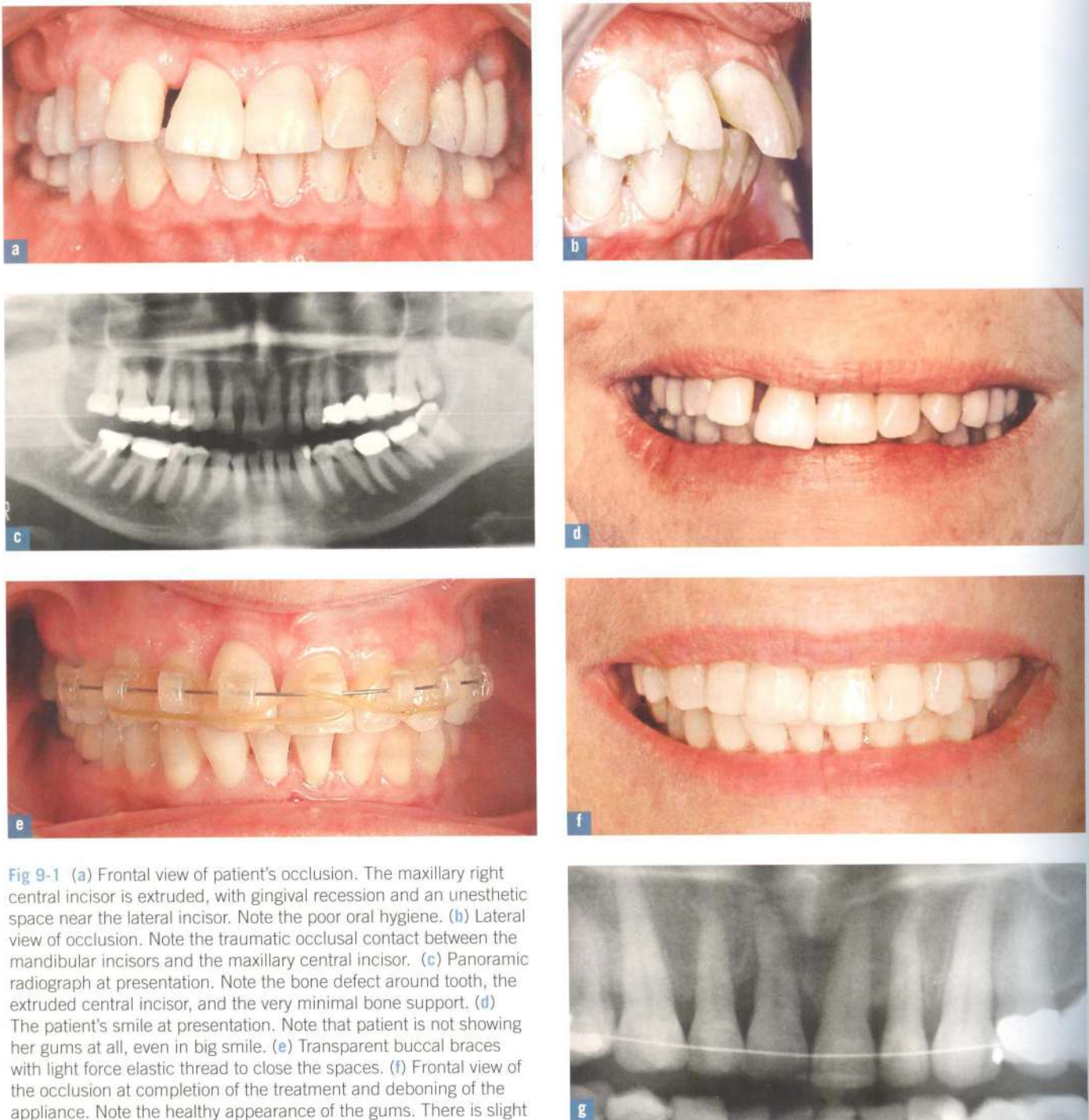


Devorah Schwartz-Arad

# Ridge Preservation & Immediate Implantation



**Fig 9-1** (a) Frontal view of patient's occlusion. The maxillary right central incisor is extruded, with gingival recession and an unesthetic space near the lateral incisor. Note the poor oral hygiene. (b) Lateral view of occlusion. Note the traumatic occlusal contact between the mandibular incisors and the maxillary central incisor. (c) Panoramic radiograph at presentation. Note the bone defect around tooth, the extruded central incisor, and the very minimal bone support. (d) The patient's smile at presentation. Note that patient is not showing her gums at all, even in big smile. (e) Transparent buccal braces with light force elastic thread to close the spaces. (f) Frontal view of the occlusion at completion of the treatment and deboning of the appliance. Note the healthy appearance of the gums. There is slight midline deviation, which is esthetically acceptable. (g) Close-up radiologic view of the anterior teeth at the completion of the treatment. Note that the bone defect is reduced compared with the initial situation, roots are parallel, and embrasures are open, allowing proper maintenance.

trusive movement, after proper periodontal surgical therapy, can positively modify both the alveolar bone and the soft periodontal tissues.<sup>14</sup>

A number of factors must be taken into account while making the treatment decision. The first is the gingival exposure during smile; in this case, the patient's smile line is very low and her gums are not visible at all (Fig 9-1d). Other factors include the patient's preferences (the patient did not want an extraction) and the orthodontist's skills and experience.

In this case, orthodontic treatment is inevitable regardless of which treatment option is chosen.

### **Treatment procedure**

Buccal transparent braces (OPAL, Ultradent Products, South Jordan, UT) were bonded (Fig 9-1e) and light continuous force used to intrude the right central incisor and close the spaces. The patient was treated by the hygienist monthly to maximize oral health and supervised by the periodontist every 2 months. Treatment time was 10 months. Clinical and radiologic examinations show that the central incisor was intruded extensively, the spaces were closed, and gingival health was tremendously improved (Figs 9-1f and 9-1g). The case has been in retention for 10 years now and is stable.

