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Review Article

Trans-alveolar extraction: a spectacular oral surgical approach

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ABSTRACT

Dental caries' has significantly become a widespread disease, raising a serious global concern. In certain cases, when caries or other oral symptoms like root resorption, tooth ankylosis seem to happen beyond care; 'dental extraction' becomes inevitable. But, in various cases like retained roots; hypercementosis; impaction; bony sclerosis; where simple extraction is unable to eradicate the distress; "complicated exodontia" or "trans alveolar extraction" ranges the highest accord. A 'trans alveolar extraction is a surgical approach' to successful tooth removal necessary; when a tooth or root cannot be extracted with standard forceps methods, often, because of fracture or other difficulties. The particular "open" or "surgical" technique involves making incisions and exposing the tooth and the underlying jawbone; with the purpose of removing the tooth fragment. It may also owe to alarming post-operative complications, and over-time, studies have evaluated its incidence and management, while effective research highlighting patient demographics, the diagnostic tools like indices for surgical difficulty, and post-operative care with agents like topical ozone therapy is still in progress. This paper chiefly imparts special mention to 'complicated exodontia'-the otherwise typically established oral surgical procedure.

Keywords: Complicated, Exodontia, Surgical, Hypercementosis, Incisions, Flap elevation

INTRODUCTION

What is exactly meant by the term- "Exodontia"?

Definition

The surgical, or open, extraction technique is the method used for recovering the roots that were fractured during routine extraction of teeth and cannot be extracted by the routine closed methods for a variety of reasons- Peterson. Also known as the "open method of extraction". It is defined as the 'painless removal of whole of the tooth or part of the tooth, or part of the tooth with minimal trauma to investing tissues so that the wound heals uneventfully and no post-operative prosthetic problem is created' (Figure 1).

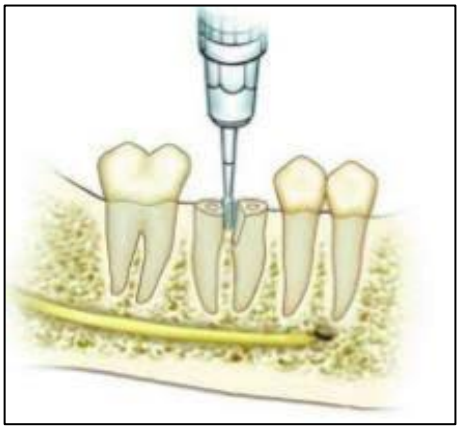

Figure 1: Image showing trans alveolar extraction.

Types of exodontia

Intra-alveolar extraction, also known as "forceps extraction," is a closed method technique of tooth removal that utilizes forceps and elevators. In contrast, extra-alveolar extraction, commonly referred to as "surgical extraction" or "trans alveolar extraction," is an open-view technique that involves more extensive surgical access to the tooth and surrounding structures.[2,3]

Aim and objectives

There are several technical goals to be achieved during the procedure, including improving access, enhancing mechanical advantage, reducing resistance, and correcting an inadequate path of withdrawal.[2,3]

Indications

Teeth that present significant resistance during forceps extraction, as well as retained roots that cannot be grasped by root forceps, may require special consideration. Other indications include hypercementosis of a tooth, radiographic evidence of complicated or difficult root patterns, and sclerosis of the surrounding bone. Additionally, teeth associated with pathology, such as periapical granulomas, cysts, or tumours, as well as impacted or embedded teeth, often necessitate more advanced extraction techniques.[3-7]

Contraindications

Certain patient conditions may contraindicate or complicate tooth extraction. These include severe and uncontrolled diabetes, the presence of an infected extraction site, and patients with gingival diseases. Other considerations involve hypertensive individuals, those with asthma or other respiratory disorders, and haemophilic patients. Tooth extraction is also generally avoided during the first and third trimesters of pregnancy and in immunocompromised patients due to increased risk of complications.[6,8,9]

Factors complicating the procedure

Several dental conditions can complicate tooth extraction. These include internal resorption of teeth, increased bone density around the root, dilacerated roots, ankylosis, and abnormal or unusual root morphology. Teeth that have undergone root canal treatment, grossly decayed crowns, or the presence of significant exostoses may limit buccal bone expansion, making extraction more difficult.

