EXTRACORPOREAL SHOCKWAVE THERAPY - SUCCESSFUL ALTERNATIVE IN ORTHOPAEDIC TREATMENT

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ABSTRACT

Extracorporeal Shockwave Therapy (ESWT, Orthotripsy) has increasing popularity in treatment of various orthopaedic conditions, like delayed and nonunion of bones(pseudoarthrosis), shoulder periarthritits, plantar fasciitis and calcaneal spur, tendopaties - tennis or golfer elbow. The study aims to present successful results after application of ESWT in 204 patients for 5 years period, using two popular shock wave devices. The results are promising and are quite near to these after surgery. There is success in treatment of pseudoarthrosis in 64% of patients. Shoulder pain is reduced in 75% of patients with shoulder periarthritits and their calcificates are altered in 68%. The plantar fasciitis and epicondilitis complaints are successfully treated in 71% and 69% respectively. ESWT demonstrate results that are comparable to those after surgery. The advantages of the methods like low patients morbidity, no risks or any side effects, quick recovery, make Orthotripsy preferable method in orthopaedic practice.

Keywords: Extracorporeal Shockwave Therapy, ESWT, Orthotripsy, Pseudoarthrosis, Shoulder periarthritits, Plantar fasciitis, Epicondilitis

INTRODUCTION

Extracorporeal generated shock waves were introduced approximately 30 years ago to desicrate kidney stones. Shockwaves subsequently have been used in orthopadics and traumatology to treat various insertional tendopathies and delayed unions and nonunions of fractures. The concept of the orthopaedic disorthers is that shockwaves stimulate or reactivate healing process in tendons, surrounding tissue and bones through microdisruption of avascular or minimal vascular tissues to encourage the revascularization, release of growth factors and recruitment of appropriate stem cells conducive to more normal tissue healing- Brummer(1), Valchanou - Michailov (10), Wang et al(11).

The current author will give an overview of his experience in various applications of Orthotripsy.

The aim is to evaluate results of Extracorporeal Shockwave Therapy

(ESWT, Orthotripsy) in various orthopaedic conditions.

Many of orthopedic disturbances need surgical treatment when none operative treatment fails. ESWT is an alternative to surgical treatment to such conditions and probably an answer of many unsolved problems.

MATERIAL AND METHOD

ESWT is a technique that releases energy by sonic beams to tissues by electrohydraulic system. It produces microfractures and haemorrhages on the bone, which induce neovascularisation and osteoneogenesis. This lesion is localized in two planes with the help of X-ray C-arm. Before embarking upon treatment in the entosapaties, the soft tissue lesion is demarcated by sonography. The intensity of the Shockwaves varies from 12-18 KV for soft tissues and 20-24 KV for bony lesions. It is done as an outpatient procedure under local anaesthesia or neuro leptanalgesia. Most patients tolerate shockwaves with only some discomfort. There are no significant side effects encountered except local bruise or petechia. Compared to surgery the healing time is much shorter – up to 6 weeks for soft tissues and to 10 weeks in bony disturbances.

The major indications for ESWT are:

- Delayed and nonunion of bones(pseudoarthrosis),
- Shoulder periarthritits,
- Plantar fasciitis and calcaneal spur, Achilodinia,
- Tendopaties, like tennis or golfer elbow.

Contraindications are few, like local infection or osteomyelitis, tumours or metastasis, open epiphyses in children and blood coagulation disorders.

RESULTS

Two hundred and four cases are carried out in a period of 5 years – 2003 - 2007. Thirty nine of them are treated in the

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The patients are subdivided in 3 groups, according the disease:

- 1st group - 45 patients with delayed or none union of a long bone after fracture.
- 2nd group – 159 patients with enteso and tendopaties (shoulder periarthritits, epicondilitis, plantar fasciitis)

The treatment is fulfilled by on of the two Shock wave devices:

- Stonelith V5 – electorhydraulic lithotripter
- Masterpuls200(Storzmedical) – radial shockwave orthotripter.

The results after ESWT treatment of pseudoarthrosis in 45 patients are:

1. The treatment is successful in 29(64%) of the patients
2. Tibia(73%) and antebrachium (62%) noneunions heal much better than humerus(40%) - Figure 1.
3. The mean time for bone healing after ESWT is 34-63 days, depending on the bone – Figure 2.

Figure 1. Bone healing rate in %. The results in tibia, femur and antebrachium are much better, than in humerus.

Figure 2. The mean period for healing in the different long bones after ESWT differs in the different long bones - 34-63 days.

Results after treatment of shoulder periarthritits are estimated in 70 shoulders by two methods.

Pain scoring by Visual Analog Scale - Figure 3. The estimation presents that pain in abduction differs from the pain in neutral position until the 45th day. The pain on the 3rd month and after that is under 1 cm (VAS ≤ 1,0) in 40(57%)shoulders.

Figure 3. Pain dynamics during the follow up. Pain in abduction and pain in neutral position differ until the 45th day. It is under 1 cm (VAS ≤ 1,0) in 40 shoulders (57%) on the 3rd month. Fifty two patients(74%) are pain free on the 6th month.

