

Minimal-invasive extraction and Surgical extrusion Application of the vertical extraction System Benex®

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Tooth extraction is one of the oldest and most commonly performed dental surgical procedures, although it ekes out a miserable existence in research. The instruments most often used – forceps and luxators – have hardly changed over the past 100 years. The author has extracted over 10,000 teeth over the last 20 years and developed Benex® in 2003, an atraumatic, vertical extraction system (AES). With this enormous experience, he demonstrates how, in the age of implantology, extraction is performed with the vertical atraumatic extraction system (AES) and how, by using surgical extrusion, teeth - conventionally judged for extraction – can be restored and retained.

Extraction

Benex® is a vertical extraction method in which a tensile force applied along the longitudinal axis of the tooth allows extraction without straining the alveolar bone. This optimally and uniquely preserves the surrounding hard and soft tissue during extraction. This is the best basis for minimizing alveolar bone loss following tooth extraction and thus significantly facilitates subsequent implant insertion. This is of particular relevance for immediate implantation.

Today there are various instruments available based on the corkscrew principle, i.e. instruments for vertical extraction (AES). However, without the Benex® system described here, they deviate from the vertical root axis during root elevation and thus cause an undesired force to be applied on the socket wall.

Extrusion

Following several hundred AES procedures with Benex®, in November 2009 for the first time a conventionally non-restorable root could be extruded rather than extracting it. This means the severely defective root, lacking biological width was transplanted coronally by several millimeters and then splinted to the adjacent teeth and provided with a post core.

On account of the minimally-invasive approach, this surgical extrusion with Benex® results in significantly fewer complications as compared with earlier surgical extrusion procedures. The result could be demonstrated in a clinical study¹ in collaboration with Dr. Gabriel Krastl of the University of Würzburg. Here, teeth usually not considered to be restorable can be preserved using the Benex® extrusion procedure. For this reason, the use of Benex® plays an important role in tooth preservation at the University of Würzburg.

Clinical application of extraction

The extraction consists of luxation *and* elevation. At the luxation a low, sustained force applied to the periodontal tissue with luxator or forceps to induce intra-alveolar root movement. At the elevation the force applied in the root axis with AES (Benex[®], Fig. 1) or with luxator or forceps.

Only after luxation, once the root moves slightly, the root is elevated with the Benex[®] system or pressed out with the luxator. The sustained application of force for 30 to 60 seconds stresses the periodontal fibers and their tear strength gradually decreases. This empirical experience could be scientifically confirmed by force measurements during Benex[®] extraction (Fig. 2).

Consequently, the Sharpey fibers should be stressed immediately after anesthesia. This intra-alveolar luxation requires little force, but 30 to 60 seconds of patience until the tooth or root shows slight movement. If the crown can be gripped, luxation is done with the forceps, rotating around the longitudinal axis. There must be an approximal gap to the neighboring tooth, otherwise the crown has to be approximately sliced. In the case of a root without crown, pressure is applied with the luxator in the mesio-distal direction. In the presence of an adjacent tooth, it can be used to support the luxator (Fig. 3), otherwise the root is osteotomized slightly for applying leverage, without injuring the buccal and oral socket walls.

Multirrooted teeth are separated by bifurcation and the separated fragments are pushed together for luxation. In the maxilla, the palatinal root is pressed against the buccal root – using any kind of forceps – until the separation gap is closed (Fig. 16). The buccal roots are only separated after palatinal root extraction (Fig. 17) and pressed out with the luxator in the disto-palatal and mesio-palatal direction (Fig. 18).

It was shown that an intact alveolar blood clot is the most favorable precondition for wound closure. It enables trouble-free healing and for good regeneration of the socket bone (remodeling). You gain the best results when the patient is biting on a gauze, which only rinsed off with water – without pulling – after 60 minutes (Fig. 9).

Step by step: Extraction of a single-rooted tooth

1. Immediately after anesthesia, the root is subjected to intra-alveolar luxation in the mesio-distal direction using a fine luxator/twister for approx. 30 seconds, without the least transversal force. In the case of well anchored roots, pressure must be applied up to 60 seconds (Fig. 3).
2. Root canal drilling with a trephine drill follows, which facilitates determination of the root axis and allows any canal filling material to be removed (Fig. 4). Preferably, the drill hole with the diamond coated Benex[®] twist drill should be localized in the axis and in the center of the root fragment. It is sufficient if the diamond part of the drill lies 5 to 7 mm in the hard dentin – deeper drilling is not necessary. Drilling should be water-cooled. To remove the smear, make inward and outward movements when drilling deeply (Fig. 5).

3. Depending upon the situation, now insert the extraction screw using the insertion aid. The extractor is positioned on the adjacent teeth, whereby the opening of the round, rotatable segment plate has to be aligned in the vestibular direction to ensure a direct sight to the extraction screw.
4. The extractor has to be positioned such that the same axial direction can be achieved for the screw and the cable. If this is not possible with the straight and the tapered segment plates, the quadrant support comes into use.
5. A quick impression is taken with the putty, whereby hardening can take place extraorally. Important: The putty should be as thin as possible, otherwise the extraction tension will cause the build up of an unfavorable spring force.
6. The pulling cable is hooked into the extraction screw, passed over the pulley and attached to the hook of the extraction slide. By turning the hand screw slightly (so that the cable does not detach), the instrument is moved into the correct position. After 1 to 3 minutes of constant tension, the remaining periodontal fibers tear and the root detaches from the socket (Fig. 7).
7. The blood filled socket is covered with a gauze for 60 minutes (Fig. 8 and 9). If the socket is dry, bleeding is induced deeply apical using a round bur.

