"Learn the rules like a pro so you can break them like an artist."

PABLO PICASSO

7

Adjacent Implants

/ Tomohiro Ishikawa, Arndt Happe

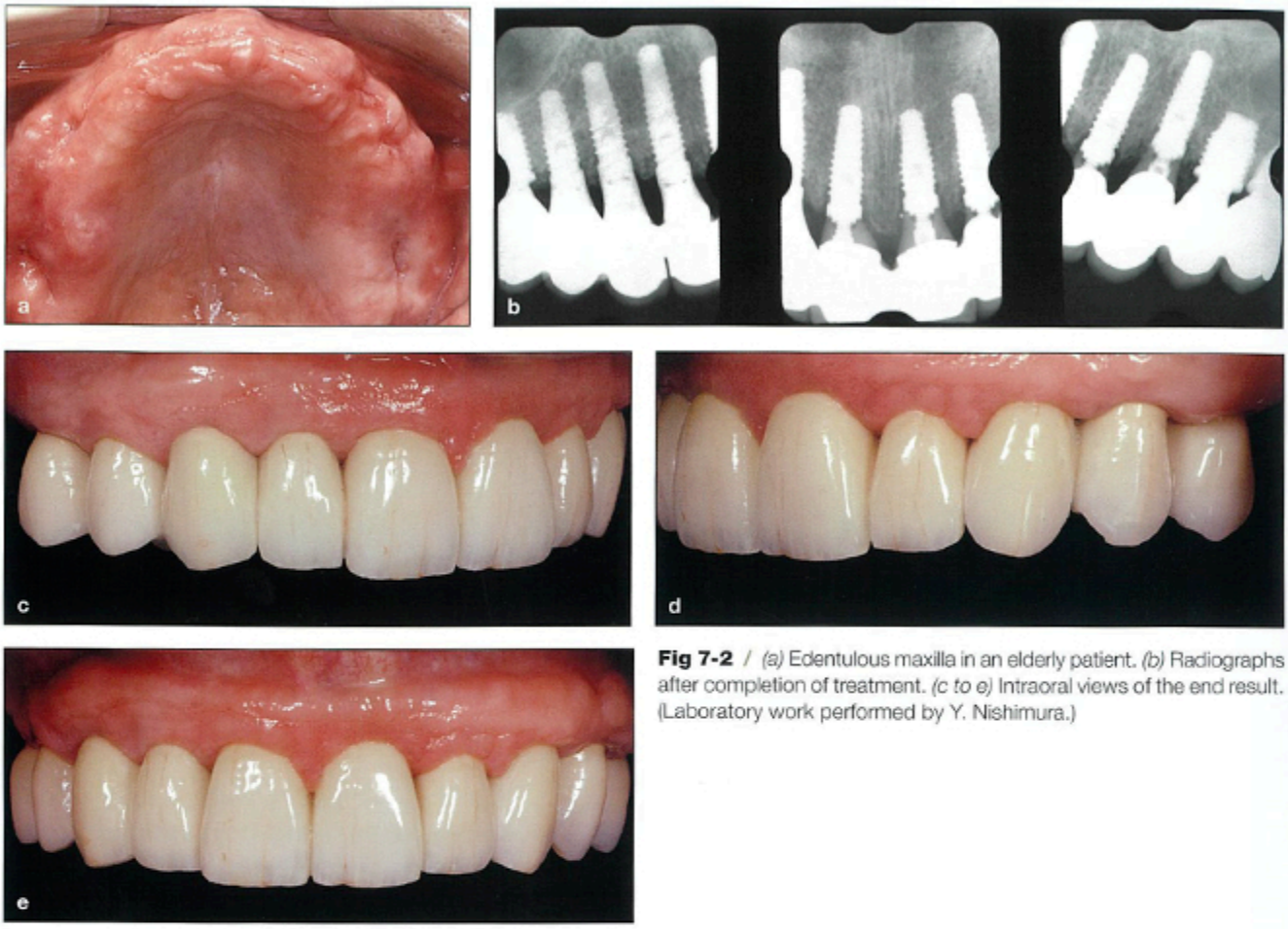

Fig 7-2 / *(a)* Edentulous maxilla in an elderly patient. *(b)* Radiographs after completion of treatment. *(c to e)* Intraoral views of the end result. (Laboratory work performed by Y. Nishimura.)

papillae were stable 4 years after treatment. Despite the less-than-ideal papilla heights, the patient was satisfied because the symmetric, harmonious relative heights of all the papillae created an overall appearance that was esthetically pleasing (Figs 7-2c to 7-2e). The radiographs show the heights of the interimplant bone. The interimplant bone crest is determined by the interimplant distance, and the degree of remodeling is mainly determined by the difference in this distance.