### **Discussion**

The patient was referred by her dentist for extrusion and space closure prior to extraction and immediate implantation. After all aspects had been discussed, the treatment option was modified to intrusion and preservation of the tooth. However, if at any stage the patient loses the tooth, implantation is still possible, and although this will force the dentist to restore it longer than the adjacent teeth (due to the intrusion), it will be esthetically acceptable as the patient does not expose her gums during smile.

### **Case 2**

WK, a 29-year-old female, presented four hopeless anterior teeth (maxillary left and right lateral in central incisors) with extensive periapical lesions and reduced bone height compared with the adjacent canines (Figs 9-2a and 9-2b).

### **Treatment options**

A. Extraction without orthodontic treatment: The patient has a gummy smile, which will render the implants and the restored teeth very long and unesthetic. Due to the extensive bone defect and periapical lesions, more bone resorption is expected.

B. Orthodontic extrusion for implant site preparation: Although the teeth are irremediable, extrusion might help to create both soft and hard tissues to support future implants and crowns.

### **Treatment procedure**

Flexible rectangular orthodontic wire (Copper Ni-Ti®, 0.016 × 0.022-inch, Ormco Sybron, Orange, CA) was passively bonded to the posterior teeth (first and second premolars and first molars) and then actively elevated towards the gingival aspect of the anterior teeth and bonded with orthodontic resin composite material (Transbond LR®, Unitek 3M, Monrovia, CA). Since all anterior teeth were covered by a one-unit temporary acrylic resin fixed partial denture, only two contact points were used (on the central incisors) to maximize the deflection of the wire and to create minimal continuous force (Fig 9-2c). The crowns were periodically shortened and the wire was reactivated. After 4 months of treatment, extensive extrusion was achieved (Fig 9-2d).

At this stage, the teeth were extracted and immediate implants (NobelActive®, Nobel Biocare, Gothenburg, Sweden) were inserted. As can be seen in Figs 9-2e and 9-2f, extensive bone and soft tissue were created by the extrusion procedure, providing favorable conditions for the immediate implantation process and the prosthetic restoration.