Step by step: Extraction of a multirrooted tooth

1. Multirrooted teeth are separated with bifurcation (check with the mirror and very slight leverage). The separated roots are pressed together in the maxilla with forceps (Fig. 16) and in the mandible with a luxator with little force until the separation gap is closed. This way the roots detach without the slightest force on the buccal and oral alveolar surfaces.
2. The well detached palatal molar root is removed with the pole extractor (Fig. 17), with the handpiece used for drilling. Only then the buccal roots are separated and pressed out with the luxator in the palato-mesial and palato-distal direction (Fig. 18).
3. The distal mandibular molar root can be elevated with the extractor or removed with the luxator in the same way as the mesial root.

Step by step: Surgical extrusion

Only single-rooted teeth can be extruded. Ideally, little used, well cutting Benex® screws are used for extrusion. The first steps correspond to those for extraction treatment.

1. Elevation is stopped at the required height of intra-alveolar root transposition with sufficient biological width and the Benex® screw is removed. To release the screw, it is advantageous to push the root back into the socket.
2. The root – held by the loose screw – is returned to the required position and fixed with wooden wedges before the screw is completely screwed out (Fig. 12).
3. Afterwards the build up of the root-post and core can be started for example with everStick / GardiaCore. Splint the root to the adjacent teeth for three weeks (Fig. 13).
4. After three month the permanent crown restoration can be made (Fig. 14, 15).

Conclusion

Longitudinal extraction with the Benex® system is a gentle extraction method, which is particularly relevant in the age of implantology. In addition, severely damaged roots not usually judged to be worth saving can be extruded and preserved with the system.

Picture material

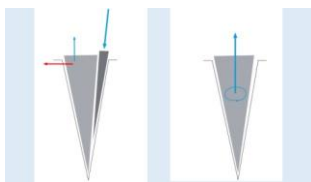


Fig. 1 Force vectors with extraction: left for conventional extraction, right for longitudinal extraction.

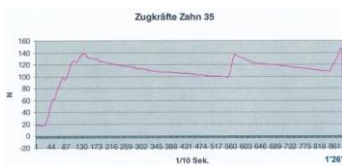


Fig. 2 Recording of the cable tensioning force during a Benex® extraction: After building up the tensile force (zig-zag line), within minutes there is a spontaneous reduction of the cable tension, i.e. the periodontal fibers tear and the root retention weakens.



Fig. 3 Intra-alveolar root luxation with the luxator in the mesial and distal direction



Fig. 4 Canal preparation with the trephine drill to determine the root canal axis and for removal of the canal material



Fig. 5 Benex® drilling along the root canal



Fig. 6 Extractor in the correct position. State after approx. 2-minute cable pulling. The moderate bleeding from the periodontal gap indicates rupture of the periodontal fibers.



Fig. 7 The root has detached.



Fig. 8 State of the socket after extraction



Fig. 9 Pressed-in gauze



Fig. 10 State after being struck by an ice hockey puck.



Fig. 11 Fracture extending 3 mm subcrestal: conventionally non-restorable tooth.



Fig. 12 Clinical state after 5 mm extrusion, wedge fixation.



Fig. 13 Radiological state after 5 mm extrusion and splinting to adjacent teeth.



Fig. 14 Radiological state 18 months after extrusion.



Fig. 15 Clinical state with crowning 18 months after extrusion

Abb. 16

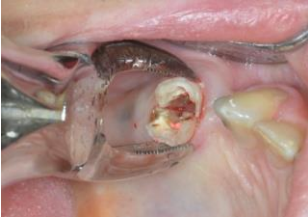


Fig. 16 The separated roots of a multirooted tooth are pressed together in the maxilla with a forceps.

Formatiert: Englisch (USA)



Fig. 17 Removal of the detached palatal molar root with the pole extractor.



Fig. 18 The buccal roots are pressed out with the lever.

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Videos:

Save the Unsavable. Benex Extrusion
<https://vimeo.com/241405210>

Benex extraction with the stickremover
<https://vimeo.com/218437790>

Tooth Extraction, multirooted in upper jaw
<https://vimeo.com/216718165>

Tooth extraction is a breeze with Benex
<https://vimeo.com/216713087>

Tooth preservation by extrusion with the Benex system
<https://vimeo.com/211015047>

[Benex-Extrusion](https://vimeo.com/241405210)
<https://vimeo.com/241405210>

[Tooth Extraction, multirooted](#)

Source:

¹ Krug R., Connert T., Soliman S., Syfrig B., Dietrich T., Krastl G.: „Surgical extrusion with an atraumatic extraction system: A clinical study.“, J. Prosth Dent 2018 (in Druck)

Purchasing of Benex® control system through:

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Fabrik für zahnärztliche & chirurgische Instrumente
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