The surgically accelerated orthodontics in multidisciplinary implant treatment

Authors_Federico Brugnami and Alfonso Caiazzo, Italy

_Abstract

Multidisciplinary treatment requires excellent communication and coordination amongst clinicians in a variety of fields.

Although a multi-disciplinary treatment approach is somewhat cumbersome and time consuming, it has the potential to achieve optimal results, which may be beneficial for many patients. For example, in patients where dental migration precludes prosthetic rehabilitation, orthodontic therapy has the potential to selectively move teeth into pre-designed positions to allow for surgical implant placement and dental restoration. Many adult malocclusion cases are associated with tooth loss, bone resorption and consequent need for implants and/or periodontal treatment and bone augmentation procedures.

In such patients, reshaping and augmentation of bone by a periodontist, and endosseous implant

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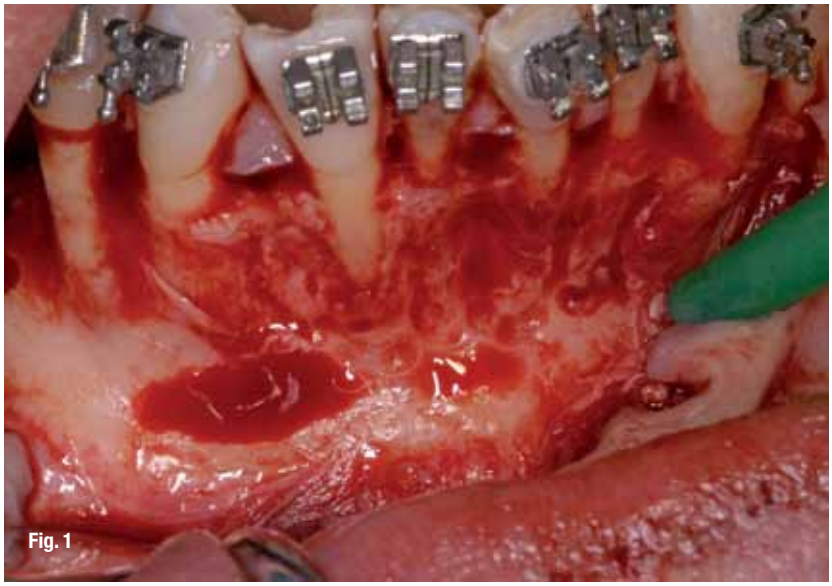
Fig. 1

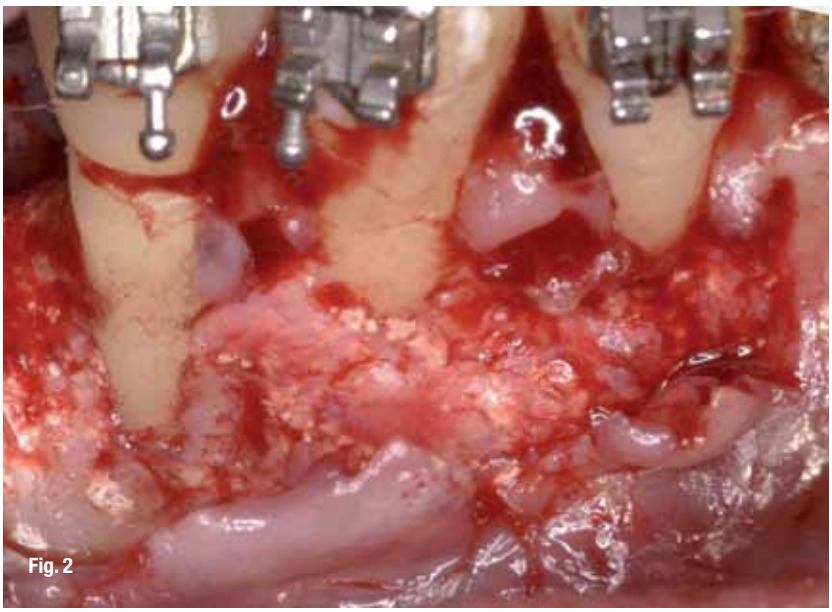
Fig. 2


Fig. 3

placement by a surgeon can theoretically be used to obtain adequate anchorage and increase precision and predictability of tooth movement by the orthodontist.

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 esthetic effect during therapy.

The concept of surgically accelerated orthodontics (SAO) can significantly reduce the total treatment time of orthodontic therapy.

This exciting, relatively new technique requires a well-coordinated, multidisciplinary treatment approach. It involves intentional surgical "violation" of the alveolar bone with the aim to produce regional acceleratory phenomenon (RAP).[1,2]

The biological result of this is osteopenia (decrease of bone mineralization 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 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 oral or periodontal surgery. In these cases, corticotomy can be combined with wisdom tooth extraction and/or a regenerative technique, such as

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, United States) and a resorbable membrane (Osseoguard, Biomet 3i, United States) was performed. (Photos/Provided by Federico Brugnami and Alfonso Caiazzo)

Fig. 2 _Six months after surgery one osteointegrated implant (Biomet 3i, United States) 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.

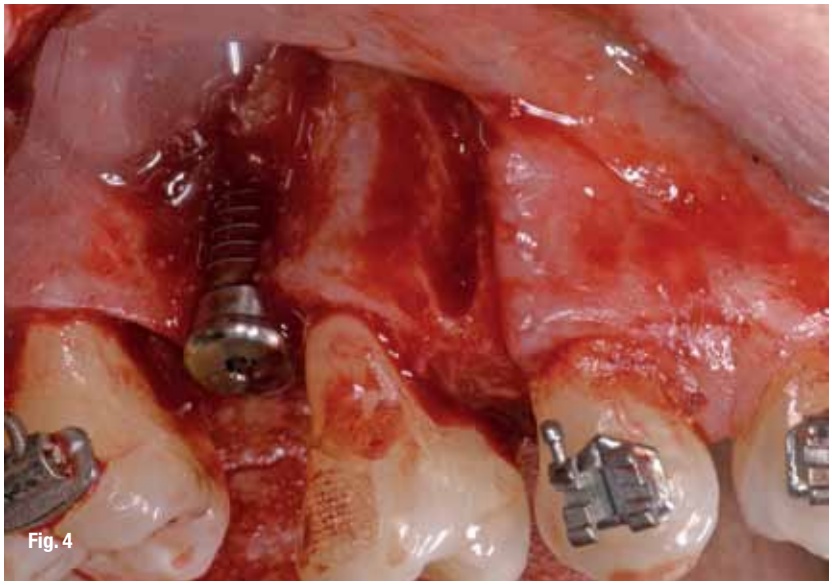
Fig. 4


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 preparartion, covered with xenograft and a resorbable membrane (Endobone and Osseoguard, Biomet 3i, Palm Beach Gardens, United States) was performed simultaneosuly to the placement.

Fig. 5_Provisional restoration in place.

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. Because 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 percent of the skulls, and a fenestration was present in 61.6 percent of skulls.[15]

If this data is translated in clinical treatment, it may mean that potentially at least 50 percent 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 preoperative 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 postoperative 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 because 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

Accelerated orthodontic movement techniques can be successfully used to hasten dental movement, treat and prevent periodontal problems and to regenerate ridge defects, thereby allowing delayed implant placement._

A list of references is available from the publisher.

_contact implants

Federico Brugnami, DDS
Piazza dei prati degli Strozzi 21
00195 Roma, Italy
Tel.: +39 06 39730191
Fax: +39 06 39730195
fbrugnami@gmail.com

Alfonso Caiazzo, DDS
Private Practice, Salerno, Italy