### **Discussion**

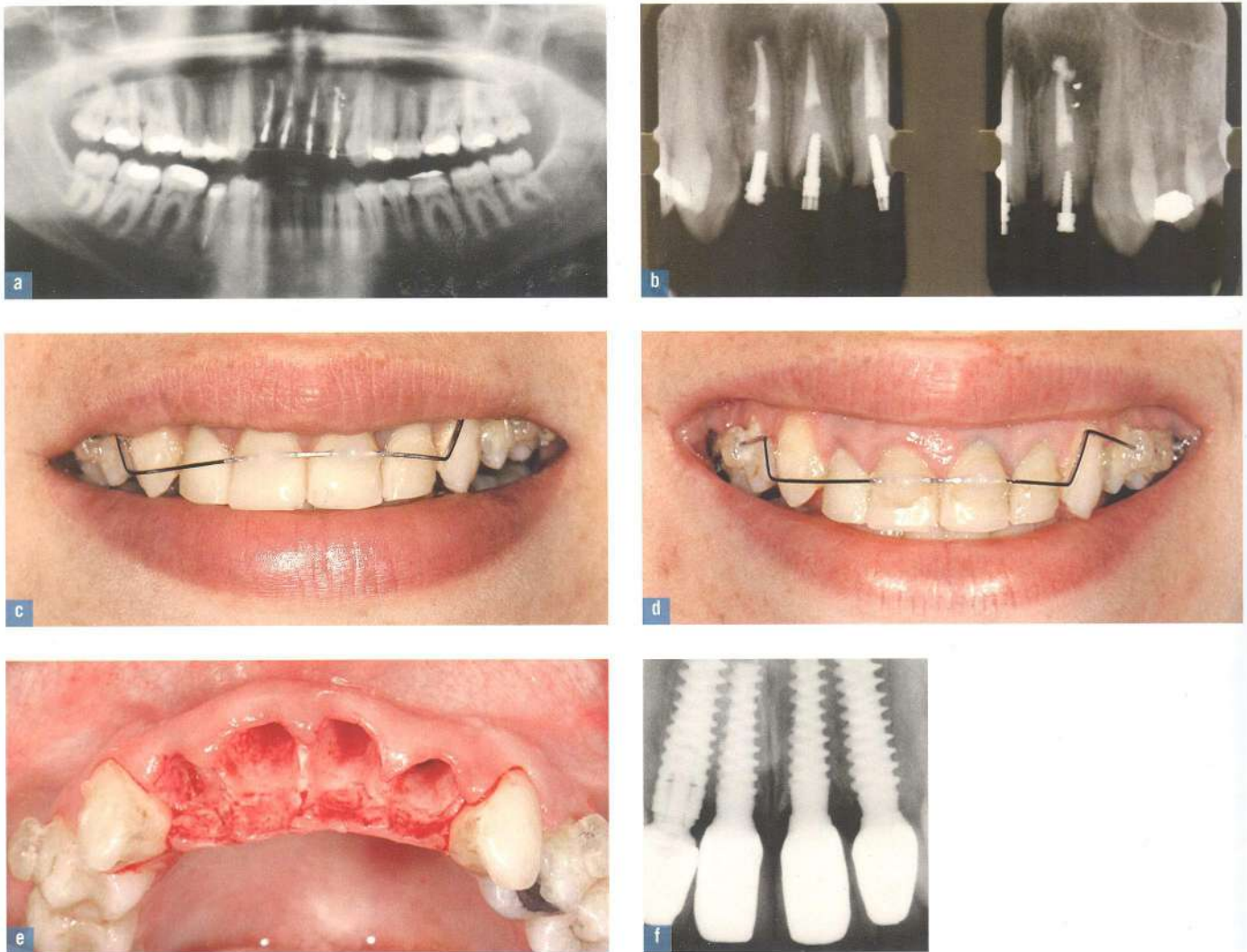
Although the teeth were in a hopeless condition – with active periapical lesions and periodontal disease – the orthodontic extrusion process, performed carefully and under maximum control by the entire dental team, was able to create favorable conditions and was justified clinically despite the additional costs for the patient.