Unilateral tooth loss

When there is unilateral tooth loss, it is far more difficult to produce an attractive soft tissue esthetic than it is with bilateral missing teeth. It proves particularly challenging if there is a prominent contralateral papilla to compare with the compromised interimplant papilla.

Clinical case

A 20-year-old patient with unilateral trauma-related tooth loss presented after an accident (Fig 7-3a). The radiographs show that nearly all the interdental bone septa were intact (Figs 7-3b to 7-3d). The maxillary left central incisor was classified as worth preserving despite the unavoidable root canal treatment. Unfortunately, the right lateral incisor together with its vestibular bony wall had been lost, and the fracture line of the horizontal fracture of the right central incisor extended 2 mm subcrestally. It was therefore decided to replace both right incisors with implants. After completion of the treatment, the interimplant papilla between the implant crowns did not completely match the corresponding contralateral papilla, but the patient was very satisfied with the result despite the asymmetric papillae (Fig 7-3e). The radiograph reveals slight resorption of the interimplant bone (Fig 7-3f).

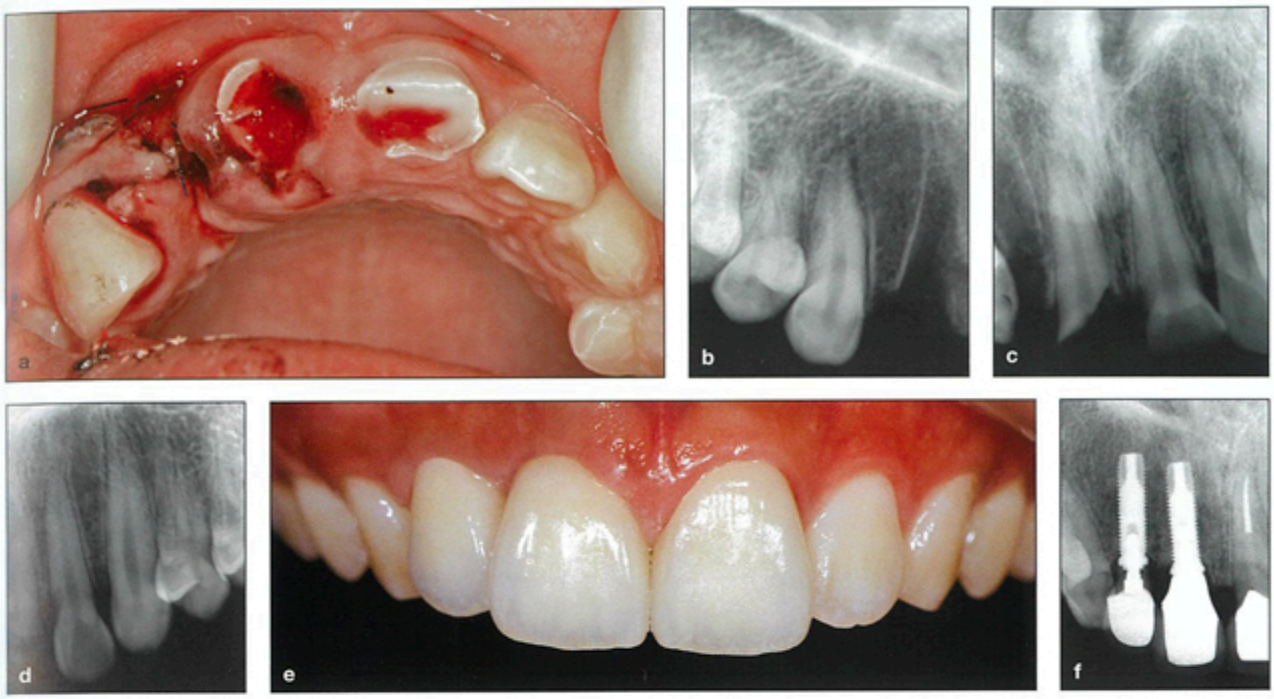

Fig 7-3 / *(a)* Occlusal view at initial visit. *(b to d)* The radiographs show that nearly all of the interdental bone septa were intact. *(e)* The papilla between the implant crowns does not fully match the corresponding contralateral papilla. *(f)* Radiograph shows slight resorption. (Laboratory work performed by K. Nakajima.)

