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Deep margin elevation or crown lengthening? A simplified workflow for surgical indirect restorations.

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Nowadays, it is clear that an endodontically treated tooth restored with a direct restoration has a high risk of fracture¹. Furthermore, the fracture is usually more complex than in vital teeth and often extends subgingivally, especially in premolars and molars². From a classical point of view, a tooth with such a deep fracture could be considered "hopeless". If one would decide to save the tooth, crown lengthening surgery would be necessary to establish the biological width³ and time would be needed to let the tissue heal and mature. But assuming that good isolation can be obtained, could it be possible to open a conservative flap, to elevate the deep margin, prepare the tooth for an indirect restoration and to take the impression in the same appointment?

Biological width and deep margin elevation

The dimension of the gingival attachment along the root surface is referred to as biological width: it consists of the junctional epithelium and the connective tissue attachment below⁴. Despite the remarkable variation in the biological width - especially for the epithelium part - it is in average between 2.15 and 2.30 mm⁵. Several studies found that the position of the restoration margin influences the

health of the periodontal tissue⁶, and it is widely accepted that this biological width must be respected when teeth are restored⁷. If it is impossible to avoid the invasion of the biological width, a crown lengthening surgery is needed to establish a distance of about 2.5-3 mm from the restorative margin to the bone⁷. Nevertheless, to avoid surgery when the fracture extends subgingivally, some experts^{8,9} have suggested to relocate the margin of the restoration coronally rather than relocate margin towards the gingiva. From a clinical



Fig. 1, 2: Fracture of the buccal wall of tooth 16, extending below the gingiva.



Fig. 3, 4: Before the surgery, the crown length was reduced to check the prosthetic space for the onlay restoration.



Fig. 5-8: Because of the large amount of keratinized tissue, a para-marginal flap was made to expose the limit of the fracture; when the secondary flap was removed, the dam was placed over the opened flap.

point of view, the result was that sometimes the distance from margin of the restoration to the bone was less than 2.5 to 3 mm (1.5-2 mm), which is the minimum space needed to enable rubber dam isolation and at the same time the minimum space for the connective tissue of the supracrestal tissue attachment¹⁰.

The clinical case: a fracture of an endodontically treated molar

A 49-year-old female patient came to the office in 2018 to restore three cavities on the With this good isolation extending beyond margin of the fracture 14, 15 and 16. Two simple Class II composite restorations

were made on 14 and 15 and an endodontic treatment on 16. Due to her financial situation, the patient opted for a direct composite restoration on tooth 16. The clinical case was monitored during the years with a 6 months follow-up, but in 2021, the patient returned with a fracture of the buccal wall of tooth 16 (Figs. 1,2).

Following a classic approach, the treatment of a fractured tooth would be its extraction, followed by the placement of an implant or by a bridge (fixed dental prosthesis), or the maintenance of the tooth with crown lengthening followed by full crown or adhesive partial restoration (onlay).

The challenge was to do minimally invasive surgery (an "open-flap deep margin elevation"), composite build-up, and digital impression in the same appointment.

Because there was about 50% of the enamel left¹¹, it was decided to do an adhesive indirect ceramic restoration. A digital impression of both arches and a bite scan were taken. At the beginning, occlusal guides of 1.5 mm were made and after occlusal reduction, the prosthetic space needed for the onlay was verified¹².

A para-marginal flap was made and after folding away the secondary buccal flap, the rubber dam was placed over the flap while it was opened. With this good isolation extending beyond margin of the fracture, the tooth was treated following a conventional adhesive workflow.

First, the entire tooth was sandblasted with Al₂O₃ 50 μm (Rondoflex, KAVO), the enamel was etched with 37% phosphoric acid for 20s, and thoroughly rinsed. The adhesive



Fig. 9-12: The adhesive workflow using a universal adhesive system.



Fig. 13, 14: The suture to close the flap at the end of the first appointment under the provisional restoration and the tissue after one week at the appointment of the cementation of the final ceramic onlay.



Fig. 15: Lithium disilicate onlay (Initial LiSi Block, GC).

(G-Premio BOND, GC) was spread on the enamel, dentine and composite for 20s with active brushing, strongly air-blown, and light-cured for 20s. The deep buccal margin was elevated with a Flowable composite and meticulously polished and finished after 20s polymerisation. Eventually, the preparation for onlay was concluded and a digital impression

of tooth 16, which had been digitally trimmed on the initial impression, was taken without removal of the rubber dam. After removal of the dam, the flap was closed with a synthetic multifilament suture 5.0 (Supramid, Braunn). The patient went home with a provisional restoration.

One week later, the lithium disilicate ceramic restoration (Initial LiSi Block, GC) could be luted. The Initial LiSi Block onlay was polished and the majority was left unglazed. A small amount of glaze was placed on the buccal surface to mimic the colour of the other teeth and to give a more tridimensional shape.

For the cementation, a full adhesive workflow was chosen. After the

removal of the sutures and placement of the rubber dam, the tooth was sandblasted and the enamel was etched. The inner surface of the ceramic was etched for 20s with 5% hydrofluoric acid, rinsed and immersed for 5 minutes in alcohol and ultrasound. After drying, it was coated with a silane-containing restoration primer (G-Multi PRIMER, GC), left for 60s and coated with adhesive. The adhesive (G-Premio BOND, GC) was spread on the enamel, dentine and composite and light-cured for 20s. The restoration was luted with a highly filled flowable composite: the excesses of the flowable were removed and it was cured for 1 second. The contact points with the adjacent teeth were checked, the other excesses of composite cleaned and the restoration was finally light-cured for 6 minutes (2 minutes for each side). At the two-month follow-up, the soft tissue was completely healed with no signs or symptoms of inflammation.

Conclusion

Considering the wide variation in biological width dimension, it is not easy to confirm a standardized protocol to approach deep cavities. Of course, we know that an attachment between restorative materials and the connective tissue of the periodontal attachment is impossible, but this is compensated by an increase in length of the junctional epithelium⁴. So clinically, the limit between classical crown lengthening and deep marginal elevation (whether or not with opened flap) might be the possibility to place the rubber dam; indeed, the space needed to place the clamp is about 1.5 to 2 mm, the same needed for supracrestal tissue attachment.



Fig. 16-18: Adhesive workflow using universal adhesive system and high-loaded flowable composite light-cured for the cementation.



Fig. 19: The healing of the soft tissue after two months.



Fig. 20: Follow-up after 14 months.

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