### **Case 3**

ZC, a 36-year-old male, presented an unesthetic appearance due to a long anterior crown on the maxillary right central incisor and a high gingival line (Fig 9-3a). In addition, the anterior crowding prevented the prosthodontist from creating a tooth symmetrical to the contralateral central incisor. Root canal treatment had been very poor and the prognosis for the tooth was questionable (Fig 9-3b).

### **Treatment options**

A. Alignment and extrusion prior to extraction and immediate implantation: The minimum space required for an implant in the area of a maxillary anterior incisor is 7 mm,



**Fig 9-2** (a) Panoramic radiograph at presentation. Note the extensive periapical lesions and reduced bone height compared to the adjacent canines. (b) Periapical radiograph of the four maxillary anterior teeth. (c) Frontal view of the orthodontic appliance. (d) Frontal view of the teeth at completion of the extrusion. Note the change in the gingival line of the anterior teeth when compared with the adjacent canines. (e) Clinical view following extraction of the four maxillary incisors. Note the extensive amount of bone gained by the extrusion movement. (f) Radiograph showing the four implants in place.

which, in this case, seems impossible unless extensive stripping is performed.

- B. Alignment and extrusion with preservation of the tooth: This option is less invasive and more predictable, but the prognosis for the central incisor is uncertain due to the poor root canal treatment and the extensive amount of extrusion needed, which will affect the root-to-crown ratio.

**Treatment procedure**

A transparent buccal appliance (Brillant®, Forestadent, Pforzheim, Germany) was bonded with an open nickel-ti-

tanium coil spring and low extrusion forces (Fig 9-3c). A provisional acrylic resin crown on the central incisor was incisally reduced continuously during the treatment (Fig 9-3d). After 8 months of treatment, the patient was referred to an endodontist for renewal of the root canal treatment and a new restoration was constructed. Although the clinical result is esthetically acceptable (Fig 9-3e), the radiographic examination shows that the amount of space available for an implant is still borderline (Fig 9-3f). The prognosis of the tooth is still uncertain and should be tested in the nearest future.



**Fig 9-3** (a) Frontal view of the patient's occlusion. Note the long clinical crown on the maxillary right central incisor, the overlapping with the lateral incisor, and the unesthetic appearance. (b) Panoramic radiograph of the patient at presentation. Note the poor root canal treatment and the minimal space for implantation at the cemento-enamel junction level. (c) Frontal view of the orthodontic appliance. Note the extrusive force on the right central incisor together with the expansion spring. (d) Patient at debonding of the orthodontic appliance. Note the short clinical crown on the right central incisor (due to the continual shortening of the tooth during the extrusion process). (e) Clinical view at completion of the treatment. (f) Periapical radiograph of the right central incisor at completion of the treatment. Note the improved root canal treatment and the more favorable bone level.

## Discussion

The need to extract the maxillary right central incisor and place an immediate implant is still valid and should be re-evaluated in the future. New implant technologies might soon enable the clinician to use the minimal space available at the end of this orthodontic intervention, and if not, additional treatment can always be considered.

## Case 4

RA, a 35-year-old male, presented with a Class I malocclusion and missing maxillary lateral incisors. The maxillary canines had erupted mesially, leaving only small spaces distally, which are not sufficient for placing implants (Figs 9-4a to 9-4d).

### Treatment options

- A. Distalize the maxillary canines to create space for the missing lateral incisors in their original location: The advantage



**Fig 9-4** (a) Frontal view of the patient's occlusion at presentation. Note the abraded maxillary central incisors and the uneven gingival line between the right and left maxillary incisors. Also note the unesthetic appearance of the gingival line at the canines, which is higher than that at the central incisors, rather than lower, as one would expect for lateral incisors. (b, c) Right and left lateral views of the patient's occlusion at presentation. (d) Panoramic radiograph at presentation. (e) Follow-up panoramic radiograph at 8 months of treatment, showing that more uprighting of canines is needed.

of this treatment option is that it is more appropriate and has esthetic prosthetic options, as implants as small as 3 to 3.5 mm can be used for lateral incisors. The disadvantage is the excess time needed to move the canines' roots, which are already mesially located towards the distal, and the increased occurrence of root resorption due to the type of force required and the longer treatment time.

