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USE OF SURGICAL MICROSCOPE IN NON SURGICAL PERIODONTAL THERAPY

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Abstract: The aim of this review article is to outline the use of surgical microscope and microsurgical loops in enhancing and removal of calculus under magnification. The use of high level magnification combined with head mounted coaxial lighting may improve the ability of dentist to perform prophylaxis. The detection and removal of calculus located subgingivaly can be visualised by magnified view of supragingival contours. Use of magnification, facilitates improved visual acuity, rapid wound healing and increased acceptance by the patient.

Keywords: Microsurgical loops, Scaling and root planning, Non surgical periodontal therapy.

1. INTRODUCTION:

Microsurgical concepts have been recently introduced in the field of Periodontics. The therapeutic value of dental prophylaxis is removal of calculus from the teeth surface, and biofilm located within periodontal pocket[(1)]. In dentistry, the use ofmagnification system and periodontal microsurgery becomes a broad movement, to perform minimal invasive procedure[(2)]. For diagnosis and treatment of periodontal surgery, the surgical microscope is an inevitable aid for Periodontists. Microscopic level magnification helps the dentists to improve the ability to detect colour difference between calculus and normal tooth structure and also detect microscopic amount of calculus located subgingivally.[(1)]

2. HISTORY:

Normal vision is enhanced in microsurgery which helps in refinement of surgical technique. The first microsurgery was reported by Carl Nylen in 1922, performed ear surgery under microscope[(3)]. In 1960s, endoscopic microsurgery of larynx was introduced[(3)]. The 2-3 x binocular loupes were used by some dentists occasionally, but because of its low power it is inadequate. So that a special dental operating microscope come into dental field with accessory instruments and epuipments. In 1978, Apothekar and Jako first introduced the microscope to dentistry[(4)]. By 1992, Carr published an article which outlines the use of microscope in endodontic procedure[(4)]. In 1993, microsurgery was introduced in the speciality of Periodontics. Cario et al, described the treatment of periodontal pocket with shallow to moderate bony defect in esthetic zone.[(2)] Proprioceptive guidance is of little value

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under microscope, so visual guidance is used to make a midcourse correction of operating hand position to maximize fine movements required for treatment procedure. About 70-80% of typical periodontal procedure could be performed at magnification 10-20× and remaining could be with loupes under 6-8× using enhanced motor skills with surgical microscopes[2].

SURGICAL MICROSCOPE AND ASSOCIATED EQUIPMENTS:

Two types of stereoscopic microscopes are used in dentistry. First type is Greenough, which hastwo monocular microscopes arranged side by side at an angle so that two objectives focus on same object. The second type is Galilean type which is based on the application of magnification loupes combined with binocular viewing system. The working distance of operator in Galilean microscope is 200-300 mm from collimating lens to the subject. Other features include

- Coated optics with achromatic lenses which provides good optical resolution and efficient illumination,
- Fiberoptic coaxial illumination helps in focusing the light parallel to the microscope's optical axis to eliminate shadows[2]
- Rotating variable magnification that allows the clinician to change working magnification easily.
- Assistant eye piece attachment facilitates the surgical assistant's visibility during microsurgery procedure.[2]
- Microvision allows definite visualisation of root surface deposits and irregularities.
- Video and still imaging cameras helps for documenting periodontal pathology and procedures, using a digital or 35mm image producing beam splitter camera attachment.[5]

ADVANTAGES OF MICROSCOPES IN PERIODONTICS:

- Improved view of root surface helps for more definite removal of calculus and improved smoothness of the root surface.[4]
- Various postural and ergonomic method helps to reduce unwanted hand movementin more precise surgeries which reduce occupational pathology to practicing periodontics.[2]
- Smaller instrumentation helps in increased precision delivery of surgical skills which results in more accurate incision.[4]
- Smaller needles and sutures permits precise repositioning of tissue.[4]
- Microsurgery facilitates faster healing of smaller surgical wounds.
- Highly accepted by patients.[2]

LIMITATIONS OF SURGICAL MICROSCOPE:

- Surgical operating microscope require training and practice to gain proficiency[2]
- The microscopic units need space for maneuverability and good external source of illumination in addition to its built in light system.[2]
- They are expensive[2]

