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Perioscopy in Dentistry- A Literature Review

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Review Article

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Abstract: The aim of this review is to summarize existing evidence of history, parts, mechanism and uses of perioscopy. The perioscope, as it is called, is an endoscope that has been specifically designed to explore and visualize the periodontal pocket in patients with periodontitis. An image on a computer monitor shows the diseased tooth's root surface. The perioscope enables the clinician to see the contents of the periodontal pocket and to analyze the root surface of the tooth for disease, as well as to see plaque and calculus. This form of periscope, with the addition of two simple lenses, served for observation purposes in the trenches during World War I. The existing literature on perioscopy, the literature on the videoscope, the literature on VMIS, and the techniques designed around the advantages of the videoscope have been reviewed. The published clinical results are favorable and indicate that VMIS can be used to consistently regenerate bone around periodontally damaged teeth.
Keywords: videoscope, perioscopy, periodontitis.

INTRODUCTION

A Perioscope is a dental endoscope (endo means "within" and scope means "observe or look at"), and the procedure using this tool is known as Perioscopy. It is used to view inside the pockets between the gum and teeth at high magnifications [1]. The World Health Organization indicated that tooth loss caused by severe periodontitis occurs in 15%–20% on middle-aged adults (35–44 years old) in most populations worldwide [2]. The effective treatment of periodontitis involves the detection and removal of subgingival dental calculus.

In general, subgingival calculus is more difficult to detect than supragingival calculus because it is firmly attached to root surfaces with periodontal pockets. The periodontal dental explorer is the traditional method for detection of subgingival calculus, but its use depends upon the tactile sense of the operator. Because a smooth and clean root surface is often considered the endpoint of scaling and root planing, clinicians often remove excessive amounts of the root structure because of decreased visibility [3]. Recently, several novel methods have been developed to facilitate dental calculus detection. For example, a periodontal endoscope, which consists of a fiber optic bundle with a diameter of approximately 1 mm, can be inserted into the periodontal pocket to magnify the root surface. The light-emitting-diode based optical probe detects the specific spectral signature caused by the absorption and reflection of a certain area and uses this signal to distinguish subgingival dental calculus from sound enamel [4]. Medical endoscopic technology was modified for application in the dental environment. It comprise more and more uses, they were evaluation of subgingival root deposits, caries root fracture and treatment planning, delivery and evaluation of therapy. The aim of this review is to summarize existing evidence of history, parts and uses of perioscopy.

HISTORY

Perioscopy is a minimally invasive dental endoscope that allows clinicians and hygienist to see magnified details of tooth anatomy below the gum line. In its simplest form, it consists of an outer case with mirrors at each end set parallel to each other at a 45° angle. This form of periscope, with the addition of two simple lenses, served for observation purposes in the trenches during World War I. Military personnel also use periscopes in some gun turrets and in armoured vehicles [5].

PERIOSCOPE

This endoscope for dental puposes is manufactured by dental view inc., lake forest CA, USA (Fig-1). Perioscopy consist of four parts 1.perioscopy unit, 2.perioscopy explorers (Fig-2), 3.perioscopy sheaths (Fig-3), 4. Perioscopy fibre (Fig-4). The miniature camera is attached to the fiber .The endoscope has a flexible design that can be combined with other dental instruments [6]. The use of this technology has been previously described in few case reports and other clinical studies [7, 8]. The equipement consist of gradient index of lens that is mounted on the end of a 2m long fused fiberoptic bundle containing 10000 individual light guiding fibers (pixels). Surrounding the fused bundle and lens are 15 large core plastic fiber optic stands for carrying illuminative lights from a remote lamp to the operative site 0.85 mm diameter of flexible plastic tube at the distal end. A spring activated connector located 1mm from the distal end to window sheath.

Fig-1:

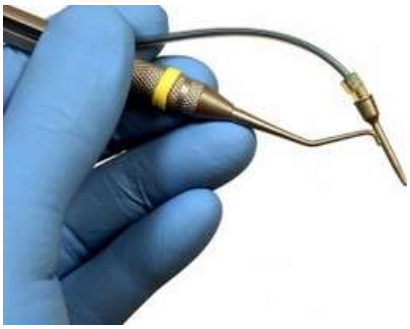

Fig-2:

Fig-3:

Fig-4:

USES

Endoscopic Treatment Options

Secondary use: Patients go through traditional tactile debridement followed by reevaluation; then sites that have not responded are endoscopically debrided.