- B. Mesialize the maxillary canines, close the space between the central incisors, and place implants between the canines and the first premolars: This option seems to offer a shorter treatment time and so was chosen by the patient and his referring dentist.

### **Treatment procedure**

Creating space for implants does not only involve uprighting roots. The orthodontist must also plan the placement of brackets according to the initial clinical crown, the abrasion and attrition of the incisal edges, and the gingival height, and in this case adjust the canines to fit the shape and the characteristics of the maxillary lateral incisors. The orthodontic plan consisted of extrusion and uprighting forces to the maxillary canines and space closure. After 8 months of treatment, a follow-up panoramic radiograph showed that more uprighting was needed (Fig 9-4e). In addition, minimal interproximal reduction in the area of the maxillary first and second premolars and first molars was carried out and rotational forces



**Fig 9-4** (f, g, h) Frontal, right lateral and left lateral views of the patient's occlusion before implant placement. (i) Panoramic radiograph before implant placement. Note the parallelism of the roots. (j) Panoramic radiograph after implant placement.

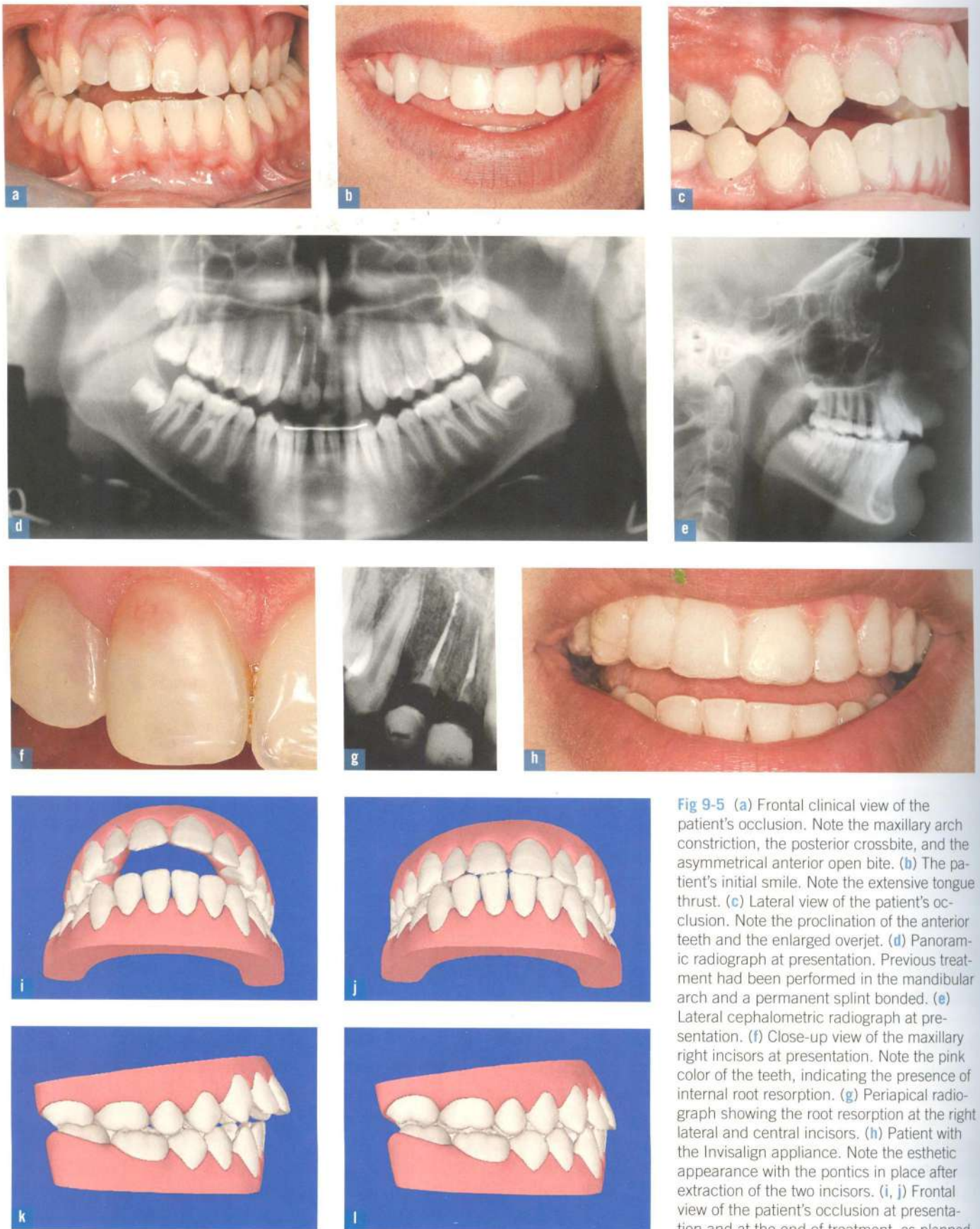
were applied to the premolars, all in order to gain more space at the future implant sites. After an additional 5 months, all treatment goals were achieved (Fig 9-4f to 9-4h). The canines were extruded and placed slightly palatally to enable resin composite restoration (to convert them to the shape of lateral incisors) and the roots were paralleled. The right central incisor could benefit esthetically by being more intruded, to make the gingival heights of the central incisors more even, but the patient chose not to, to avoid having to have this tooth restored later due to the elevated incisal edge that would result from the intrusion process. At this stage, the patient was referred to the surgeon for placement of the implants (Fig 9-4i). The appliance was removed immediately after the implants were loaded (Fig 9-4j).

