

The surgically accelerated orthodontics in multidisciplinary implant treatment

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Abstract

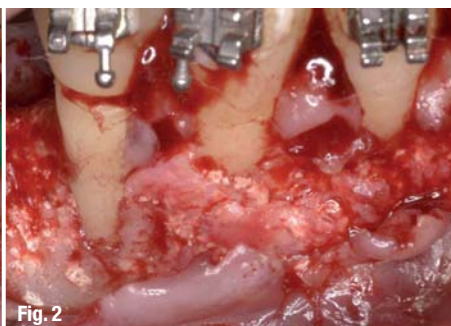
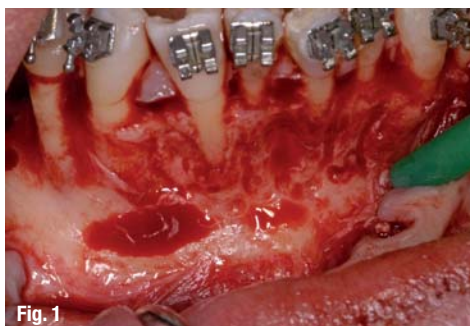
Multidisciplinary treatment requires excellent communication and coordination amongst clinicians in a variety of fields. Although this can be difficult to achieve at first, interdisciplinary collaboration may result in efficient treatment that patients appreciate and benefit from. When appropriately coordinated, the job of each specialist can facilitate the work of the other team members. For example, orthodontists can be of considerable assistance in periodontal and prosthetic treatment. Dental alignment of the arches can facilitate periodontist's and prosthodontist's objectives. This is done, for example, by aligning the natural dentition, making possible a path of insertion for a prosthesis, or establishing a physiological alveolar crestal topography to facilitate periodontal surgery. Orthodontic tooth movement can then be of substantial benefit for the patient. Many adults seeking routine restorative dentistry have misaligned teeth, which compromises either the final restorative outcome or the ability to clean the natural dentition. Orthodontic appliances have become smaller, less noticeable and easier to maintain during therapy. Invisible or lingual appliances further improve the rate of acceptance by adult patients. Many adults can now have their teeth aligned to improve their

chewing function and their smiles with reduced aesthetic effect during therapy. In addition, implants have become a major part of the treatment plan for adults with missing teeth. If adjacent teeth have drifted into the edentulous area, orthodontics may be beneficial for providing adequate space for implant placement and restoration. One of the major problems in acceptance of orthodontic treatment by adults is the length of treatment. For this reason, periodontists and oral surgeons may be helpful to the orthodontist, as they can facilitate the orthodontist's work and thereby reduce treatment time. Endosseous implants can be used to enhance anchorage and increase movement control of orthodontically moved teeth. Furthermore, the alveolar architecture can be reshaped with periodontally accelerated osteogenic orthodontic augmentation (PAOO) surgery to produce the regional acceleratory phenomenon (RAP),^{1,2} which results in a vast increase in osteoblast and osteoclast activity. The biological result of this is osteopenia (decrease of bone mineralisation without loss of volume). The clinical result is softer bone, which may allow faster movement of teeth.^{3,4} In multidisciplinary treatment of adult patients, malocclusion may be associated with tooth loss, bone resorption and a consequent need for implants and/or periodontal treatment and bone augmentation. In these cases

Fig. 1 A very resorbed ridge in the edentulous area was evident together with bone dehiscence on teeth 31, 42, 44. A regeneration with xenogeneic bone of bovine origine (Endobone, Biomet 3i, USA) and a resorbable membrane (Osseoguard, Biomet 3i, USA) was performed.

Fig. 2 Six months after surgery one osteointegrated implant (Biomet 3i, USA) in the augmented area was placed. A regeneration of the bony fenestration on tooth 42 was also evident, while the control 44 remained unchanged.

Fig. 3 Appropriate implant placement requires orthodontic movement.



