Antibacterial effectiveness of high-energetic extracorporeal shock waves: an in vitro verification

AIM: Extracorporeal shock wave therapy (ESWT) is used for a multitude of different indications in modern orthopedics. Local bacterial infections, like infected pseudarthrosis, are still considered as contraindications. The goal of the present study was to determine the effect of ESWT on the growth of clinically relevant bacteria in orthopedic and trauma surgery.

METHODS: Standardized suspensions of five bacterial strains of bone and implant-associated infections were treated with 4,000 impulses of high-energy shock waves with an energy flux density (ED) of 0.96 mJ/mm² and a frequency of 2 Hz. Subsequently, viable bacteria were quantified and compared with an untreated control. RESULTS: A highly significant antibacterial effect of the ESWT was demonstrated for all bacterial strains with a reduction of growth to values between 1.1% and 29.7% (p<0.01). Reference strains of Staphylococcus aureus and Staphylococcus epidermidis reacted with the highest sensitivity whereas Enterococcus faecium demonstrated the highest resistance towards high-energy shock waves.

CONCLUSION: ESWT proved to exert a significant antibacterial effect on clinically relevant pathogens. Further investigations on energy flux density and impulse rates might contribute to an optimization of the bactericidal effectiveness. Infections as possible indications of the ESWT should therefore be assessed in further
studies and the clinical relevance should be verified in an animal model.