CASE REPORT

Orthodontics and Implant Therapy to Replace a Congenitally Missing Lateral Incisor

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Osseointegrated implants have been successfully used as alternatives to bridges for replacement of congenitally missing teeth.[1-11] Although normal and stable papillae are difficult to obtain between adjacent implants, optimal results can be achieved when an implant is placed between two natural teeth with healthy periodontia—for example, to replace a congenitally missing lateral incisor.[12-15]

An interdisciplinary treatment approach is required to ensure long-term stability of both the implant and the soft tissues around a single-tooth implant, as well as a satisfactory esthetic appearance. The prosthodontist needs the implant to be positioned so that the restoration can be cosmetically authentic, without overloading. The oral surgeon needs an adequate volume and shape of available or reconstructed bone to meet the prosthetic requirements.[16]

This article presents a case of a congenitally missing upper lateral incisor, associated with a Class III malocclusion, that was treated with orthodontics and implant therapy.

Case Report

An 11-year-old female in the mixed dentition presented with a compensated Class III malocclusion and a missing upper right lateral incisor (Fig. 1). Her chief complaint was excessive lower anterior facial height, which seemed to be an inherited feature.

Because of the patient's profile, Class III skeletal pattern, and pronounced maxillary spacing, as well as the size and shape of the anterior teeth, the treatment plan was designed to in-

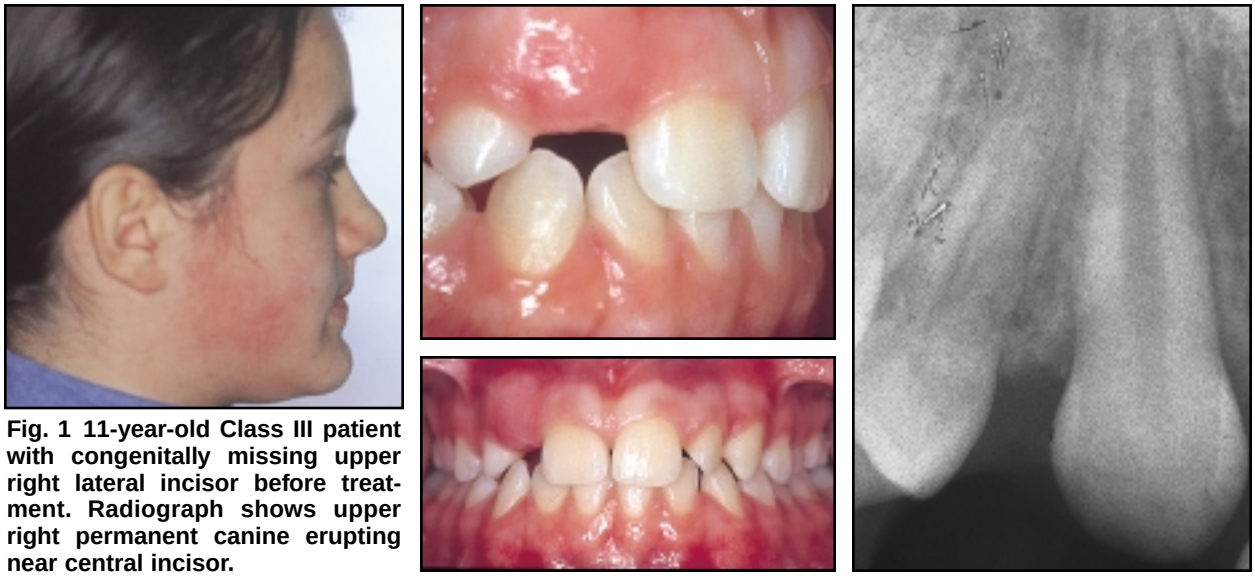

Fig. 1 11-year-old Class III patient with congenitally missing upper right lateral incisor before treatment. Radiograph shows upper right permanent canine erupting near central incisor.

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volve space reopening and implant therapy.[17-19]

The upper right permanent canine was allowed to erupt near the adjacent central incisor. Once the deciduous canine exfoliated, maxillary edgewise brackets were bonded to produce 7mm of interradicular and intercoronal space in the missing lateral incisor site. A compressed-coil spring was used between the central incisor and canine to distalize the crown of the canine, while the root was distalized with archwire bends (Fig. 2).

