



EVOLUTION OF EXODONTIA – EXPLORING NEWER HORIZONS

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ABSTRACT

Dental extraction or Exodontia is a routinely practiced procedure in Dentistry. There are many techniques and instruments that aid the clinicians in this procedure. Many techniques have been in play since times of Aristotle and Abulkasim. This paper discusses the recent advancements in the science of exodontia and the advantages they have on conventional techniques. Many new technologies have been introduced that help in more efficient surgeries and faster healing. It is upon the judgment of the clinician upon which method to apply in which clinical situation.

KEYWORDS: Dental extraction or Exodontia Aristotle and Abulkasim.

INTRODUCTION

Exodontia is the method of removal of teeth from dental alveolus in the alveolar bone.^[1] This is routine procedure done by the Dentists in clinical settings. A number of instruments and techniques are being employed by clinicians for performing extraction of teeth. These are specific to case situations. There is not universally accepted armamentarium or technique that can fit all the cases. However, constant improvement is being done in these methods to enhance the patient experience, healing and skills of the clinician. In this paper we are going to discuss some latest innovations in exodontia which are now being used by clinicians in various settings.

HISTORY

The history of exodontia using extraction forceps goes back to the time of Aristotle from 384 to 322 BC. He described the mechanism of dental forceps as “two levers acting in contrary sense having a single fulcrum”. After 100 years, Archimedes came up with the principles of lever.^[2]

After a run of extraction forceps for many years, the first person to apply an elevator using the one lever mechanism was Abulkasim (1050 to 1122 AD). He applied the elevator at the base of the teeth to remove them from the socket.^[3] (Figure 1).

Levers and inclined planes are commonly used in dental extractions. The term machine was used to describe the devices that increase the amount of force applied with

minimal effort.^[4] These devices were inclined plane, a lever, a wheel, a pulley and a screw, which each transmit or modify force or torque in different manners.

A wedge can be described as a double-inclined plane in motion. By applying a relatively smaller force, it can overcome a larger resistance.^[5] Examples of wedge action include the dental elevators and the periotomes – They are used to luxate the tooth from the socket when they are pushed along the root of the tooth.

The last major development which took place in the field of minor surgery was in 1970s when the surgical handpiece was developed.^[6] Prior to that, mallet and chisel were used to remove bone in order to get surgical exposure of impacted teeth and to section their roots to facilitate their removal. Severely decayed, ankylosed and multirooted teeth were also removed using the same technique. Other than this advance, the instruments and techniques used in the removal of teeth have remained essentially unchanged for the last century.

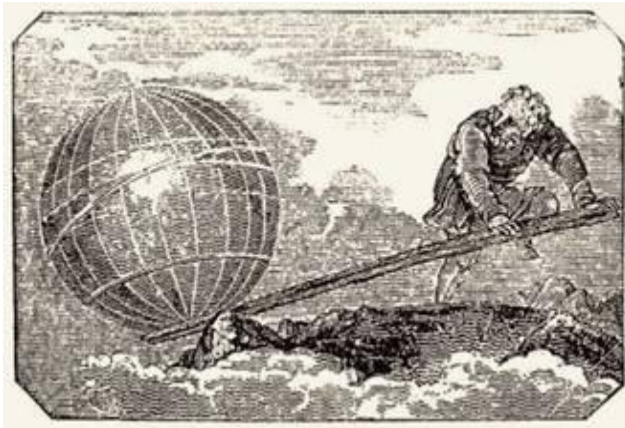


Figure 1 - Concept of leverage

Conventional extraction forceps technique

Dental extraction forceps can actually be thought of as two first-class levers, connected with a hinge. The long side of the lever is the force applied to the handles, the beak on the tooth acts as the short side of the lever and lastly the hinge acts as a fulcrum. As a result, the force applied on the handles is increased greatly to allow the dental extraction forcep to grasp the tooth with a large amount of force. The interesting fact is that none of the force is used to perform the tooth extraction, where increased force may crush or fracture the crown of the tooth. Conventional exodontia requires two equal forces applied on the tooth (squeezing) combined with a third force, which is the movement of your arm, to release the tooth from its socket. This is similar to attempting to pull a bottle cap off a bottle using a pair of pliers versus using the advantage of a lever to remove the cap by using a standard bottle opener.^[3] (Figure 2).