MICROSCOPIC AIDED SCALING AND ROOT PLANNING:

The root debridement is an inevitable component in periodontal therapy. Complete removal of subgingival calculus and root planning helps in new attachment of periodontal ligament. Improved view of root surfaces, permits more definitive removal of calculus and improved smoothness of root[2].The microscope helps the dentist to precise the

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tactile sensitivity to determine the smooth and rough calculus. A tactile feeling is associated with microscopically small point on the tooth surface that is directly visible as point on supragingival tooth structure.Magnified view of the supragingival tooth surface, the angle in threedimensional space of the long axis of the tooth, the dimension of the perimeter of the tooth at the gingiva, and concavities on the supragingival clinical crown that indicate the furcations of roots or subgingival tooth surface concavities can be provided bymicroscope-level magnification[(1)]. A magnified view of the interproximal area between two teeth allows a dentist to better determine the location of the interfaces between tooth structure, gingiva and alveolar bone, and the locations of the contact areas[(1)]. The dentist can better estimate the dimension of the contact area in three-dimensional space from the buccal to the lingual direction, and the dimensions of the empty embrasure space between the teeth.

DETECTION OF HARD CALCULUS USING MICROSCOPE:

A dentist can use microscopically, precise tactile sensitivity to determine if there is calculus at any microscopically small point on a subgingival tooth surface and associate tactile sensation of smooth and rough point on a tooth surface. A tactile feeling may be associated with a microscopically small point on a tooth surface that is supragingival tooth structure, or a subgingival surface point, the location of which is inferred base on a magnified view of the angle and depth of penetration of a cavitron tip into a periodontal pocket[(1)]. The dentist using microscope may observe that touching a cavitron tip to this apparent tooth "surface" results in microscopically small incremental increases in the depth of penetration of the cavitron tip towards the actual subgingival root surface. This increasing depth of penetration shows this subgingival "tooth surface" is actually subgingival calculus[(1).]

ORIENTATION OF CAVITRON TIP:

Microscopic -level magnification allows a dentist to efficiently angle a cavitron tip in three-dimensional space so that the tip contacts calculus precisely. A cavitron tip tangential to the tooth surface, contacts multiple points on the tooth surface simultaneously, or only the tip of the cavitron may touch a single point on the tooth surface[(1)]. A magnified observation of how the tip contacts a tooth surface allows a dentist to evaluate if a particular tip contact results in efficient removal of the calculus. With the microscope the dentist can determine at what precise angle and depth of penetration the cavitron tip contacts the subgingival tooth surface at each point along the tooth perimeter. A magnified view of a tooth allows a dentist to detect if the subgingival tooth structure is undercut, relative to the supragingival tooth structure and to angulate the cavitron tip accordingly to ensure that it contacts the undercut for a meticulous clean[(1)].When the dentist places a cavitron tip interproximally or subgingivally and feels a hard structure, a magnified view allows a dentist to intelligently presume if this hard structure is calculus, tooth structure or alveolar bone, or if the tip is lodged between two proximal tooth surfaces that form the embrasure space[(1)].

ASSESSING AND REMOVAL OF TOOTH STAINS:

A dentist can better analyze the types and possible causes of a patient's tooth stains using microscope. Stained calculus collects in microscopic pits or depressions on a tooth surface. Microscopes helps to detect these pitted surfaces and aid in precise smoothening of the surfaces using an aluminum oxide composite polishing bur in a high-speed handpiece[(1)]. Microscopic overhangs and ledges on composite restorations that catch and retain organic particles can also produce stains. Stains associated with deep pits or soft areas can be due to dental caries and would require direct restorations. Microscope-level magnification helps to detect a thin, square-shaped film of yellow discoloration on the facial surfaces of incisors,

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which could be old orthodontic composite bonding material which were not removed during orthodontic brackets removal[(1)].

3. CONCLUSION:

Scaling and root planning forms the basis of periodontal therapy, even though they can be performed in normal vision, performing it using microsurgical instruments provide improved visual acuity which enhance dentist's ability to perform prophylaxis procedure by improving the ability to detect hard calculus and soft biofilm. It also helps to detect the morphological contours of both supragingival and subgingival tooth surface and to precisely reproduce working end angles that results in efficient cleaning of tooth surfaces.

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