Fig. 2 Space-opening mechanics.

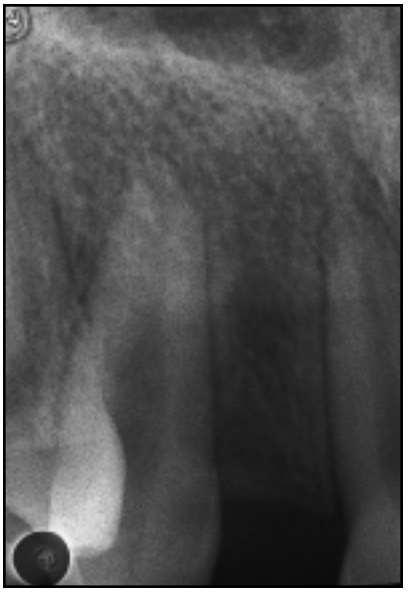
The lateral incisor space was filled with a temporary acrylic pontic during treatment. After 18 months of treatment, when the fixed appliances were removed (Fig. 3), a well-adapted removable space maintainer with a lateral incisor pontic was used.

After the patient's facial growth had ceased, at age 19, she was referred to an oral surgeon for insertion of an implant to replace the missing lateral incisor (Fig. 4). Four years later, x-rays showed the roots parallel with the implant; the alveolar bone contour was satisfactory, with no radiolucency around the implant (Fig. 5). The radiographic and clinical appearance was characteristic of osseointegration. Periodontal probing did not produce any bleeding, and the sulcus depth was less than 3mm.

Discussion

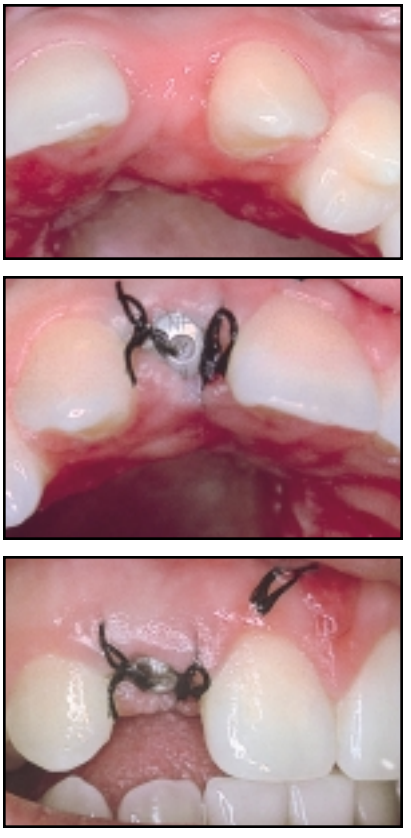
In cases such as this, the best results are obtained if the permanent canine is allowed to erupt in the lateral incisor position and is then moved distally after the exfoliation of the deciduous canine.[20] Distal movement of the canine produces a labiolingual and distal enlargement of the alveolar crest at the incisor

Fig. 3 Patient after 18 months of treatment, showing good root parallelism.



site, thus exploiting the full regenerative potential of the orthodontic movement.[21,22]

Correct positioning of the implant will help prevent soft-tissue recession and greatly increase the likelihood of a successful outcome.[23] If the implant is 3.75mm in diameter, its platform will be 4mm wide. To preserve the interdental papilla and allow for adequate oral hygiene, 1.5mm of space is needed between the implant and the tooth on each side. Therefore, 7mm of mesiodistal space must be created between the abutment teeth.[1,24] If the implant is too close, excessive resorption of the surrounding bone crest may lead to inadequate bone support for the interdental papilla and a poor esthetic appearance.[25,26] In addition, if an implant is lost due to mechanical problems, the implant or implant fragment may



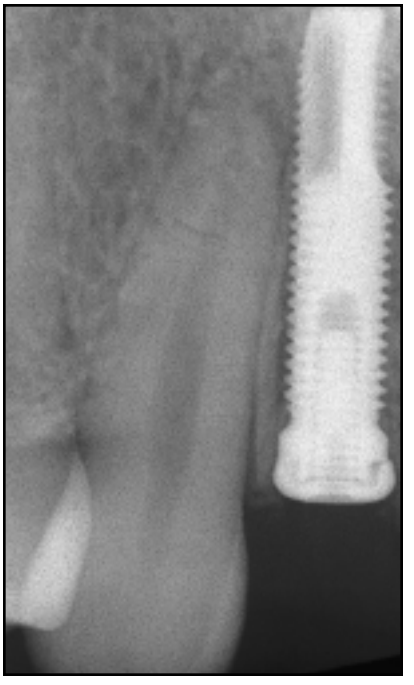


Fig. 4 Implant inserted in place of missing lateral incisor at age 19.