Fifty two patients (75%) are pain free on the 6th month. Resorption of the calcium deposit after ESWT is presented in Table 1. It analyses 43 shoulders with X-ray evidences for paraarticular calcificates, subdivided according the Gaertner.

Table 1. X-ray image of the shoulder calcificate according the Gaertner. The results are estimated twice - on the 3rd and 6th month. *Partial resorption of the calcificate - alteration of thickness, lines and sizes. ** Full resorption of the calcificate.

X-ray - Gaertner	No	Calcific resorption				T O T A L
		3 rd mo after ESWT		6 th mo after ESWT		
		Partial*	Full**	Partial*	Full**	
Type I	10	2	1	3	1	
Type II	14	2	3	5	4	
Type III	19	0	1	3	4	
No in groups	43	4(9%)	5(12%)	11(25%)	9(21%)	
No changed		9(21%)		20(47%)		29 (68%)
Full resorbtion		5 (12%)		14(33%)		19 (45%)

The calcific deposits are reduced in 9 (21%) patients on the 3rd month.

The total number of patient with calcific alteration is 29(68%), 19(45%) of them have full resorption.

Results after treatment of plantar fasciitis with Orthotripsy are analyzed in 27 patients(31 heels). They are estimated by two methods:

- Visual analog scale (VAS)(Figure 4) presents heel pain dynamics. Substantial pain reduction is estimated after the 15th day and 71% painless heels are demonstrated at the end of the trial (6th month).

Figure 4. VAS for pain in plantar fasciitis after ESWT, estimated 7 times. Pain reduction is estimated after the 15th day and 71% painless heels are demonstrated at the end of the trial (6th month).

- Roles and Maudsley scoring system presents the alteration of the daily activity, caused by the heel pain (Figure 5). Six patients (18%) are with good and very good results on the 15th day.

At the end of the trial the scores are good(27%) and very good(52%), or a total of 24(79%) patients are satisfied. Bad and unsuccessful are 3(10%) и 4(11%) of all patients respectively.

Figure 5. Roles and Maudsley score for the daily activity after ESWT in painful heel on a total of 31 heels. Six patients (18%) are with good and very good results on the 15th day

At the end of the trial the scores are good(27%) and very good (52%), or a total of 24(79%) patients are satisfied. Bad and unsuccessful are 3(10%) и 4(11%) of all patients respectively.

Results after treatment of epicondylitis with Orthotripsy are estimated in 57 patients for 6 months follow up. They are analyzed by the VAS for pain scoring. Significant pain reduction is assessed as follows(Figure 6): 4,7 points on the 15th day; 2,3 points on the 45th day, 1,1 points on the 3rd month. The final result at the end of the follow up on the 6th month is 40(69%)patients, who's VAS≤1,0.

Figure 6. Pain scoring (VAS) in epicondylitis demonstrates reduction after 15th day. Sixty-nine % of the patients are satisfied.

DISCUSSION

The surgery treatment is still a method of choice for all of the above mentioned orthopaedic diseases. The contemporary miniinvasive methods provide low morbidity and quick recovery.

Schleberger (7) demonstrated 85-93% success after surgery in pseudoarthrosis cases. Wang et al (12) presented 82% healing rate after ESWT. Schaden et al(8) confirmed approximately the same high rate – 79% in 755 tiabial pseudoarthrosis.

The shoulder peri arthritis is treated usually conservatively, but when it fails then surgery is taken in account. Uththoff(9) demonstrated variable success - 60-80%. ESWT had even higher success rate according to Rompe (5). He assessed excellent results on the 12th month, but the improvement began on the 3rd week. The CS raised, from 43 to 78 points in the end of his trial. The partial disintegration of the calcium deposit was accomplished in 57% of the patients.

Martin et al(3) presented 237 patients with plantar fasciitis, treated with different methods – NSAID, physiotherapy, splinting, exercises, locally applied corticosteroids. Only 51% of these patients were without symptoms on the 6th month. Same results presented Davis et al(2) after open surgery. The main disadvantages were high postoperative morbidity and long recovery period. Ogden J et al(4) proved that ESWT is excellent noninvasive method for treatment of heel pain with 83% success. Substantial pain reduction occurred after 45th day.

Rompe et al(6) accomplished ESWT in 150 patients with epicondylitis after unsuccessful conservative treatment. Ninety two percents of them had received previously few corticosteroid injections. In his follow up 36% of the patients

presented very good and 51% good results. Only 16% of them didn't have improvement of their elbow complaints. All 4 groups of patients in our investigation attained significant improvement as in their pain complaints, as in extremity function and mobility. Our results are similar to those of the above mentioned authors.

CONCLUSION

We make two conclusions and recommendations, based on the findings of our investigations:

1. Treatment with ESWT achieves significant improvement in pain and function in many orthopaedic disturbances.
2. The clinical results after Orthotripsy are comparable with the results after conventional surgery methods. Absence of risks and low patient morbidity, as shorted recovering term are great advantages of ESWT. We therefore recommend application of ESWT in Orthopaedics and it is now a standard treatment in our clinic.

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