## Case 5

A 16-year-old patient, presented to the clinic with a Class I malocclusion, enlarged overjet (9 mm), constricted maxillary arch, right posterior crossbite, asymmetrical open bite, and a strong tongue thrust habit (Figs 9-5a to 9-5e). In addition, the maxillary right central and lateral incisors were internally resorbed due to trauma (Figs 9-5f and 9-5g).

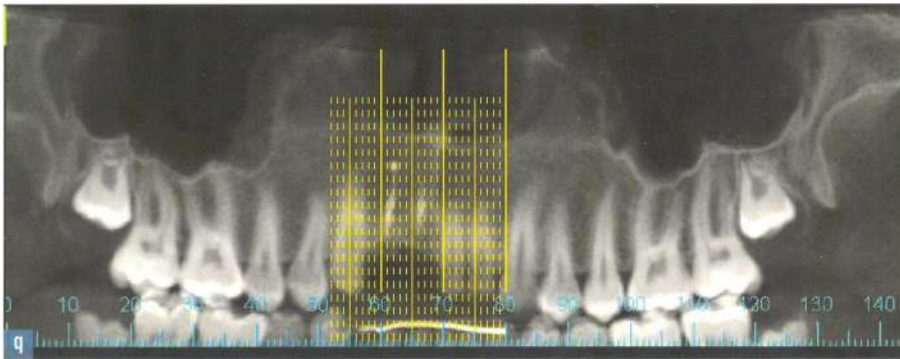
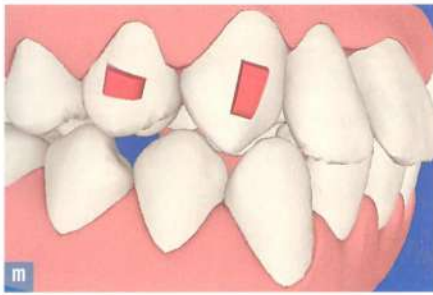
### Treatment options

In this case, it was obvious that the patient needed implants at the site of the maxillary right central and lateral incisors. The questions were:



