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NEWER METHODS OF EXTRACTION OF TEETH

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ABSTRACT

Atraumatic extraction methods are deemed to be important to minimize alveolar bone loss after tooth extraction and to facilitate subsequent implant restoration and optimal esthetic outcomes. With the advent of such techniques, exodontia is no more a dreaded procedure in anxious patients. Newer systems and techniques for extraction of teeth have evolved in the recent few decades.This article reviews and discusses new techniques to make simple and complex exodontias more predictable and efficient with improved patient outcomes. This includes physics forceps, powered periotome, piezosurgery, benex extractor, Sonic instruments for bone surgery, lasers.

KEYWORDS: **Physics forceps, Piezosurgery, Benex extraction, Powered periotome**

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INTRODUCTION

The traditional means of extracting teeth often involving creation of a mucoperiosteal flap, elevation, and luxation with forceps often results in fracture or deformation of the dentoalveolar complex.[1] This trauma could lead to ridge defects, making the placement of implants very difficult or even impossible in some cases. Also, elevation of the mucoperiosteum may compromise the periosteal blood supply to the alveolus, leading to loss of marginal alveolar bone even in relatively atraumatic extractions. Regardless of whether an implant is placed immediately postextraction or if the socket is grafted in preparation for future implant placement, the preservation of alveolar bone allows for more aesthetic and functional implant restorations. Millimeters do count when it comes to implants. Atraumatic tooth extractions are desired more and more to preserve bone for immediate implant placement and to aid in successful prosthetic rehabilitation. As a result Newer systems and techniques of extraction have evolved to achieve this target. This article discusses the various innovations in the extraction methods and their potential applications in oral and maxillofacial surgery.

PHYSICS FORCEPS

The Physics Forceps (Golden Dental Solutions, formerly known as GoldenMisch) invented by Dr. Richard Golden have a beak and bumper design that allows for efficient atraumatic extractions using only wrist movement based on Class I lever mechanics.. The Physics Forceps technique eliminates the need to firmly grasp, twist, rock, push and pull with arm. In dentistry, the physical change of expanding the dental alveolar bone (socket) along with the severing of the periodontal ligament is the basis of tooth extraction. Although this does happen, it is more important to understand what is occurring biochemically with the tooth and its socket. When the periodontal ligament is traumatized with forceps or elevators, hyaluronidase (hyluronate glycanohydrolase) is released. This is an enzyme that catalyzes the hydrolysis of the interstitial barrier, hyaluronan (hyaluronic acid), which is the cement substance (extracellular matrix) of all human tissues. The tooth is released from its attachment to the alveolus and can be removed, once chemical breakdown of the periodontal ligament by hyaluronidase occurs. This technique applies a steady rotational trauma to the periodontal ligament quantitatively creating a release of hyaluronidase in a shorter period of time than traditional forceps or elevator extractions because the trauma from these conventional techniques is intermittent (ie, not a steady constant force). As a result, the Physics Forceps technique is more efficient, faster, and less traumatic to the alveolar bone than conventional methods.

Mechanism of physics forceps

The physics forceps[2] uses first-class level mechanics to atraumatically extract a tooth from its socket. One handle of the device is connected to a “bumper,” which acts as a fulcrum during the extraction and stabilizes the beak during wrist movements. This bumper is usually placed on the facial aspect of the dental alveolus, typically at the mucogingival junction. It is critical that the bumper side of the forceps always be seated higher than the beak side before beginning the extraction. The beak of the extractor is positioned most often on the lingual or palatal root of the tooth and into the gingival sulcus.[3] Unlike conventional forceps, only one point of contact is made on the tooth being extracted. Together the beak and bumper design acts as a simple first- class lever. A squeezing motion should not be used with these forceps. By contrast, the handles actually rotate as one unit using a steady yet gentle rotational force, a few degrees for a few minutes with wrist movement only. An element of “creep” allows the bone to slowly expand and the PDL to release. Once this occurs, the tooth will disengage and rise approximately 1-2mm occlusally. and can be delivered with a hemostat, rongeur or conventional forceps. No force is required to be placed on the beak, which is only on the lingual aspect of the tooth

root, therefore, the tooth does not split, crush or fracture. The force applied to the gums and bone by the bumper of the Physics Forceps is over a greater surface area and is a compressive force, thus bracing the buccal bone. This permits the lingual plate to expand more and protects the facial plate from fracture. With this technique, no prior elevator use is required before attempting the extraction and no mucosal flap need be used. Thus Physics Forceps has been developed to apply a biomechanical rationale to the extraction process of a tooth using a class 1 lever, creep, and shear components of force and extraction can be done with very minimal force.

Advantages

Predictable and efficient extractions typically in less than 4 minutes; Preserving the buccal bone and cortical plate; Preventing having to lay flaps and removing bone to access roots; Virtually eliminating root tip fractures; Assisting with efficient full mouth reconstructive extractions; and Supporting immediate implant placement.