Primary use: Patients don't go through a separate tactile debridement; they have initial endoscopic debridement followed by reevaluation [9].

The perioscope, as it is called, is an endoscope that has been specifically designed to explore and visualize the periodontal pocket in patients with periodontitis. An image on a computer monitor shows the diseased tooth's root surface. The perioscope enables the clinician to see the contents of the periodontal pocket and to analyze the root surface of the tooth for disease, as well as to see plaque and calculus. It also allows for identification of other problems, such as cracks in the tooth, and perforations and other disease entities of the root surface. Previously, this would require a surgical procedure.

Detection and removal of subgingival calculus

Dental calculus primarily consists of inorganic content, including dicalcium phosphate dehydrate, octacalcium phosphate substituted hydroxyapatite, and magnesium-substituted tricalcium phosphate, covered by an unmineralized bacterial layer. The porous structure of calculus largely resembles that of dentin [10]. Kurihara *et al*., showed that the fluorescence intensity can also be used to distinguish dental calculus from sound enamel with high reproducibility in vitro [11]. However, the relatively low intensity of the signal from subgingival dental calculus or from bacteria or blood covering dental surfaces has limited the application of these modalities in clinical use. MENG-CHUN KAO *et al*., said that the 3D OCT scanning design and flexible projectile processing are also useful in image registration for OCT images from multiple measurements, such as monitoring of calculus lesions after treatment.

Vedioscope assisted minimally invasive periodontal surgery:

Stephen K Harrel *et al*., reported that, 1 year outcomes from vedioscope assisted minimally invasive periodontal surgery. Sample of 18 patients having a residual pocket probing depth atleast 5 mm and 2mm of clinical attachment loss following initial non surgical therapy were treated with V-MIS. There was a statistically significant improvement ($p \geq 0.001$) in mean PPD (4.11± 0.98 mm) and CAL (4.58±1.19 mm) in surgical site. A mean improvement in the soft tissue also noted (0.48±0.65mm $p \geq 0.006$). The improvement associated with V-MIS appears to be favour when compare to previous reported result of periodontal regenerative surgery [12].

Stephen K. Harrel, DDS videoscope incorporates a gas shielding technology that eliminates the problems of fogging and fouling of the optics of the videoscope that has previously prevented the successful application of endoscopic visualization to periodontal surgery [13]. Additionally, as part of the gas shielding technology the videoscope also includes a moveable retractor specifically adapted for minimally invasive surgery [14].

Dental implant

The cause of bone loss around implants is unknown, and many different causes for bone loss around implants may exist. Clearly, because the implant interface with the bone is completely different from a natural tooth, it is unlikely that peri-implant bone loss is the same process that occurs in periodontal bone loss around natural teeth [13]. Various factors have been suggested, including bacterial plaque, occlusion, and improper surgical placement of the implants.

While these conditions perioscopy is used to locate and eliminate foreign material that may cause further damage to the implant-supporting bone in the future as well as may interfere with the regeneration of bone around the implant

SUMMARY

The existing literature on perioscopy, the literature on the videoscope, the literature on VMIS, and the techniques designed around the advantages of the videoscope have been reviewed. The published clinical results are favorable and indicate that VMIS can be used to consistently regenerate bone around periodontally damaged teeth with no recession and a

possible improvement in soft tissue height. In addition, the application of the VMIS technique to peri-implant bone loss has been reviewed. The videoscope is also being used for other surgical and non-surgical procedures. Some of these are surgical and non-surgical endodontic procedures, sinus elevation surgery, and non-surgical hygiene procedures. Research in these applications is ongoing. This is a great advance for us as dental professionals and for our patients. Before perioscopy existed, we had to cut open your gums to remove any infection. This new technology has given us a less invasive way to examine your gums and to treat any problems we may find.

Conflicts of Interest: The author declares no conflict of interest.

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