Figure 2 - Class 1 lever

Fractures

Fractures due to improper technique and armamentarium during exodontias is common phenomenon.^[7] These can be grouped into

1. Patient related
2. Tooth related
3. Technique related

While all these factors contribute to fracture of a tooth. We will be discussing techniques that can address all of these and facilitate smoother exodontias.

Bone loss

Araujo *et al* (2005) found the resorption of ridges after a conventional extraction and found that 56% of the buccal

plate and 30% of palatal/lingual plate is lost horizontally after 4 months of extraction. 8 weeks post extraction buccal plate is 2mm apical to the lingual plate leading to a sloped bony contour.^[8] Since labial crestal bone consists entirely of bundle bone, labial bone resorption is typically more severe than palatal bone resorption. So it is imperative that no or minimum trauma is induced to the alveolar bone, in order to minimize resorption.

The Future

Since the focus now is to preserve bone during extractions and minor surgeries, new armamentarium and new concepts and techniques for extraction are being developed. These all are now encompassed under the term atraumatic extraction methods.

1. The Luxator (Figure 3)

It was invented by Swedish Dentist Dr Bo Ericson and metallurgic engineer Eilert Andersson. Specially designed periodontal ligament knives that:

- cut the membrane
- compress the alveolar bone
- gently ease the tooth from the socket.^[9]

Available as LUXATOR Periotomes, Short Periotomes, Dual edge and Forte elevators.

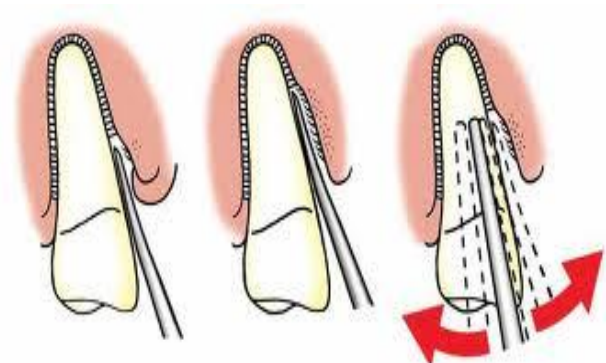


Figure 3 - Working of a luxator in cutting and rocking motion

The tip is inserted between the tooth surface and the supporting bone. It is pushed apically using a slight rotating movement, which compresses the bone and allows the instrument to slide apically. This is usually done mesially, distally and palatally. It is avoided buccally to avoid fracture of thin cortical plates. (Figure 4) It is important to remember that a luxator is not an elevator. If the clinician tries to use it as an elevator, it will bend or break. (Figure 5) To understand the functioning of luxator and elevators better, Figure 6 shows a comparison between the anatomy of both the instruments.

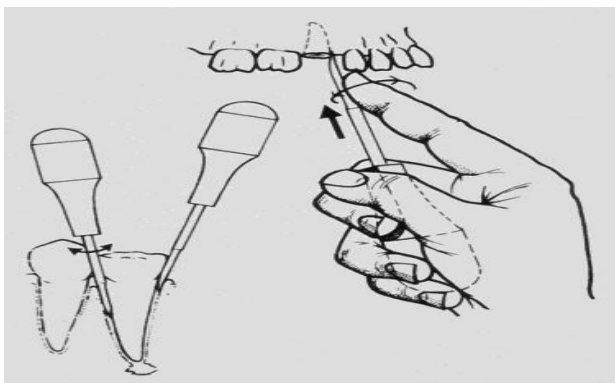


Figure 4 - Working of a luxator



Figure 5 - Broken luxator

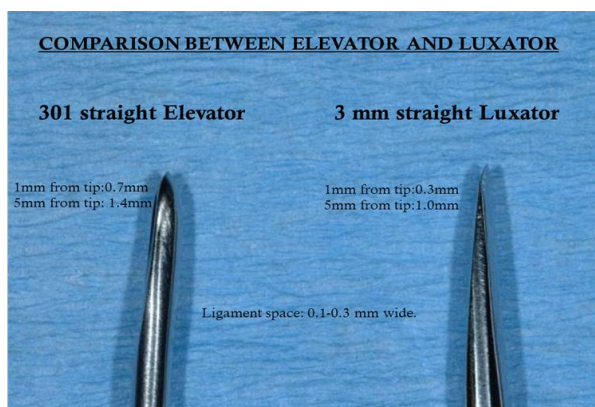


Figure 6 - Comparison between elevator and luxator

2. Periotomes

Periotomes have been in use since 1999. They have a finer blade than a Luxator. These instruments are used to sever the periodontal attachments in single rooted teeth causing minimal damage to the alveolar bone. (Figure 7) The blade of the instrument must be angled 20 degrees to the bone to prevent slipping of the instrument. However, it is difficult to mobilize the root entirely by using periotomes, they must be used to create the space for luxators in tight gaps.^[10]



