

## Advances in Ultrasonics: Perceived for Periodontics

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The last few decades have seen the advent of power driven instruments as an accepted treatment modality.

Power driven scalers may be classified as -  
A. Ultrasonic vibration at tip of the instrument ranges from 20,000 to 45,000 cycles per seconds.

1. Magnetostrictive pattern of vibration of the tip is elliptic, which means all sides of tip are active & will work when adapted to the tooth.
2. Piezoelectric - pattern of vibration of the tip is linear, or back & forth, meaning that the two sides of the tip are most active.

B. Sonic - vibration at tip of the instrument ranges from 2000 to 6500 cycles per seconds. Pattern of vibration of the tip is orbital which allows instrument to adapt to all tooth surfaces.

Power driven & hand instrumentation demonstrate similar outcomes. Tunkel in 2002 did a review of literature on efficacy of power driven & hand subgingival debridement in treatment of chronic periodontitis, found no difference in efficacy in single rooted teeth.

Until recently, use of ultrasonics was mostly limited to supragingival debridement because of their bulky working tip & difficulty in adapting to the tooth surface. However, advances & new designs have redefined their role. Most practitioners prefer ultrasonics, as it works faster with less effort & by doing that it reduces the time of treatment & fatigue of operator. So, clinician can treat more patients in given amount of time. Also it causes less tissue trauma & less postoperative discomfort.

But there are potential hazards of using power scalers. Concerns include-

1. Aerosol production: produce aerosol & there is no significant difference in amount of aerosol generated among them. Aerosol produced by power driven scaler on periodontally involved teeth is contained with blood. Patients with known communicable disease that is transmitted by aerosol should not be treated with ultrasonics.

Recommended protocol for minimizing aerosol:

- a. Personal protective barriers such as mask, gloves, safety glasses.
- b. Routine use of preprocedural antiseptic rinse with 0.2% chlorhexidine for 1 minute, as it significantly reduces the number of viable bacteria in aerosol.
- c. Use of high speed evacuation device.

It is important to reduce aerosol as it is potential hazard to operating staff as well as to other patients & to environment.

2. Patients with pacemaker: Magnetostrictive ultrasonic

scalers interfere with some pacemakers & hence should not be used.

3. Neurological disturbance of the hand caused by vibration & hearing loss: Studies are limited & not specific for sonic or ultrasonic use therefore, no direct proof exist that the use of power scalers causes these conditions.

In spite of having certain limitations there is tremendous progress in ultrasonic equipment & it finds more applications in dentistry & worth the cost.

Other applications of ultrasonic in dentistry: (Fig-1)

- Scaling Tips
- Root planing & irrigation Tips
- Root planing for furcation
- Surgical Tips for bone cutting e.g. Sinus lift procedure or ridge splitting in implants
- Tips for Root Canal Treatment
- Tips for Apicoectomy (Retrograde Treatment or Root End Surgery)
- Tips for Removal of Foreign Objects in Root Canals like File/ GP Point

Current tips are designed to be both site specific & job specific for example:

1. Large-diameter tips are created in universal design for removal of large, tenacious deposits, a high power setting recommended. For which many companies provide tips with high frequency 30 KHz.
2. Thinner-diameter tips have site specific design & work at a low power setting.

Studies have demonstrated that new, thinner inserts are clinically effective as hand instrumentation.

- a. Straight-tip design is ideal for treating patients with gingivitis & for deplaqueing maintenance patients.
- b. Right & left contra-angled instrument allows for greater access & adaptation to root morphology.

Manufacturers are responding to demands for new tip designs. Today new tips are shaped like periodontal probes or delicate explorers. If we can probe an area, we can successfully gain access to complex tooth surfaces by selecting an insert compatible with the root anatomy. Today's micro-ultrasonic tips can be viewed as probes with the power to disrupt plaque bio-film. Microultrasonic scaling is the term used to describe scaling with these new inserts.

Examples:

1. Hu-Friedy Swivel inserts reduce the torque from the handpiece cord, increasing overall balance for hassle-free

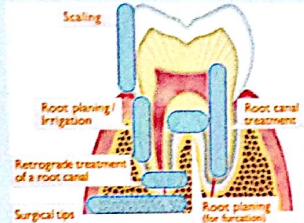


Fig-1 application of ultrasonic in dentistry

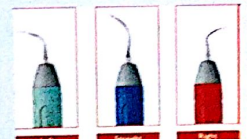


Fig-3 Hu-friedy After five inserts



Fig-5 Bellissima cavitron insert



Fig-2 Hu-friedy SWIVEL inserts

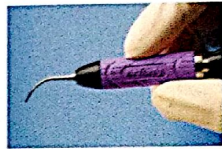


Fig-4 cushioned grip



Fig-6 Ultrasonics with inbuilt additional light source



Fig-7 Cavitron sterimate light

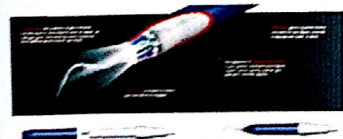


Fig-8 Amdent ultrasonic with LED light source & detachable ergonomic grip.