POWERED PERIOTOME

A powered periotome (Powertome 100S, Westport Medical Inc., Salem, OR, USA), is an electric unit that contains a handpiece with a periotome that is activated by a foot control. This device allows precise control over the quantity of force that the periotome tip exerts and the distance it travels into the PDL space. This instrument has a microprocessor-run actuator that eliminates uncertainty while extracting a tooth and comes with a controller box that can be adjusted to 10 different power settings.The powered periotome functions by using the mechanisms of wedging and severing to aid in tooth extraction.[4] These instruments are made of very thin metal blades that are gently wedged down the PDL space in a circumferential manner which severs Sharpey fibers, which function to secure the tooth within the alveolar socket. After most of the Sharpey fibers have been severed from the root surface, gentle rotational movement with minimal lateral pressure facilitates tooth removal.[5] When using the powered periotome, starting interproximally seems to work most efficiently because of the thickness of the interproximal bone. It is important to keep the blade parallel along the long axis of the tooth being removed. The blade should follow the tooth anatomy circumferentially in an apical direction in 2- to 3-mm increments. When extracting a multirooted tooth, it is most efficient to section the tooth and treat each sectioned root as a single-rooted tooth.[6]

Advantages:[7,5]

Surgery can be flapless, Faster than manual periotomes, Minimal or no alveolar bone loss, Less risk of fracture of the lingual or buccal plate, Reduced pain and swelling for patient, faster recovery time, Reduced bone loss in extraction, Increases efficiency in extraction, Allows for immediate implant after extraction, preserves bone and gingival architecture, maintains periosteal blood supply, reduced extraction time than conventional techniques, provides extremely sensitive tactile feedback than manual periotome.

PIEZO SURGERY

Piezosurgery system was introduced in 1988 by Mectron medical technology, Carasco, Italy and has improved since then. The equipment works on the principle of ultrasound and consists of a piezoelectric handpiece and a foot switch that are connected to a main unit, which supplies power and has holders for the handpiece and irrigation fluids. The system produces a modulated ultrasonic frequency of 24 to 29 kHz, and a microvibration amplitude between 60 and 200 microm/s.[8] For the handpiece several autoclavable tooltips, called ‘inserts’, are available which are coated either with titanium or diamonds and available in various grades. The system has a peristaltic pump for cooling with a jet of solution that discharges from the insert with an adjustable flow of 0-60 ml/min and removes detritus from the cutting area. During the osteotomy procedure, the working tip is cooled with physiological saline [4degrees C].

Mechanism of action

This system utilizes piezoelectric principle: certain ceramics and crystals deform when an electric current is passed across them, resulting in oscillations of ultrasonic frequency. Microstreaming and cavitation phenomenon are the peculiar features of piezosurgery.[9] The microstreaming is generated by a continuous whirling movement of a fluid generated by a little vibrating insert that favours a mechanical action of debris removal. The cavitiation phenomenon, caused by implosion of gas bullae into blood vessels during osteotomy, produces an important hemostatic effect to optimize intraoperative visibility.

Applications:[10,11,12]

Atraumatic tooth extraction, Osteotomies in craniofacial region like lefort 1 osteotomy, calvarial osteotomy, Osteotomy during impacted third molar surgery[8], For augmentation in implant operations like sinus lift procedures, ridge expansion, Removal of oral pathologies [cysts], Alveolar distraction osteogenesis, Corticotomy, Jaw resection, TMJ Ankylosis resection. For bone grafting distal to second molars after third molar removal surgery The new bone lid technique[13] uses the piezosurgery device to cut and elevate a precisely defined bone lid on the lateral cortex of the mandible to provide access to the teeth needing extraction or even a lesion that needs to be excised. The bone window is then elevated with the help of a curved osteotome. The tooth or lesion can then be seen and subsequently removed atraumatically by either sectioning with piezosurgery or by circular piezo-osteotomy. After the visual confirmation of an undamaged IAN and adjacent tissues, the bone lid is placed back into its original position and fixated with absorbable miniplates.

Advantages:[10,12]

Reduced facial swelling and trismus, less bleeding in surgical site, allows a very clean and precise surgical cut, does not harm soft tissues such as nerves and blood vessels even with accidental contact with the cutting tip [prevents damage to inferior alveolar and lingual nerves during lower impacted third molar surgeries], safer than traditional burs and surgical saws, effortless and efficient control of the device.

Disadvantages

Increased operative time cannot be used on thick cortical bones and inaccessible areas. Its use is contraindicated in patients with cardiac pace makers.

BENEX EXTRACTION

The Benex extraction system represents an innovative system allowing gentle, secure and easy extraction of the root of the tooth. Benex extractor system developed by Hager & Meisinger GmbH, Neuss, Germany and Helmut Zepf Medizintechnik, GmbH, Tuttlingen, Germany has benex extractor, a pull string, a sectional impression tray, self-tapping screws and matchingdiamond burs in 2 different diameters (1.6 mm and 1.8 mm).[14] This works on the principle that the tooth is extracted exclusively by pulling along its long axis, vertically out of its socket. Similar systems to benex extractor include easy X-TRAC, Apex control. It can be used to extract single rooted teeth, multi rooted teeth with non-divergent roots.Sometimes multirooted divergent teeth can be sectioned and removed. A further advantage of the new Benex Extractor is to be found in the field of germectomy – germs of the teeth are also removed in a gentle and time saving manner.