Figure 7 – Periotomes

3. Piezosurgery

In the year 1997 Professor Tomaso Vercellotti and Mectron developed the idea of piezoelectric bone surgery. Mectron Italy started producing the units for delicate bone cutting in 2000. (11) They consist of very fine blades similar to periotomes for cutting the periodontal ligament. (Figure 8).



Figure 8 - Piezosurgery unit

4. Physics forceps

These forceps were designed by Robert Golden, a practicing Dentist from Detroit, Michigan. They have been touted as the greatest invention in Oral Surgery in the last 200 years. It uses the 'Beak and Bumper' design acting as a Class 1 lever. It functions by application of opposing forces. One force is applied with the beak of the forceps on the lingual aspect of the tooth/root. The second force, the bumper of the forceps is placed on the alveolar ridge below the mucogingival junction. (Figure 9) The handles (once in position) are rotated as one unit for a few degrees, and then the action is stopped for approximately 1 minute. During this period, deformation (creep) of the bone and periodontal ligament occurs. This allows socket expansion. Once creep has expanded and weakened the periodontal ligament and bone, the handle of the extraction device may be slowly rotated another few degrees for 10 to 30 seconds. This action contributes to the creep rupture of the ligament and usually elevates the tooth a few millimeters from the socket. At this point the tooth is loose and ready to be removed from the socket using conventional forceps. It is claimed that as minimal force is placed on the beak, the tooth does not split, crush or fracture. Any tooth (except impacted) can be removed by this technique.^[3]

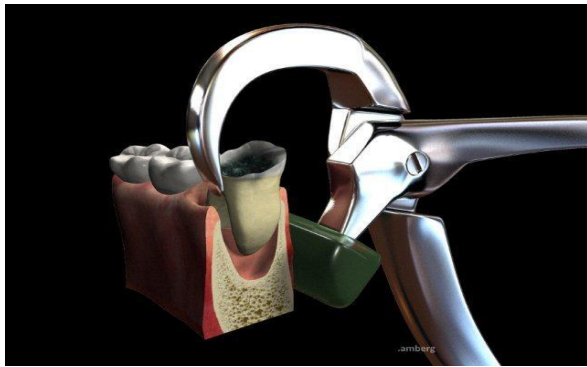


Figure 9 - Physics forceps

5. Benex Extraction System

This system consists of an Extractor, set of self-tapping screws, 1.6mm and 1.8mm diamond drill bits, a pull-string and a sectional impression tray. The chief advantage is that this system allows for minimal expansion of socket, preserving the bone loss.^[12] (Figure 10)



Figure 10 - Benex extraction system

6. The rubber band method

This method proved to be useful in hemophilic patients or patients undergoing radiotherapy –bisphosphonates. Elastics were first used for bloodless extraction of teeth in hemophilic patients by Dalitsch in 1934 and by Birch and Snider in 1939. The technique was suggested first by Wentworth in 1870 after an accidental loosening of a tooth by a rubber band. It functions by two ways – rubber band acts as a foreign body causing inflammation and necrosis of periodontal ligament and the physical pressure pushes the root out of the socket. The mean time required with this process is 6 weeks (6 recall appointments). The length of the procedure depends on the morphology and the attachment apparatus of each root and the patient's cooperation.^[13]

CONCLUSION

If we compare the newer methods in exodontia with the conventional ones, the advantages supersede the disadvantages like high cost and complex armamentariums. Figure 11 shows a concise comparison between the methods. The advent of the newer techniques in exodontia is promising, but lacks scientific comparative studies. More research is needed to test

these methods in wider settings for universal applications.

Comparison between methods

▶ TRADITIONAL

- Expansion of socket
- No prior sectioning
- No vertical traction
- No palatal/lingual instrumentation
- Compression of socket +ve
- Reflection of Flap

▶ NEW

- No expansion
- Sectioning required
- Vertical traction +ve
- Palatal/lingual instrumentation +ve
- No compression of socket
- Flapless

Figure 11 - A comparison between traditional and new methods

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