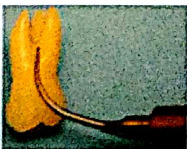


Fig-9 furcation tips

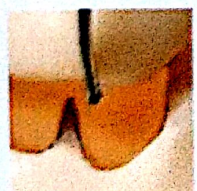


Fig-10 0.8mm ball end tip for furcation

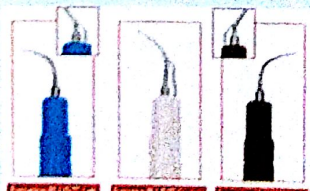


Fig-11 Hu-Friedy furcation tips

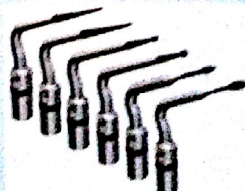


Fig-12 diamond coated tips



Fig-13 Cavitron 30 K SofTip Ultrasonic Implant Insert



Fig-14 Cavitron 30 K SofTip Ultrasonic Implant Insert



Fig-15 Suprasson Newtron Piezoelectric Ultrasonic Scaler

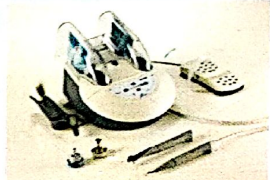


Fig-16 Vector Pro system package S: Complete base unit with rotating Paro & scaler handpiece, complete filling, footswitch, Vector Fluid polish, abrasive fluid Vector, Vector disinfection, service kit & tool kit Paro & tool kit scaler.



Fig-17 Polishing Fluid with hydroxylapatite particles



Fig-18 Perioscan by Sirona



Fig-19 Perioscan by Sirona

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scaling. (Fig-2)

2. After five inserts (Hu-Friedy): After Five inserts are available as Straight, Left & Right inserts (Fig-3). These probe-size tips offer smooth, deep access into periodontal pockets for efficient subgingival scaling.
3. Ultrasonic Services (USI) manufactures the thinnest magnetostrictive tips. One design is virtually indistinguishable from a periodontal probe. An even thinner version resembles the diameter of an explorer.
4. Satelec new no.1 slim scaling tip
5. Cavitron FSI slimline insert.

Cushion Grip inserts for ultrasonic: (fig-4)

The grip is larger than standard inserts, reduces finger pinching, resulting in less hand fatigue & enhanced tactile sensitivity. The lightly textured silicone grips provide a secure, comfortable grasp. Examples:

1. Hu-friedy swivel (fig-2)
2. Bellissima insert - combining Cavitron inserts with a new soft, dimpled & comfortable grip (fig-5).

Ultrasonic with inbuilt additional light source: (fig-6)

This additional light improves visual acuity during scaling e.g. Cavitron "sterimate" light, with ergonomic grip (fig-7)

Fiber optic lighting, example

1. Brasseler USA-NSK
2. Satelec-Acteon.

LED light source, example-

1. Amdent: having detachable ergonomic grip (fig-8)
2. Furcation Insert (fig-9):

1. Hu-Friedy Furcation inserts (fig-10, 11): 0.8mm ball end design adapts to furcation. Ball end offers greater tip surface area for more thorough debridement in this difficult to reach area & also ideal for developmental concavities. The slim design allows greater access with less tissue distension & the water delivery tube is positioned for focused lavage. They are available in right, left, & straight patterns for a full range of access

2. Diamond coated tips (fig- 12): are also available for furcation debridement.

Inserts for scaling around implants

Implants pose another clinical challenge. Most research suggests that traditional metal ultrasonic tips can create scratches on the surface of implant abutments.

1. EMS offers a plastic-coated piezo-tip,
2. Satelec has carbon composite tips designed for safety with implants.
3. Tony Riso Company has the ITS (Implant Titanium Scaler) magnetostrictive insert that can be covered with a single-use, plastic sheath.
4. Cavitron 30 K SofTip Ultrasonic Implant Insert (fig-13, 14): The Cavitron SofTip Implant Insert is only used with a SofTip disposable prophylaxis tip attached. The SofTip disposable prophylaxis tip is a single-use, plastic tip that is safe for implant maintenance.

Suprasson Newtron Piezoelectric Ultrasonic Scaler (fig-15): Satelec/Acteon, has recently introduced the Suprasson Newtron

There are four other kits for periodontics.

Perio Kit has four mini-tips & is purportedly designed to provide non-surgical periodontal treatment, while being kind to the tissue.

Diamond-coated mini-tips, recommended for odontoplasty & for removing calculus from very narrow inter-root spaces & furcations.

BDR kit has four separate probe-shaped tips (2 straight & 2 curved), purportedly for bio-film disruption at periodontal maintenance therapy appointments.

Periosoft Kit consists of 3 tips made of carbon/composite to be used at low amplitude & power for maintenance of implants.

The Twiny-double spray tip is patented & purportedly amplifies the cavitation effect determining when worn tips require replacement.

Vector ultrasonic System (Du"rr Dental) (fig-16, 17): Recently, a newly developed ultrasonic system Vector-ultrasonic system (Du"rr Dental, generating vibrations at a frequency of 25 kHz, in which horizontal vibration of the device is converted by a resonating ring in vertical vibration, resulting in a parallel movement of the working tip to the root surface. Furthermore, the energy from the instrument is transmitted to the root surface & the periodontal tissues by a suspension of hydroxyapatite (HA) particles & water, comparable to ultrasonic cleaning baths. The suspension is not sprayed in an aerosol by the instrument, but held hydrodynamically on the instrument by the linear ultrasonic movement.

Perioscan (by Sirona) (fig-18, 19): Ultrasonic instrument for diagnosis as well as treatment. Gives full control at all times with maximum treatment safety. Also avoids moderate & excessive treatment. When carrying out treatment in gingival pockets once the ultrasonic tip contacts calculus, this diagnosis is indicated as the lighting integrated into the handpiece will change colour. For complete safety, the change in colour of the light is also displayed optically with a coloured diagram of a tooth on the Perioscan display: green light means "healthy root surface", blue light indicates "calculus". As an option, a beeper also sounds.

**Conclusion:** Selection of power scaler or hand instruments or combination of both depends upon clinician's preference, experience & needs of each patient. This is the brief compilation of available information on equipments & its advances as dentistry is progressing in leaps & bounds every single day.



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