Interimplant distance

The minimum distance required between two implants is 3 mm. It is always advisable to use the largest possible interimplant distance because this parameter has a direct impact on the potential height of the interimplant papilla.[7,8] The papillae between the central and lateral incisors as well as the lateral incisors and canines in both arches can be compared with their contralateral papillae. This means that there is a natural comparative size that must be achieved for a balanced esthetic result.

Limited mesiodistal space and a natural papilla on the contralateral side, which allows for comparison, create a difficult esthetic situation prior to treatment. If the interimplant distance is small, it is usually only possible to create small papillae. If there is sufficient space, however, the interimplant bony ridge can normally be preserved, and a natural-looking interimplant papilla can be established.

Clinical case with 3-mm interimplant distance

A 37-year-old patient presented after traumatic tooth loss (Fig 7-4a). Both central incisors with their vestibular bony wall had been lost. Two implants were placed without the appropriate measures being taken to reduce postrestorative bone remodeling. As a result of bone remodeling processes in the area of the abutment-implant interface, the interimplant bone resorbed, and the interdental papilla in this area appeared distinctly reduced and visibly flatter than the papillae between implants and adjacent natural teeth. If the papilla is smaller between the central incisors, it is often still esthetically acceptable because the bilateral symmetry is not disturbed (Figs 7-4b and 7-4c).

Clinical case with 4-mm interimplant distance

A 55-year-old patient had lost both maxillary central incisors a few years before treatment. Although the ridge was already very narrow, there was no vertical deficit. The implants were placed in the ideal prosthetic position, and the alveolar ridge was augmented horizontally with GBR (Figs 7-5a and 7-5b). The horizontal bone augmentation laid the foundation for an esthetic papilla. After successful osseointegration, it was possible to develop an interimplant papilla to a height that was comparable with the interdental papillae of the adjacent natural teeth (Fig

Fig 7-13 *cont.* / *(i)* Situation after completion of the orthodontic pretreatment. *(j)* The occlusal relationship after the orthodontic treatment. *(k)* Even after the orthodontic correction, it is still a complex task to create a pleasing esthetic. *(l)* Situation before bone augmentation. The high smile line, in particular, made the treatment challenging. *(m)* Bonded provisional restoration. The provisional with its pink gingival portion provided a preview of the intended end result. *(n)* A diagnostic template was fabricated to plan the tissue augmentation. This made it clear that a 3D ridge reconstruction was imperative for an esthetic outcome.

