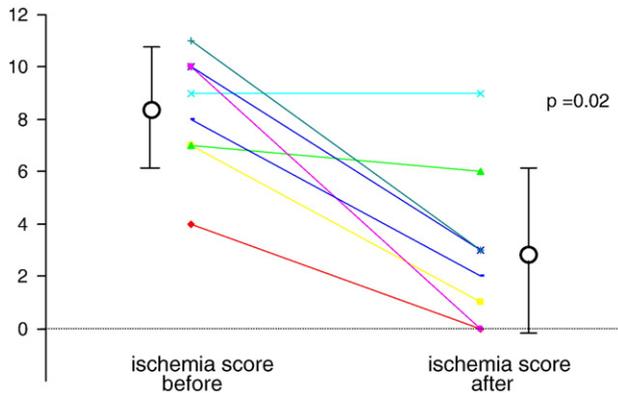


Fig. 2. Ischemic scores of treated segments in patients ($n=8$) subjected to cardiac shock wave therapy for refractory angina pectoris.

was used to investigate differences before and after treatment (Wilcoxon rank sum test). P -values <0.05 were considered significant.

Eight patients completed the 9 sessions. One patient who was on psychotherapy because of chronic depression did not tolerate therapy and described it as painful and in another patient therapy was discontinued because of a slight troponin T elevation after the 6th session without further consequences. One death out of hospital occurred 4 weeks after the last session. Nine out of 10 patients had CCS angina class ≤ 2 at follow-up. The mean CCS class at baseline was 3.3 ± 0.5 and at follow-up was 1.0 ± 1.3 ($p=0.007$) (Fig. 1). Among the 8 patients a total of 22 ischemic segments were subjected to treatment. The mean summed stress score was 8.3 ± 2.2 at baseline and fell to 3.0 ± 3.1 at follow-up ($p=0.02$) (Fig. 2). Per definition CSWT was successful in 6 out of 8 patients (75%). Myocardial perfusion improved only in the ischemic areas treated by CSWT.

Extracorporeal shock wave therapy is a non-invasive, safe and easy-to-use application. In a randomised study, Nishida et al. [3] have shown among a porcine model of chronic myo-

cardial ischemia complete recovery of left ventricular ejection fraction, wall thickening fraction, and regional myocardial blood flow of the ischemic region in 4 weeks (all $p < 0.01$) after receiving shock wave treatment ($n=8$) as compared to animals which did not receive the therapy ($n=8$). A clinical pilot study was able to reproduce these favourable preclinical results among nine selected patients [5].

We report the first series from clinical routine. There was a significant improvement in anginal symptoms that was associated by a substantial reduction of ischemic myocardium. It remains unclear, however why two patients did not show an objective improvement inspite of clinical benefit. One explanation could be the need for more shock waves and/or higher energy levels according to size and severity of the ischemic zone; or that the angina improvement is in part a placebo effect.

Drawing conclusions must be done carefully; nevertheless, we can report that CSWT for refractory angina pectoris is effective in ameliorating anginal symptoms by limiting the underlying ischemia burden of the myocardium.

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