

Discovering the mysteries, magic and marvels of power driven scaling and visual acuity

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Abstract

Ultrasonic instrumentation has become an inevitable part of success in periodontal therapy. There are two major types of power driven scalers – sonic and ultrasonic. Ultrasonic scalers can be Piezoelectric or Magnetostrictive. This article attempts to provide a brief review on power driven scalers.

Keywords: Scaler, sonic, ultrasonic, scaling.

Introduction

Ultrasonic instrumentation is integral to the success of periodontal therapy [1]. In the past, periodontal debridement was primarily performed with hand instruments since sonic and ultrasonic instruments were originally designed for gross scaling and removal of supragingival calculus and stains [2]. More recently, these power driven instruments have been modified to have smaller diameter tips and longer working lengths, thereby providing better access to deep probing sites and more efficient in subgingival instrumentations [1].

History

The Magnetostrictive effect was discovered by Joule in 1847[3]. Curie brothers discovered piezoelectric effect in 1880. The use of ultrasound in dentistry was first proposed by Catuna in 1953 as a method of cutting enamel and dentin for cavity preparations [4]. Later about 1958, Cavitron (prophylaxis unit) was introduced for periodontal therapy.

Dawn of Ultrasonics



Figure 1: Cavitron 25k scaler

Types of Power Driven Scalars

There are two types of power driven scalars –

- Sonic
- Ultrasonic

Ultrasonic scalars are of two types ie

Magnetostrictive And Piezoelectric

Sonic Scalars

Sonic scalars are connected to the dental unit's compressed air valve. Their frequency varies from 2500 Hz to 8000 Hz. In Sonic scalars, the stroke motion is orbital. However, water is required to cool the heat from the friction of the tip. Another fact is that, in sonic scalars, all sides of the tip are active

Advantage

The main advantages of Sonic scalars are that they are portable and inexpensive. They can be used in patients with cardiac pace makers

Disadvantages

Their disadvantages include the fact that they produce more sound and have decreased clinical power. They also do not create cavitation.

Ultrasonic Scalars- Magnetostrictive

They function at a Frequency of 18000-45000 Hz. They have elliptical stroke motion and all sides of the tip are active.

Advantage

More surface area can be covered on the root surface, especially in concavities such as furcation with minimal hand/wrist movement [5].

Disadvantage

As they create a magnetic field, they cannot be used in patients with cardiac pacemakers [6].

Ultrasonic Scalars- Piezoelectric

This portable scaler has the perfect combination of efficiency, reliability, affordability and simplicity. They are easy to use and are gentle on patients. They are quite

powerful with a frequency of 28,000- 30,000 HZ. Piezoelectric scalars use less water than traditional scaling methods. Their Stroke motion is linear

Advantages

Piezoelectric units do not affect pacemakers because the energy is produced by ceramic crystals without generating a magnetic field [7].

Little heat is generated and water is not necessary to cool the elements.

The tip never leaves the tooth surface, decreasing root roughness and gingival distention with enhanced patient comfort [8].

Mechanism of Action

- Sonic devices operate at a comparatively low frequency of 3 kHz to 8 kHz and the energy is air driven from the dental unit. The stroke range is significant in distance and is orbital in tip action.
- Piezoelectric units use a quartz crystal that expands and contracts in a horizontal range of motion, thus providing a linear action of the tip[5].
- Magnetostrictive units convert alternating electrical current into mechanical energy at a vibration frequency of 25 kHz to 35 kHz with an action that is elliptical in nature[5].

Multiple actions in ultrasonic dental instrumentation:

1. Vertical motion
2. Horizontal motion
3. Curettage
4. Lavage
5. Cavitation
6. Medications

Advantages of Power-Driven Scalars

- Calculus removal

In shallow pockets, and more effective in pockets >4mm

- Furcation access

More effective in treating class II and III furcation.

- Lavage

Irrigation improves vision and helps speed healing by removing toxic bacterial by-products.

- Bactericidal effect
- Shorter instrumentation time
- Increased patient comfort
- Conservation of tooth surface.
- Penetration into deep periodontal pockets

Disadvantages Of Ultrasonics

- Effect on cardiac pacemaker

Magnetostrictive - generate a magnetic field that might interfere with certain types of cardiac pacemakers.

- Water production and visibility after clinical assessment and treatment planning an armamentarium should be selected tailored to the individual needs of the patient.
- Ultrasonic instrumentations is proven effective and efficient in treating periodontal disease.
- Reduced tactile sensitivity
- Reduced visibility especially when using indirect vision
- Production of contaminated aerosols
- Potential to gouge root surfaces if not used properly.

Newer Inserts And Their Utility In “Difficult To Reach Areas

Modified tips for use in deep pockets:

- Modified contra-angle tip
- Diamond coated ultrasonic tip
- Sonic scaler fitted with plastic tip
- Teflon coated sonic inserts
- Periosonic
- Slim line

Periodontal Scaler With Medicinal Fluid Applicator

A periodontal implement in form of a scaler or curette having at least one blade mounted to one end thereof in

which the body of the implement includes at least one fluid passageway through which a source of medicinal fluid supply including germicidals, anesthetics, soothing agents, hemostatics and are released to the area of the blade during patient treatment by controlled flow such as by metering or capillary action.

Application around Implants

Plastic instruments have been designed for scaling the implant abutment, because metal instruments will scratch and alter the titanium surface[8].

Periodontal Endoscope



Figure 2: Periodontal Endoscope

The user can see “real time” video of the highly magnified environment (approximately 3 mm on screen at a time)[9]. The periodontal endoscope lessens the need for surgical intervention. It provides subgingival visualization of the root surface up to magnifications of 24x to 48x. This is accomplished through a .99 mm fiber optic bundle that is a combination of a 10,000-pixel capture bundle[10].



Figure 3: Dental Endoscope in a Periodontal Pocket



Figure 4: Dental Endoscope viewing a furcation

Conclusion

When used properly, ultrasonics are kind to the soft tissues, requires less healing time and are less tiring for the operator. The combined use of ultrasonic and hand instrumentation is suggested to meet your treatment needs and to achieve the intended clinical results. After clinical assessment and treatment planning an armamentarium should be selected tailored to the individual needs of the patient. Ultrasonic instrumentations are proven effective and efficient in treating periodontal disease.

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