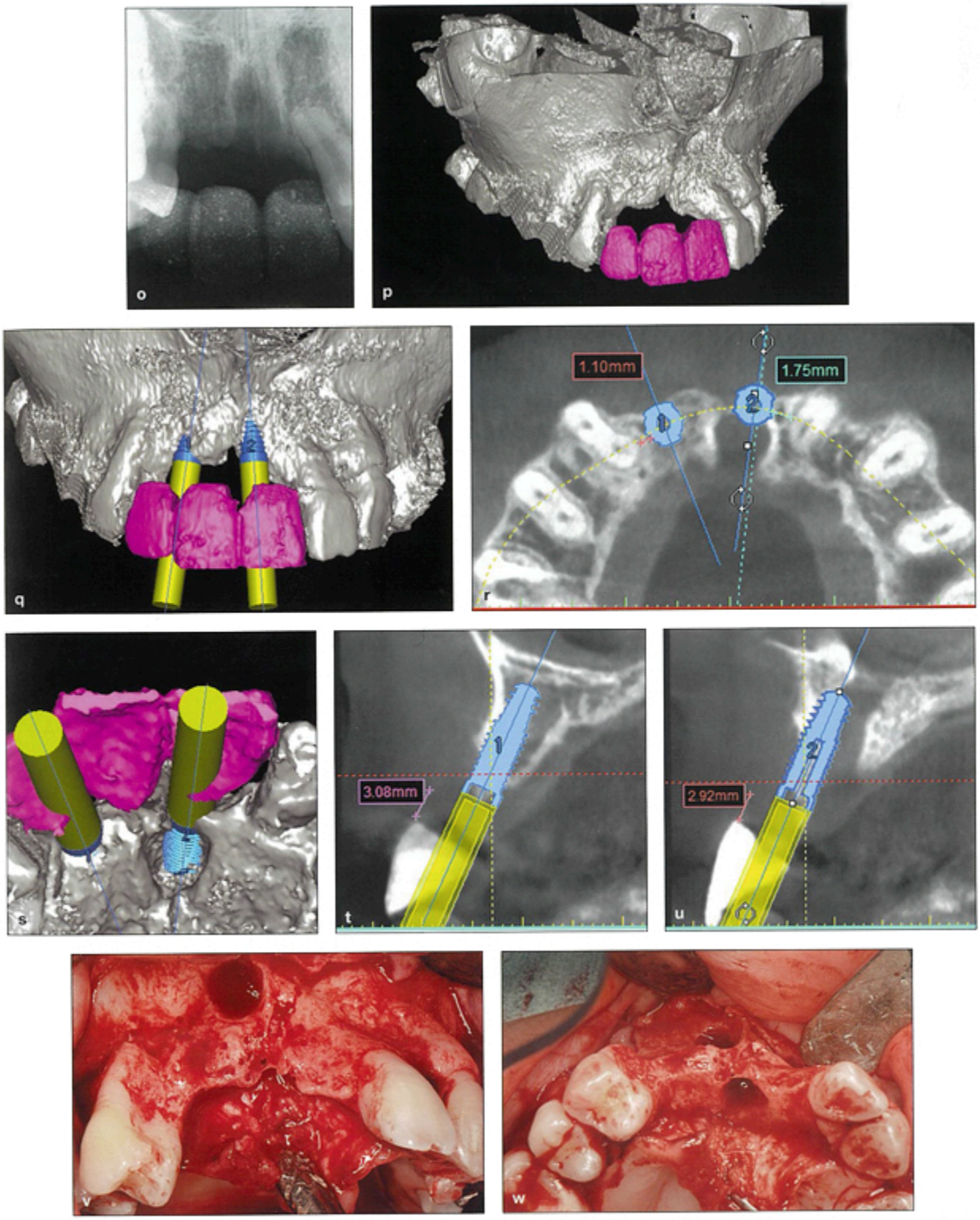

Fig 7-13 *cont.* / *(o to r)* Radiograph and CBCT scan before ridge reconstruction. The CBCT and radiograph with diagnostic template in place showed that the alveolar ridge had significant 3D hard and soft tissue defects. *(s to u)* The computer simulation prior to bone augmentation shows that the space for implant placement in the region of the right lateral incisor and left central incisor is inadequate. Furthermore, the angulation of the left lateral incisor and the prominent incisive canal prevent an ideal implant position. *(v and w)* The root eminences show the incorrect inclination of the teeth bordering the gap. The bone was cleaned of soft tissue, and the neurovascular bundle was removed from the incisive canal.

