

Effects of unfocused extracorporeal shock waves on Gram positive and Gram negative bacteria

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Introduction:

Extracorporeal shock wave therapy (ESWT) has been used for a multitude of applications in modern medicine. Although there is information on the effects of focused ESWT on eukaryotic and prokaryotic systems, there are currently no published studies on the effects of unfocused ESWT on either.

Methods:

This study was designed to determine the effect of electro-hydraulic, unfocused ESWT on Gram-positive and Gram-negative, aerobic and anaerobic bacteria *Porphyromonas gingivalis* 381, *Porphyromonas gingivalis* W83, *Fusobacterium nucleatum* ATCC 49256, *Actinomyces naeslundii* ATCC 49340, *Streptococcus mutans* ATCC 25175 and *Staphylococcus aureus* ATCC 12600. Monoculture suspensions were treated with 100 to 500 pulses of ESWT at energy flux densities (EFD) of 0.12 mJ/nmi², 0.22 mJ/mm² and 0.3 mJ/mm². Following treatment, aliquots were plated for viability determination and compared with untreated controls.

Results:

ESWT showed a significant antibacterial effect for *S. mutans* and an unencapsulated strain of *P. gingivalis* following as little as 100 pulses at 0.3 mJ/mm² ($p < 0.001$). In addition, a significant disruption of bacterial aggregates was observed at lower EFDs. No significant reduction in viability was observed for all other bacteria at EFDs and pulses tested ($p > 0.05$).

Discussion:

Unfocused ESWT appears to be able to disrupt bacterial aggregates and kill specific aerobic and anaerobic bacteria. This may be beneficial as adjunctive therapy for the treatment of bacterial biofilms in specific conditions.

Conclusion:

ESWT appears to be antibacterial for selected Gram positive and Gram negative aerobic and anaerobic bacteria associated with human disease.