Extrusion before extraction: an extra option

Using orthodontic treatment to improve the outcome of implant placement

From an aesthetic perspective, the extraction of a central upper incisor and its replacement with an implant-supported crown is a particularly challenging treatment. It becomes even more tricky and ‘dangerous’ when dealing with a young patient who has a high smile line, a thin-scalloped gingival biotype and particularly high aesthetic demands. For all these reasons every effort should be made to preserve a questionable anterior tooth in order to ensure preservation of the soft tissue architecture.

Unfortunately, this is not always an option, as we sometimes have to deal with a hopeless tooth. One such example would be a huge and untreatable external root resorption class IV, possibly caused by repeated trauma, and combined with internal bleaching. Such a case calls for extraction.

In implant treatment, the crown can be designed to ideally mimic the symmetric situation on the contralateral site, provided that the implant is appropriately positioned. The aesthetic outcome is, however, often compromised due to soft tissue recession from unpredictable healing following tooth extraction and implant surgery. Incisors have a marked undulation of the cemento-enamel junction, as well as of the gingival margin, with long interproximal papillae. These are specific to anterior teeth and are bound to a sound periodontium. The collagen fibres in the gingiva surrounding teeth are attached to the root cementum and are arranged in groups or bundles. They have distinct orientations, including dentogingival, dentoperiosteal, circular and transseptal fibres. Around implants, however, there is no periodontal ligament and the implant lacks a lining cementum with attached collagen fibres. Implant treatment in external resorption cases is complicated by the fact that huge resorptions compromise not only the teeth but also the surrounding bone.

When considering implant treatment, the presence of bone is the first determining factor for the soft tissue contour. The presence of a papilla depends on the level of the bone, the volume of the connective tissue, and the proximal support of the crowns. When an implant is next to a tooth, the presence of the papilla is mostly determined by the bone peak level on the tooth side. In order to preserve the bone level next to the adjacent teeth, the extraction has to be performed atraumatically. Additionally, the osseous lacuna should be filled with a biomaterial and the volume of the soft tissue may need to be improved. In the case presented here, a forced orthodontic extrusion of the tooth was performed before extraction in order to achieve the latter goal.

Case presentation

The patient was a woman in her twenties who reported having undergone a bleaching procedure on tooth 11. This had discoloured as a result of endodontic treatment several years beforehand, which had been carried out following repeated traumatic injuries when she was a professional volleyball player. Following the bleaching, the tooth had been restored with a post and composite resin. She was not satisfied with the bleaching and the restoration on tooth 21, and her dentist had suggested two crowns. She was looking for a second opinion because she didn’t want a crown on tooth 21.

The patient’s teeth were healthy from both a restorative and a periodontal perspective, with circular probing pocket depths of 2–3mm and no caries. Tooth 11 was no exception. It was not mobile, but the X-ray (Figure 1) taken to assess the endodontic and restorative conditions revealed a heavy external cervical root resorption and the tooth was judged to be hopeless. From the treatment alternatives proposed, the patient chose the replacement of tooth 11 with an implant-supported crown, and a new composite resin restoration on tooth 21. She had very high aesthetic expectations and was informed that the treatment would be extremely demanding because of the tooth’s...
position, her thin gingival biotype (Figure 2) and her high upper lip line (Figure 3).

The following treatment plan was proposed:

1. Orthodontic extrusion
2. Extraction and socket preservation
3. Implant placement and immediate temporary crown
4. Soft tissue modelling through temporary crown management
5. Final prosthetic restoration

The active phase of orthodontic extrusion lasted three weeks. The tooth was then immobilised for 9 weeks (Figure 4). A force of 70g was applied continuously by means of a lever achieved using a steel wire (.017 x .025) acting on the central incisor, anchored to the first upper molars, and held united by means of a trans-palatal arch.

Three months after the start of the extrusion process, a flap without vertical incisions was elevated (Figure 5), the tooth was extracted and the wound thoroughly debrided. The residual buccal bone plate was very thin (Figure 6) and partially eroded by the osteoclast activity responsible for the root resorption. The socket was filled with deproteinised bovine bone mineral (Figure 7) and covered with a collagen membrane (Figure 8).

A free gingival tissue graft was harvested from the tuber maxillae and sutured over the socket (Figure 9), in order to initially protect the collagen membrane and to improve the overall outcome of the procedure.

Four months later, the site was ready to receive the implant (Figures 10–12). No shrinkage had occurred in any direction during the healing period, there was an adequate quantity of hard tissue, the bone peaks at teeth 12 and 21 had been maintained, and there was more than enough soft tissue that could be shaped to its final form with the help of a temporary crown and, possibly, a gingivectomy.

A transmucosal implant was placed in order to maintain the papillae and protect the bone level at the neighbouring teeth (Figures 13a and 13c). The implant showed a torque value of 35N (Figure 13b) and an impression was taken (Figure 14). A temporary crown was fabricated and screwed to the implant within a few hours (Figure 15).

Six months later the final gingival contour had been definitively set (Figure 17) by means of controlled pressure through the temporary crown and a minor gingivectomy. At that time the composite resin restoration of tooth 21 was performed, slightly increasing the length of the incisor (Figure 16). Then the final impression was taken with a custom pick-up coping (Figures 18a–18e) in order to duplicate the 3D shape of the gum achieved by means of the temporary crown.

A custom zirconia framework was designed and produced by the dental lab and tried in (Figure 19) before ceramic stratification (Figure 20), which was done by the dental technician with the patient in the dental office. We always follow this kind of procedure for highly demanding aesthetic cases, in order to achieve optimal results.

At the follow-up visits (1 and 3 years) the tissue levels were stable, the result was well maintained and the patient was completely satisfied. (Figures 21a to 21f)

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Questions and responses

1. Can you describe the soft tissue management at the time of implant insertion?

I used a flapless approach, with two short vertical incisions at the mesio-palatal and disto-palatal transition angles in order to push the soft tissue buccally.

2. Did you use a free gingival graft or a connective tissue graft at the time of the socket preservation technique?

I used a free gingival graft. The gain in tissue volume obtained by means of extrusion was more than enough, and I concluded that a connective tissue graft (or combined approach) was not necessary. Furthermore, the coronal buccal plate was not present and I didn’t want to put the graft over the Bio-Oss. In other instances I have used CTG, but I prefer to do it at the time of implant insertion.

3. Have you experienced stable bone improvement using this technique?

Yes, I have.

4. Are socket preservation and immediate loading mandatory to perform this technique?

No, it depends on the clinical situation. I have carried out immediate post-extraction/immediate loading/no socket preservation cases as well as socket preservation/delayed implant insertion/delayed loading cases. Immediate loading is not mandatory at all.

5. Have you experienced mid-term or long-term gingival shrinkage using this technique?

No, I haven’t, but I have to say that the outcome of the technique varies depending on the clinical situation. I would not recommend carrying out the orthodontic extrusion in isolation. Every clinical case has to be seen as one of a kind, depending on the gingival biotype, root shape, presence or absence of the cortical plate and so on. In order to get the best possible result, many cases require additional treatments, such as socket preservation and/or connective tissue graft, and it’s important to know when to do what.
References


