

THE SCIENTIFIC BASIS AND CLINICAL VALIDATION **OF THE EFFICACY OF IRRIGATION** **UTILIZING MAGNETOHYDRODYNAMIC PULSATILE PRESSURES**

*Dr. Louis J. Naman, 1998 AAID Research Foundation Meeting, San Diego, California,
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The accumulation of bacterial plaque and the subsequent formation of supra and subgingival calculus is one of the primary causes of the ultimate failure of many dental implants.

The first organisms to appear on the exposed metal of dental implants are streptococci, which attach themselves to the surface with extracellular adhesives. These are followed by filamentous actinomyces, vibrios, spirochetes, gliding rods and flagella organisms. This produces a semipermeable gram positive bacterial plaque forming peri-implant pockets.

Eventually over 200 strains and species agglutinate and inhabit the pocket. The streptococci and other facultative organisms use up available oxygen, producing an oxygen-free environment for the rapid introduction of anaerobic gram negative pathogenic organisms.

When the metabolic byproducts of these organisms are secreted into the peri-implant pocket, the immune system is compromised.

Polymorphonuclear leucocytes emerge from the capillary beds to phagocytize these pathogens and debris. This produces a negative pH, thus causing soft tissue destruction and bone resorption.

When mucinous bacterial plaque is left undisturbed, there is a shift from gram positive organisms to gram negative pathogens. However, if the plaque is disturbed in the early stages of development, the inflammatory process will be reversed before any apparent damage occurs to the soft tissue or bone. This can be accomplished by brushing and flossing.

However, when the pocket depth exceeds 5mm, brushing and flossing become ineffective.

Irrigating devices have also been employed to flush out the plaque. Chlorhexidine, Stannous Fluoride, and topical and systemic antibiotics have also been used, but with limited success.

The next step is surgery to reduce the pockets, but without proper maintenance, in time the process starts all over again.



In the Journal of Clinical Periodontology, 1993, Rosenfelder and Sutton reported on a study they conducted in which a magnetic oral irrigating device was effective in removing calculus and plaque in the range of 44% in a double-blind study when compared to a non-magnetic oral irrigating device, when all other factors of flossing and brushing remained the same. Subsequent reports of over 75% reduction of plaque and calculus formation have been presented.

The periodontal pocket, when first formed, has an opening space of 0.25 mm wide and since bacteria are in the range of .5 microns, this represents an opening analogous to a mile-wide passageway for microorganisms to invade the periodontal pocket. However, when flossing and brushing are of no avail, there is ample room for ionized water produced by this mechanical device to invade and flush out the pocket with pulsating intermittent pressure. This effectively removes the microbial plaque inhibiting calculus formation. This produces an aerobic gram positive non-pathogenic environment in the pocket, permitting the inflamed and infected tissues surrounding the teeth and implants to return to normal health and function.

Micro-movement of dental implants also creates an environment that is conducive to the onset of infection. This motion facilitates the movement of bacteria and fluids into the implant sites.

Micro-movement at the time of placement can also compromise the ingress of vasculo-cellular elements into the healing sites.

This action can restrict the oxygen and antibiotic delivery to the healing tissue and hinder the activity of the cellular elements needed to combat the progress of infection.

The standard treatment of infection includes:

- a) Incision and drainage
- b) Removal of the source of infection
- c) Appropriate antibiotic therapy
- d) Debridement of necrotic material
- e) Wound irrigation

The removal of pathogenic bacteria and debris is essential in the treatment of infected dental implants.

This is commonly accomplished by a combination of mechanical detriment and wound irrigation.

There are four types of wound irrigation:

- a) Simple irrigation
- b) Pressure irrigation
- c) Continuous stream irrigation
- d) Pulsatile pressure irrigation



During SIMPLE IRRIGATION the wound is flushed with copious amounts of saline.

PRESSURE IRRIGATION delivers saline to the wound at a pressure greater than gravity and is more effective than simple irrigation.

Pressure irrigation can be accomplished by the use of conventional large irrigation syringes with either a bulb or plunger type system to deliver the saline that is brought into it by hand manipulation.

A CONTINUOUS STREAM TECHNIQUE utilizes an irrigation bag containing saline and inflated to 60 psi. This will deliver a constant stream under pressure.

This technique, however, subjects the tissue to continuous compression that can trap debris and infected material and drive it deeper into the wound.

In the journal "Compendium", Vol. 17 #9, Sept. 1996, Norman Butts, DDS, presented the results obtained in their treatment of grossly infected mandibular fractures utilizing PULSATILE PRESSURE SALINE IRRIGATION.

Healing was more rapid and uneventful than that using all other forms of oral irrigation.

The pulsatile pressure technique uses an adapted jet that delivers 700ml to 1500ml solution per minute in a pulsatile fashion at 1psi to 100psi.

The debris and irrigation solution is removed from the wound site by a suction system attached to the pulsatile applicator.

In studies conducted by the U.S. Army School of Dental Research, pulsatile pressure irrigation was found to be superior to continuous stream irrigation and all other forms of oral irrigation in spite of micro-movement, systemic disease and severe infection.

The use of pulsatile pressure in the range of 70psi or less removed almost ten times more bacteria and debris than all other forms of irrigation tested.

Negative bacterial cultures of contaminated wounds were obtained as quickly as nine days earlier.

The pulsatile pressure technique consists of an impulse decompression phase that allows the compressed tissue to rebound. During this brief period, foreign material and bacteria is forced from the tissue and is flushed from the area.

Pulsatile pressure irrigation in the range of 45psi to 70psi is forty times more effective in removal of bacteria and debris than all other forms of irrigation and causes no damage or irritation to the infected tissue. *



The addition of tetracycline to the irrigation solution in the wounds treated with pulsatile pressure irrigation produced less edema and inflammatory response and a marked decrease in the number of positive bacterial cultures, and the wounds healed as much as three days earlier than with pulsatile pressure alone.

The first successful clinical use of the pulsatile pressure irrigation on human subjects was reported by S.N. Beshkor et al. in 1971.

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