Fig. 5 Patient four years after implant placement.

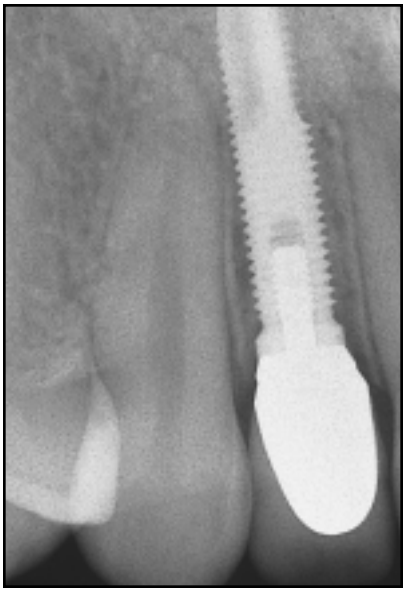


Fig. 6 Longitudinal axis of implant placed 4mm from line tangent to occlusal surfaces of abutment teeth.

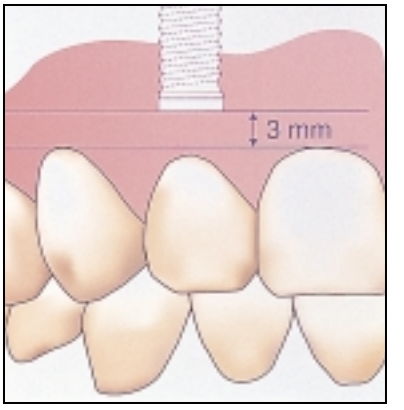


Fig. 7 Implant platform placed 3-5mm apical to gingival margins of abutment teeth.

have to be removed with a trephine bur. This can be safely done only if an adequate margin of bone has been left between the implant and the adjacent roots.

The correct buccolingual position of an anterior implant is another important esthetic factor. The head of the implant should be placed inside an imaginary line connecting the incisal margins of the abutment teeth, so that the longitudinal axis of the implant is 4mm from a line tangent to the adjacent occlusal surfaces (Fig. 6). In the horizontal plane, the center of the crown placed on the implant should be no farther than half the abutment radius from the center of the implant—about 1mm in the case of a standard abutment. This location may help prevent resorption of the thinner cortical buccal bone and consequent recession.[27] Vertically, the implant platform should be 3-5mm apical to the gingival margins of the abutment teeth to provide a harmonious smile line[20] (Fig. 7).

An adequate band of attached gingiva also helps reduce the chance of gingival recession. The biological width of the peri-implant mucosa is about 2-3mm; to allow the formation of a stable soft-tissue attachment and prevent bone resorption, a similar amount of supracrestal soft tissue is required.[23,28]

Because implants do not follow the growth of the facial bones, but behave more like ankylosed teeth, they should not be placed until the completion of maxillary and mandibular bone growth, as was done in the present case.[29-35] Any infraocclusion of a single-tooth implant crown could produce an unsatisfactory appearance, and Thilander and colleagues observed infraocclusion following implant placement in several patients even after the end of dental and skeletal growth.[29] In addition, orthodontic treatment should be designed to minimize coronal displacement of the abutment teeth, because any such movement would create the effect of an apical migration of the implant.[26]

Conclusion

Long-term studies have validated the use of osseointegrated implants for replacement of single missing teeth.[10] When orthodontics and implant therapy are combined to replace a congenitally missing lateral incisor, the major concerns of the orthodontist should be:

- Early treatment planning for correct timing.
- Adequate intercoronal and interradicular space opening.
- Root uprighting of the abutment teeth, including the apical areas.
- Complete stabilization of the abutment teeth.

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