Severe crowding in the dental arch can also restrict access for forceps application, and anatomical variations such as the fusion of two mandibular premolars can further complicate the procedure (Figure 2).[10-14]

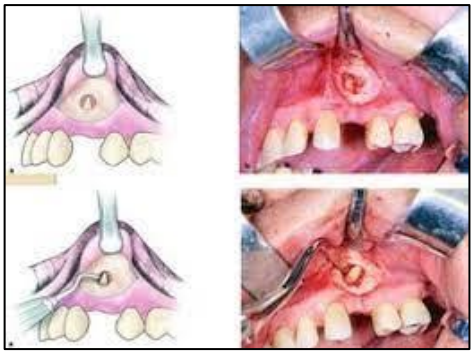

Figure 2: Flap elevation during trans alveolar extraction.

Advantages

Using proper extraction techniques provides several advantages. It allows for good visibility and easy access, helping the clinician perform the procedure efficiently. Additionally, it prevents gingival laceration and reduces the risk of bone or tooth trauma, including fractures. Overall, these measures contribute to a reduction in post-operative complications, improving patient outcomes. Figure 3.[14,15]

Figure 3: Good access and visibility occur after flap elevation.

PROCEDURE

The surgical extraction procedure typically involves several key steps. It begins with the administration of local anaesthesia, followed by carefully planned incisions and flap design. Bone removal may be necessary to gain access, and sectioning of the tooth can facilitate its elevation. After extraction, sharp edges of the bone are smoothed, the socket is thoroughly debrided, and the flap is sutured to promote proper healing.[16-18]

Description of the procedure

Local anesthesia

"Local anesthesia" has been defined as a loss of sensation in a circumscribed area of the body caused by a depression

of excitation in nerve endings or an inhibition of the conduction process in the peripheral nerves.[19] Depending on the quadrant; in which the extraction is to be done, local anaesthetic blocks are given.[19]

Incisions

Incision is defined as a 'cut or wound deliberately made by an operator in the skin or the mucosa; using a sharp instrument such as a surgical blade so that the underlying structures can be exposed adequately for surgical access.[20] Types of incisions are Horizontal, Vertical Semi-lunar.[20]

Horizontal incision

Directed along the gingival margin, either medially or distally.[21] Internal Bevel: At first, the incision is made about 1mm away from the gingival margin, directed towards the crest of the alveolar bone. Crevicular incision: Second incision starts at the bottom of the pocket; normally used in periodontal surgeries.[22] Most desirable Figure 4.

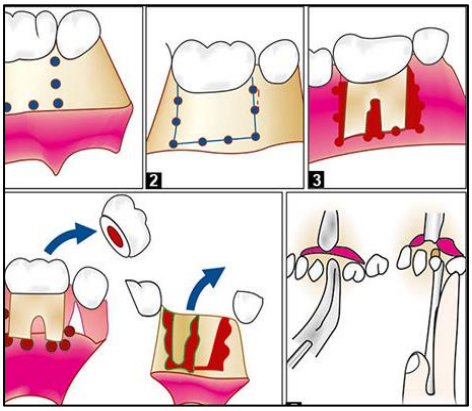

Figure 4: Horizontal incision given at the time of trans alveolar extraction.

Vertical incision

Also called as the 'releasing incision'; on one or both sides of the flap. Figure 5. They should be placed at 'obtuse angle' to the horizontal incision and should leave the interdental papillae intact.[23]

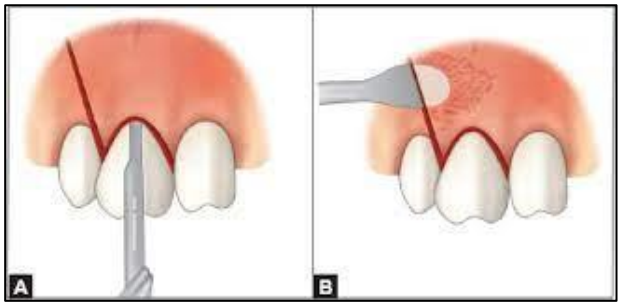

Figure 5 (A and B): Vertical incision at the time of trans alveolar extraction.

Semilunar incision

Also called as the curved or an 'elliptical incision'.[23] It is Used when it is desirable to maintain the attached gingiva intact around the teeth and for endodontic surgery. The gap of 5 mm must be present from the base of the gingival sulcus to the incision.[24] Releasing incisions to be avoided, in the area of the mental nerve. Releasing incisions should be 6-8mm anterior or posterior to the extraction site. Figure 6.