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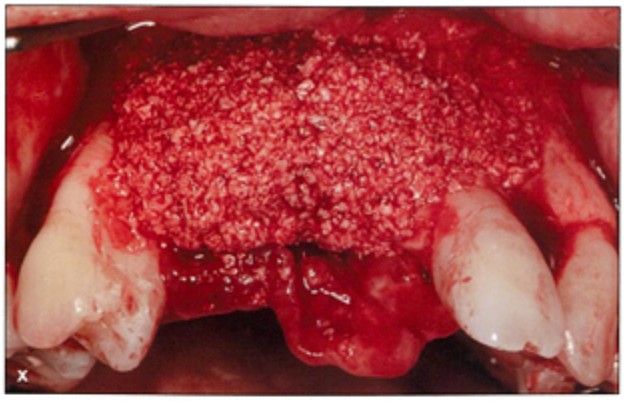
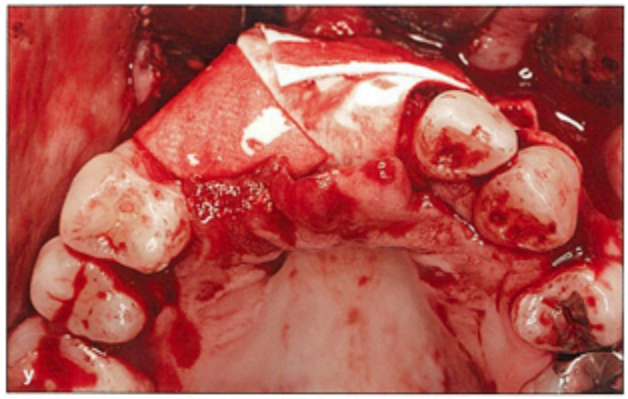
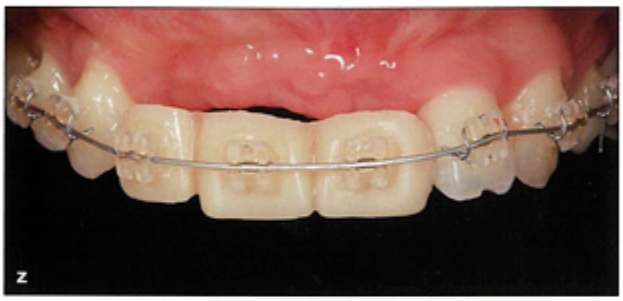
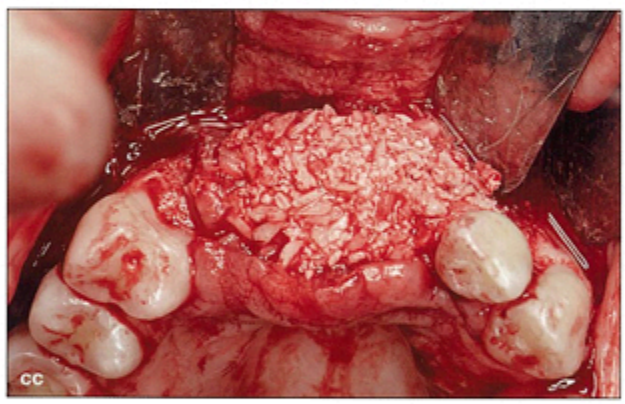








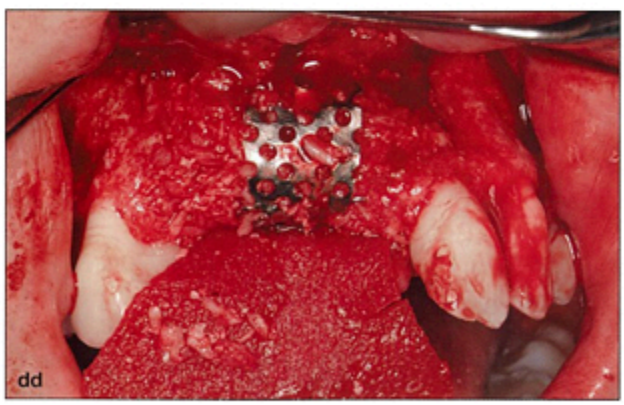
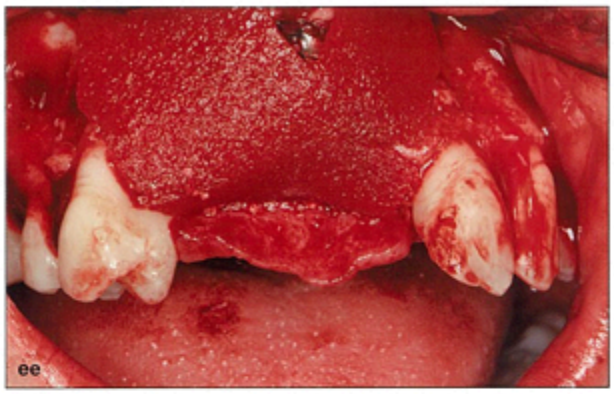
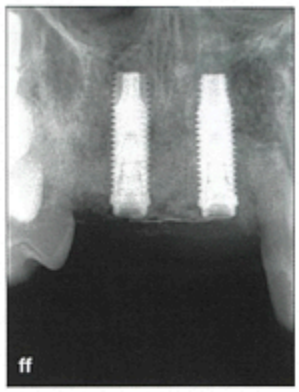
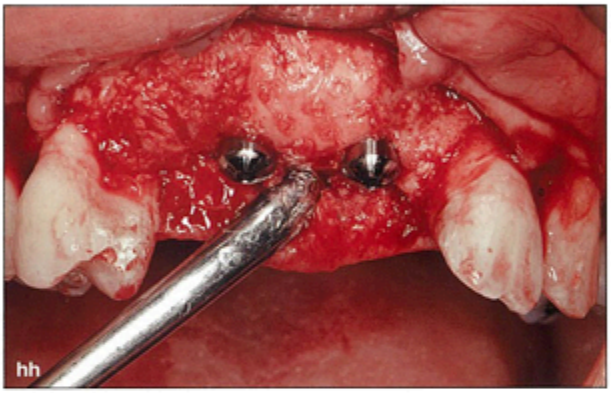
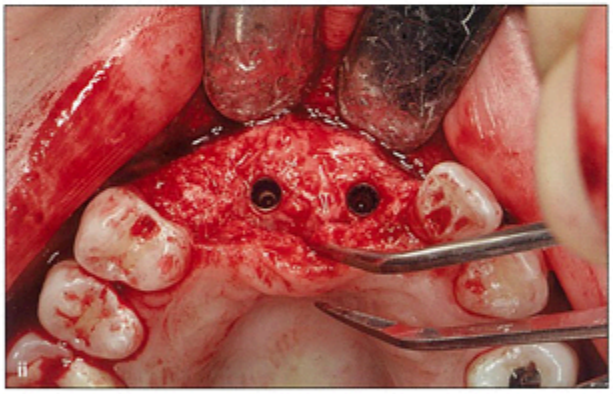


