MP Interconsulting
ULTRASONICS - SONOCHEMISTRY - INNOVATION

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MMM technology in ultrasonic treatment of high-tech parts, sensitive and complex metal parts, treating of biological implants, surgery…

1. **Stress relief by vibrating the complete part, artificial accelerated aging and fast properties stabilization.**

2. **Extending life-span of treaded parts (longer operating life, longer fatigue life).**

3. **Surface treatment under MMM vibrations: sand blasting, chemical etching, surface chemical modification, deep cleaning enabling capillary penetration of a cleaning liquid, ball peening under MMM-vibrations and deep implementation of different particles and powders in a treated metal surface.**

4. **Stress-free quenching and hardening assisted by multifrequency vibrations (also hardening applying ball peening).**

5. **Improved coating of metal parts under vibrations: by immersion in coating liquid and/or by dry ball-peening in MMM ultrasonic chamber. Deeper coating and particles implementation realized ultrasonically. Accelerated stabilization of coating layer.**

6. **Welds treating by ultrasonically vibrating the parts: extending fatigue life of welds several times (3 to 5 times). Redistributing and minimizing stress concentration caused by welding.**

7. **Accelerated free radicals de-excitation and neutralization in cases of treating plastics and composites (applicable also in cases of coating).**

8. **Vibrations accelerated polymerization (or de-polymerization in case of applying very strong vibrations).**

9. **Ultrasonically assisted degassing and de-bubbling.**

10. **Ultrasonically improved alloying and casting. Production of homogenous biocompatible alloys.**

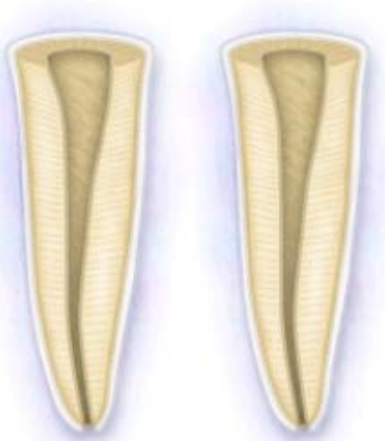
11. **Ultrasonically facilitated implantation and/or penetration of metal objects into biological and composite structures.**

12. **Deep cleaning applications.**

An example from published literature...

Influence of Passive Ultrasonic Activation on the Penetration Depth of Different Sealers

Materials and Methods



Group A (#15 Ni-Ti file)

Group B (#20 Ni-Ti file)

Forty-two single-rooted anterior human teeth were used. The specimens were stored in saline at all times except during canal preparation. To facilitate measurement and instrumentation, the crowns of all 42 teeth were cut and removed at the cemento-enamel junction level. The working length of all teeth was established by passing a # 10 K-file (Antaeos, VDW GmbH, München, Germany) to the apical foramen and then reducing the length by 0.5-1.0 mm. The roots were then instrumented conventionally with #10 to #60 K files (Antaeos, VDW GmbH, München, Germany) by one operator. One milliliter of 2.65% NaOCl solution was used as a canal irrigant prior to the insertion of each instrument. A laterally perforated needle with a closed end was used during irrigation to allow maximum penetration of the irrigation solution. Upon completion of the instrumentation, the roots were randomly divided into two equal groups of A and B.

The roots in group A received an application of 17% EDTA of 1 ml #15 Ni-Ti file energized by ultrasound was introduced 1 mm short from the anatomical apex for 1 min with small amplitude filing movements. Great care was paid to avoid touching the canal walls. The roots in group B were filled again with 17% EDTA #20 0.02 taper Ni-Ti file (HERO 642, Micro-Mega, Besançan, France) was introduced 1 mm short from the anatomical apex and energized by ultrasound for 30 seconds.

Treatment was then completed for both groups with a final 2.5 ml rinse of NaOCl for 30 sec; this was standardized for all teeth. The canals were dried with paper points (DiaDent, Group Int. Inc. CA). According to the sealers used, the groups were again divided into two equal subgroups. The sealers used were a resin based sealer AH26 (De-

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Trey, Switzerland) and a glass-ionomer sealer Endion (Voco-Germany). They were prepared according to the manufacturers' instructions and the canals were filled with lateral condensation technique. Two roots were left empty as control groups; one from group A and the other from group B. The excess gutta percha was removed from the coronal part of the canal with a heated instrument and the coronal access was sealed with Cavit (Espe, Seefeld Oberb, Germany). The roots were then stored at 37°C and 100% humidity for 10 days. To facilitate fracture, two parallel, longitudinal grooves which did not penetrate the root canal were made on two opposite external surfaces of each root. The roots were then fractured using end-cutting pliers. The root halves were mounted on aluminum stubs, coded, placed in a desiccator for 48 hours, and then coated with a thin (200 A°) palladium-gold film.

The specimens were viewed through a scanning electron microscope (SEM) (Jeol 6400, Noran Instruments) x2500 magnification. Low and high power electron photomicrographs were obtained of the coronal, middle, and apical thirds of each root. The focus of observation was the interface between the dentin and the sealer material. Data were expressed in μm and statistical analyses were performed using a two-way analysis of variance with repeated measurements. Repeated measurements were performed on regions using the Duncan test.

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