Figure 6: Semilunar flap.

Envelope flap

Ideally, this type of flap should be extended one tooth posterior and two teeth anterior to the one being extracted in order to provide an adequate reflection on the flap. Figure 7.

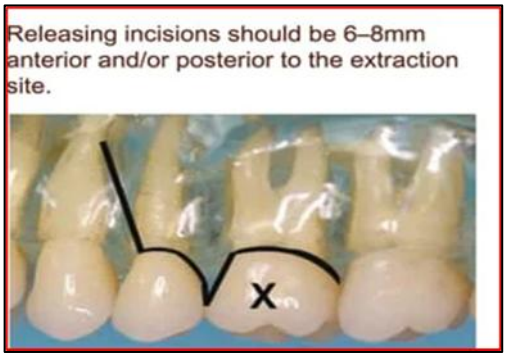

Figure 7: Envelope flap.

PRINCIPLES FOR FLAP DESIGN

Incisions should be carefully planned to avoid important anatomical structures such as major nerves and blood vessels. In the mandibular arch, structures to be avoided include the lingual nerve, mental nerve, long buccal nerve, facial artery, and buccinator artery. Similarly, in the maxillary arch, care must be taken to avoid critical anatomical structures to prevent complications during the surgical procedure. Greater palatine nerve, artery and veins, Incisive papilla, Nasopalatine nerve, incisions far enough from the surgical area: The wound should rest on

the sound bone, so that it will not collapse into the bony defect, and at the same time rapid revascularization is preserved.[26] Incisions should be made parallel to major blood vessels.[27] The base of the flap should be wider than the apex to ensure adequate blood supply.

A firm pressure upon a sharp scalpel should be used so that both the mucosa and the periosteal layers of the gingiva are incised down to the bone.[28] Incisions are made in one operation, as extensions and "second cuts" often leave ragged flap margins and delay healing. The mucoperiosteal flap should be made large enough to provide adequate visibility, accessibility and room for instrumentation.[29] Figure 8. Incisions should not be made in an area of thinned mucosa. Figure 9.

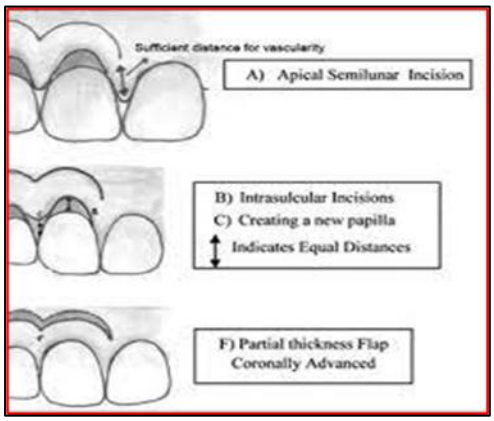

Figure 8: Different flaps and incisions.

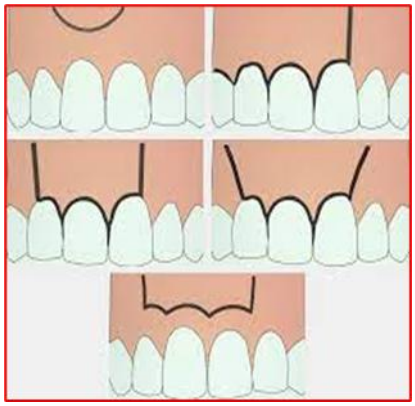

Figure 9: Principles for flap designs.

Reflection of flaps

Flaps are reflected with the muco-periosteal elevators; using the sharp pointed ends.[29] The interdental papilla is freed from the underlying bone. (using the tooth as the fulcrum).

Using the broad end of the elevator in a push stroke; the attached gingiva and the alveolar mucosa are reflected to the desired extent.[30] The muco-periosteal elevator is used in a pull- stroke (Figure 10).

Figure 10: Steps of trans alveolar extraction.