Mechanism of action: [14,15,16]

Any grossly carious hard tissue was initially removed with a bur or hand instruments. Multirooted lower molars were sectioned. A conventional probe and/or Gates-Glidden burs were used to identify the root canal if appropriate. Using diamond burs, screw hole is prepared in the canal forsubsequent insertion of self-tapping anchor screw with the provided screw driver. After insertion of the pull string into the screw head, the extractor is applied and the rope inserted into the hook of the extraction slide. To achieve axial alignment of the pull rope and/or a stable support for the support disk of the extractor, a small impression tray with silicone putty impression material is

used if deemed to be necessary by the operator. The tooth is then extracted by gradually increasing the traction force using the extractor by turning the knob clockwise, which results in controlled severance of the periodontal ligament fibres and emergence of the retained root/tooth from the alveolus. If resistance is encountered to a moderate to severe traction force, a constant force is to be applied for 30-40 seconds before a further increase of the traction force. Tavarez RR et al[17] present a case report in which they have performed an atraumatic extraction using benex extraction system followed by successful placement of immediate implants. Kuang shi-jun; zheng you-hua et al[18] in their study, Seventy seven teeth in 52 cases were successfully removed without radical fracture and no serious post -extraction reaction was reported with a success ratio of 95%. They conclude Benex extractor to be an effective way of minimally invasive tooth extraction for its simple and convenient application. Egon muska, Clemens walter et al[14] in their study, successfully extracted Ninety-eight out of 111 teeth which were not suitable for forceps extraction with the benex device, indicating an overall success rate of 83%. The success rate was higher in single-rooted teeth (89%), whereas fewer than one-half (43%) of multirooted teeth were successfully extracted. They also suggest that:1) the Benex extractor system may be successfully used for atraumatic tooth extraction; 2) the system has a higher success rate with single-rooted teeth compared with multirooted teeth; and 3) extraction failure is mostly associated with insufficient retention or misplacement of the screw and root fracture. Daniel saund and Thomas dietrich[16] in their article recommend benex system for extraction of incisors, canines, premolars, in selected cases for extraction of molar roots, in particular distal roots of mandibular molars, and the palatal roots of the maxillary molars, rarely in extraction of impacted teeth in selected cases.

Advantages

Reduced trauma to alveolar bone and soft tissues in high-risk patients [post-radiotherapy, bisphosphonate therapy] to reduce complications, suitable for anxious patients, reduced post- extraction bone resorption and preservation of alveolar ridge height and width which is suitable for immediate implant placement.

SIBS [SONIC instrument for bone surgery]

Recently, a sonic instrument for bone surgery (SIBS) (air driven Sonic handpiece SF1LM; Komet, Rock Hill, SC) was developed and various inserts (Sonosurgery, Komet) were designed by Dr Ivo Agabiti, Pesaro, Italy, which can also be used for sectioning teeth and separating the periodontal ligament (syndesmotomy). This handpiece was originally introduced for tooth preparation in fixed prosthodontics to finish the marginal preparation of abutment teeth, but the specifically designed inserts also allows for atraumatic tooth extraction. The SIBS vibrates at a high frequency (6 kHz) and provides an efficient and precise cut as well as allowing the clinician to work close to soft tissue without risking injury. SIBS is an excellent technique for preserving the alveolar bone in clinical situations where an extraction is planned in the presence of a thin buccal or lingual plate.[19] In comparison with other conventional techniques for atraumatic tooth extraction, the SIBS may reduce the surgical time compared to the use of periotomes. When comparing sonosurgery to piezosurgery, the study by Heinemann et al[20] reported that the average heat generated by the SIBS was close to that by conventional rotary cutting instrument (1.54 to 2.29°C), whereas the piezoelectric device produced a greater rise in temperature (18.17°C). Its use is contraindicated in patients with cardiac pace makers.

LASERS for extraction

The laser osteotomy for removal of impacted teeth offers noncontact and low-vibration bone cutting to allow precise bone ablation without any visible, negative, thermal side effects. Stubinger et al[21] presented a comparison of techniques using Er:YAG lasers, using either a fiber-optic delivery system or an articulated arm delivery system to remove impacted teeth in 30

patients. In 20% of the cases in which the articulated arm delivery laser was used to section teeth, a conventional dental drill was needed to finish the procedure. In the case of the fiber-optic Er:YAG laser the fiber was closely guided around the teeth, creating a narrow gap with minimal bone loss. After uncovering the teeth, they were extracted conventionally by means of standard forceps. Inspite of encouraging results, they were time consuming and patients were not happy with sound and smell of laser surgeries.

CONCLUSION

Atraumatic extraction techniques are becoming more and more popular nowadays. Technology has made extraction techniques and outpatient oral and maxillofacial surgery very simple and comfortable, thus benefitting both patients and dentists. Dental practitioners must make use of these systems, to provide high quality of treatment for their patients in a short duration of time.

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