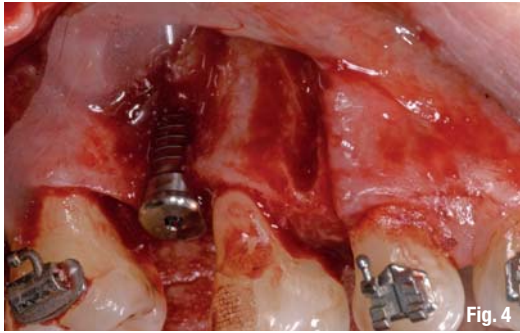


Fig. 4



Fig. 5

Fig. 4 At the time of implant placement a corticotomy was performed to accelerate the orthodontic movement and facilitate the implant restoration. Regeneration with a first layer of autologous graft collected during site preparation, covered with xenograft and a resorbable membrane (Endobone and Osseoguard, Biomet 3i, Palm Beach Gardens, USA) was performed simultaneously to the placement.

Fig. 5 Provisional restoration in place.

especially, efficient interdisciplinary collaboration may result in a great benefit for the patients.⁵⁻¹²

Periodontally accelerated orthodontic movement, as described by Wilcko, appears particularly feasible in those multidisciplinary cases for which treatment planning requires orthodontic movement and/or oral or periodontal surgery. In these cases, corticotomy can be combined with wisdom tooth extraction and/or a regenerative technique, such as guided bone regeneration (GBR), in order to avoid multiple surgeries. Recently some orthodontic therapies, especially the so-called low-friction therapies, have demonstrated clinically and radiographically that it is possible to expand dental arches without interfering with periodontal health, by augmenting the alveolar bones. Melsen *et al.*¹³ confirmed what was previously suggested, that the tooth will move with the bone and not in bone, especially when light orthodontic forces are applied. Dehiscence and fenestration, which are difficult to diagnose preoperatively, may represent a limitation of this technique. Since the tooth will move with the periodontium, in cases in which the periodontium is not present, we might create recession and attachment loss.¹⁴ A recent study on modern American skulls found that a dehiscence was present in 40.4% of the skulls, and a fenestration was present in 61.6% of skulls.¹⁵ If this data is translated in clinical treatment, it may mean that potentially at least 50% of orthodontic patients undergoing expanding movement could be at risk of gingival recession and periodontal damage. It would be advisable, then, to introduce routine 3-D X-rays into the pre-operative work-up (i.e. cone beam). The cone-beam examination, with a reduced dose of radiation compared with the fan beam (CT scan) and better definition,¹⁶ could be used routinely in those patients with a thin, scalloped periodontium, where the risk of post-operative recessions is higher. The PAOO technique has been found not only to be predictable in solving dehiscence and fenestration above the roots,¹⁷ but also to produce a noticeable change in the cephalometric analysis of points A and B.¹⁷ With the PAOO technique, the patient needs to be seen routinely for changing the wires,

as the teeth movements are much faster than in regular orthodontic treatment. The use of segmental corticotomy (applied only to the teeth that have to move more than the others) can dramatically change the relationship amongst groups of teeth.¹⁸ This has to be kept in mind, since it may require changes in distributing the anchorage by the orthodontist. The teeth in the area of surgery will be moving much faster than the other teeth.

Conclusions

When the treatment plan requires orthodontic movement and/or oral or periodontal surgery, corticotomy can be combined with a wisdom tooth extraction and/or a regenerative technique, such as GBR, in order to avoid multiple surgeries and to optimise the final outcome for the patient. Another indication is for instances in which the risk of creating root dehiscence in patients with thin periodontium is very high even with slow orthodontic movement and light forces applied. Root recession can be present even without clinical manifestation of gingival recession. An efficient multidisciplinary approach to a complex case may result in a faster and better treatment. The PAOO technique can be used for faster dental movement, to treat and prevent periodontal problems and to regenerate ridge defects, allowing implant placement.

Editorial note: A list of references is available from the publisher.

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