Retraction of the flaps and bone cutting

A periosteal elevator is used as a retractor for small flaps and the Minnesota or the Austin retractors for the large flaps. The bone is removed to some extent; to expose the underlying tooth or the root. The bone must not be sacrificed unnecessarily and the removal must be limited to what is required to achieve certain objectives.[31]

Objectives of bone cutting

Removal of bone during extraction is intended to expose the tooth or its roots prior to delivery, provide a point of application for elevators or forceps, and create space into which the tooth or roots can be displaced. The use of a bur for trans alveolar procedures is often preferred as it allows more convenient and controlled bone cutting without splintering. It also enables the operator to maintain control of the flap while removing bone and permits rapid cutting with minimal discomfort. However, care must be taken to prevent overheating of the bur, and constant irrigation with normal saline is essential. Alternatively, instruments such as chisels and mallets may be used, particularly in the maxilla. These are less time-consuming and may reduce post-operative edema, but they carry disadvantages such as the risk of temporomandibular joint problems, instrument slippage, and potential jaw fracture.[32-35] Bone file or Rasp for Complicated Exodontia??It is a double-ended instrument with a small and large end.[35] It is Used only for final smoothing of the bony ridge after gross removal.[36] The various types of the elevators used are: Coupland elevator- placed at the base of the crown.[36] Cryer Elevators-may be used in the wedging action or buccal elevation. Elevation of the tooth/root from the socket: It is a firm grip of the root or root-mass that can be obtained, the forceps or the use of elevators may be used; wherever applicable. When applying the buccal force; it is necessary to engage the elevator in a notch on the side of the root-mass. Bifurcation of the lower molars. Created with a round bur.[38] When using the elevators, excessive force is never necessary; if the principles outlined for their use are followed.[38]

Debridement and smoothening of the margins of bone

Irrigation of the socket, especially when under the flap, where the bone chips may accumulate. Scraping is done as

to remove any dental follicle or the epithelium; any granulation tissue present within the socket should be curetted.[39] Thorough checking should be done for searching out the remnants of bone. The margins should be rounded, with a round bur. Irrigating the suture again; the bleeding to be controlled. Flap placed into its normal position and sutured; which is supported by sound and intact bone.

Suturing

A suture is a strand of material; used to ligate/ tie up the blood vessels together. Therefore, the sutures perform the act of sewing or bringing the tissues together; holding them in apposition, until healing has taken place. Arrest the haemorrhage and appose loosely soft tissues as to minimize wound contamination with the food debris.[40]

Types of suturing

Various types of suturing techniques are used in oral surgical procedures, including interrupted sutures, continuous sutures, and continuous locking sutures. Mattress sutures may be applied in either horizontal or vertical forms, depending on the clinical requirement. Other commonly used techniques include the figure-of-eight suture and the subcuticular suture, each selected based on the need for wound stability, tissue approximation, and optimal healing.[41]

POST-OPERATIVE COMPLICATIONS

Post-operative complications following tooth extraction can include haemorrhage, pain, and swelling. Haemorrhage may occur due to disruption of blood vessels during the procedure, while pain is a common inflammatory response associated with tissue manipulation. Swelling typically results from local edema and the body's natural healing process. These complications are usually transient and can be managed with appropriate post-operative care, including pressure application, analgesics, and anti-inflammatory measures, to ensure patient comfort and promote optimal healing.[41]

POST-EXTRACTION INSTRUCTIONS

The patient should be advised to firmly bite on the gauze placed over the extraction socket for at least half an hour following the procedure to aid in haemostasis. They should avoid rinsing the mouth vigorously for the first 24 hours, and the use of mouthwash should be avoided on the first day. It is also recommended to avoid hot foods during this period and to follow a soft diet on the day of extraction. The patient should not use a straw, as this may disturb the clot. From the following day, warm saline rinses and gentle brushing can be resumed. Additionally, routine medications should be prescribed as necessary to support healing and manage discomfort.

ARRAY OF ERRORS DURING THE PROCEDURE

Several errors may occur during the extraction procedure, including attempting a simple forceps extraction in inappropriate cases, poor flap design, and inadequate reflection of the flap. The use of uncontrolled force and improper seating or adaptation of the forceps can further complicate the procedure. Additionally, attempting to remove root tips without sufficient access and visualization may lead to complications. Inadequate irrigation of the surgical site before re-approximation of the flap and poor repositioning of the flap can also negatively affect healing and overall surgical outcomes.[38,42]

CONCLUSION

Extraction of a tooth is a procedure that combines the principles of surgery and elementary physical mechanics. When these principles are applied correctly, a tooth can usually be removed from the alveolar process without much strength and untoward force. Removal of an erupted tooth involves the use of controlled force in a definite manner. During pre-extraction planning, hence the degree of difficulty anticipated for removing a particular tooth should be assessed with a higher extent of accuracy.

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