**Fig 9-5** (a) Frontal clinical view of the patient's occlusion. Note the maxillary arch constriction, the posterior crossbite, and the asymmetrical anterior open bite. (b) The patient's initial smile. Note the extensive tongue thrust. (c) Lateral view of the patient's occlusion. Note the proclination of the anterior teeth and the enlarged overjet. (d) Panoramic radiograph at presentation. Previous treatment had been performed in the mandibular arch and a permanent splint bonded. (e) Lateral cephalometric radiograph at presentation. (f) Close-up view of the maxillary right incisors at presentation. Note the pink color of the teeth, indicating the presence of internal root resorption. (g) Periapical radiograph showing the root resorption at the right lateral and central incisors. (h) Patient with the Invisalign appliance. Note the esthetic appearance with the pontics in place after extraction of the two incisors. (i, j) Frontal view of the patient's occlusion at presentation and at the end of treatment, as planned





by the Clincheck® software by Invisalign. (k, l) Lateral view of the patient's occlusion at presentation and at the end of treatment, as planned by the Clincheck software by Invisalign. (m) Resin composite attachments to upright the teeth adjacent to the implant site, as planned by the Clincheck software by Invisalign. (n) Frontal view of the patient's occlusion during smile. Note the expansion achieved in the maxillary arch, the normal overjet and overbite, and the space opened for implantation for the two missing teeth. (o) Lateral view of the patient's occlusion. Note the Class I canine relationship and the firm occlusion achieved, even though only one arch was treated. (p) Panoramic radiograph at completion of the orthodontic treatment. Note the parallelism of the roots adjacent to the implant site. (q) Assessment of the implant site, with the help of computerized tomography radiographic examination to provide an accurate space measurement. (r) Two implants were inserted. (s) Aligners were modified to provide esthetic retention until the implants could be loaded.

- A. How can the extended overjet be closed and the large proclination of the maxillary incisors be corrected?
- B. Is extra anchorage required for this movement, such as headgear or orthodontic mini-implants?
- C. Given that the patient is only 16 years old and needs another 2 years prior to implantation, how will we restore (provisionally) the anterior teeth that are to be extracted?

### Treatment procedure

An Invisalign® appliance (Align Technologies, San Jose, CA) was chosen as the treatment modality due to its high esthetic standards and its capability to engage with esthetic pontics. The pontics were designed by the dental technician to fit the gums (Fig 9-5h).

The treatment plan included slow expansion of the maxillary arch. This movement would not only correct the transverse dimension, but would also create more space, allowing the anterior teeth to be moved further backwards (Fig 9-5i to 9-5l). For proper uprighting of the adjacent teeth near the implant site, resin composite attachments were added to maximize the grip of the plastic aligner on the teeth and ensure the preplanned root movement (Fig 9-5m). To avoid anchorage problems, treatment was divided into 50 aligners of 2 weeks each (2 years in total), so that each aligner would create minimal force. The patient's cooperation was maximal since the aligners also served as his esthetic restoration for the missing anterior teeth. After the orthodontic treatment was finalized and proper occlusion was achieved, both functionally and esthetically, together with the parallelism of the roots of the teeth adjacent to the missing teeth (Figs 9-5n to 9-5q), implants were inserted and the aligners were modified to serve as a retention appliance until the implants could be loaded (Figs 9-5r and 9-5s).

### Discussion

Implant site preparation not only includes bone and soft tissue buildups, but should also encompass the entire esthetic, functional, and psychological requirements of the patient. Clinicians should respect the inconvenience caused by long treatment plans and be creative in their thinking, especially when very challenging biomechanical needs are involved, as in this particular case.

### Summary

This chapter has described five cases in which unconventional treatment modalities were chosen. Intrusion and preservation of a "hopeless" tooth instead of extrusion and extraction; extrusion of four anterior teeth without braces; extensive

extrusion and preservation of a questionable anterior central incisor; mesialization of canines to replace missing lateral incisors and implantation at the canines' original sites; and, finally, a very challenging case both biomechanically and esthetically that, once properly planned, was treated with minimal intervention and with maximum convenience for the patient.

Being creative and flexible is the name of the game. Clinicians tend to stick within a comfort zone, where the most conservative, yet most predictable, treatment modality is chosen, regardless of the patient's needs and requests. What we call hopeless teeth can survive and function for many more years if properly maintained. What we call unesthetic outcomes can be irrelevant and unimportant to patients, as long as harmony and function are achieved and there is a relatively significant improvement.

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