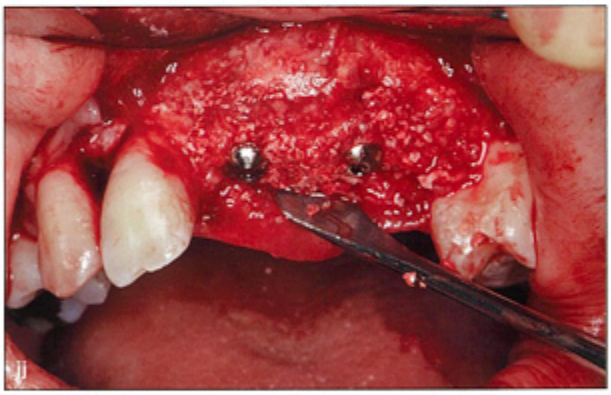
Fig 7-13 *cont.* / *(x and y)* To create the necessary bony foundation for implant placement, a mix of autogenous bone and bovine bone material in combination with a stiff, cross-linked collagen membrane was used for augmentation. *(z and aa)* Comparison of the situations before and after correction of the tooth axis of the left lateral incisor, which was completed orthodontically during the first healing phase after GBR. *(bb to dd)* Precise implant positioning and second esthetic GBR: A titanium mesh that was filled with particulate bone graft material was fixed with the aid of the gingiva former.











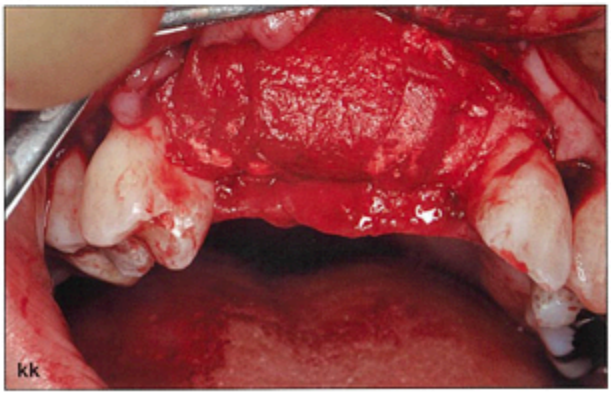


Fig 7-13 *cont.* / *(ee)* Esthetic GBR: The entire site was covered with a collagen membrane. *(ff)* Radiograph after implant placement. *(gg)* Immediately after the surgical procedure, the provisional restoration should be adapted to allow enough clearance for any postoperative edema. *(hh and ii)* The augmented ridge 7 months after implant placement. *(jj and kk)* Additional GBR for improved esthetics.

Fig 7-13 *cont.* / *(ddd to fff)* The end result. Although the patient presented with severe tissue damage, adequate tissue and papilla reconstruction was achieved, resulting in restored esthetics and function. *(ggg)* Photograph after 3 years of function showing soft tissue formation. *(hhh and iii)* Portrait after the treatment. Despite the high smile line, the patient is able to smile with confidence. (Orthodontics performed by K. Kida; laboratory work performed by M. Hinoshita.)

"Life is not a matter of holding good cards, but of playing a poor hand well."

ROBERT LOUIS STEVENSON

14

Complex Cases

/ Tomohiro Ishikawa, Gerd Körner, Arndt Happe

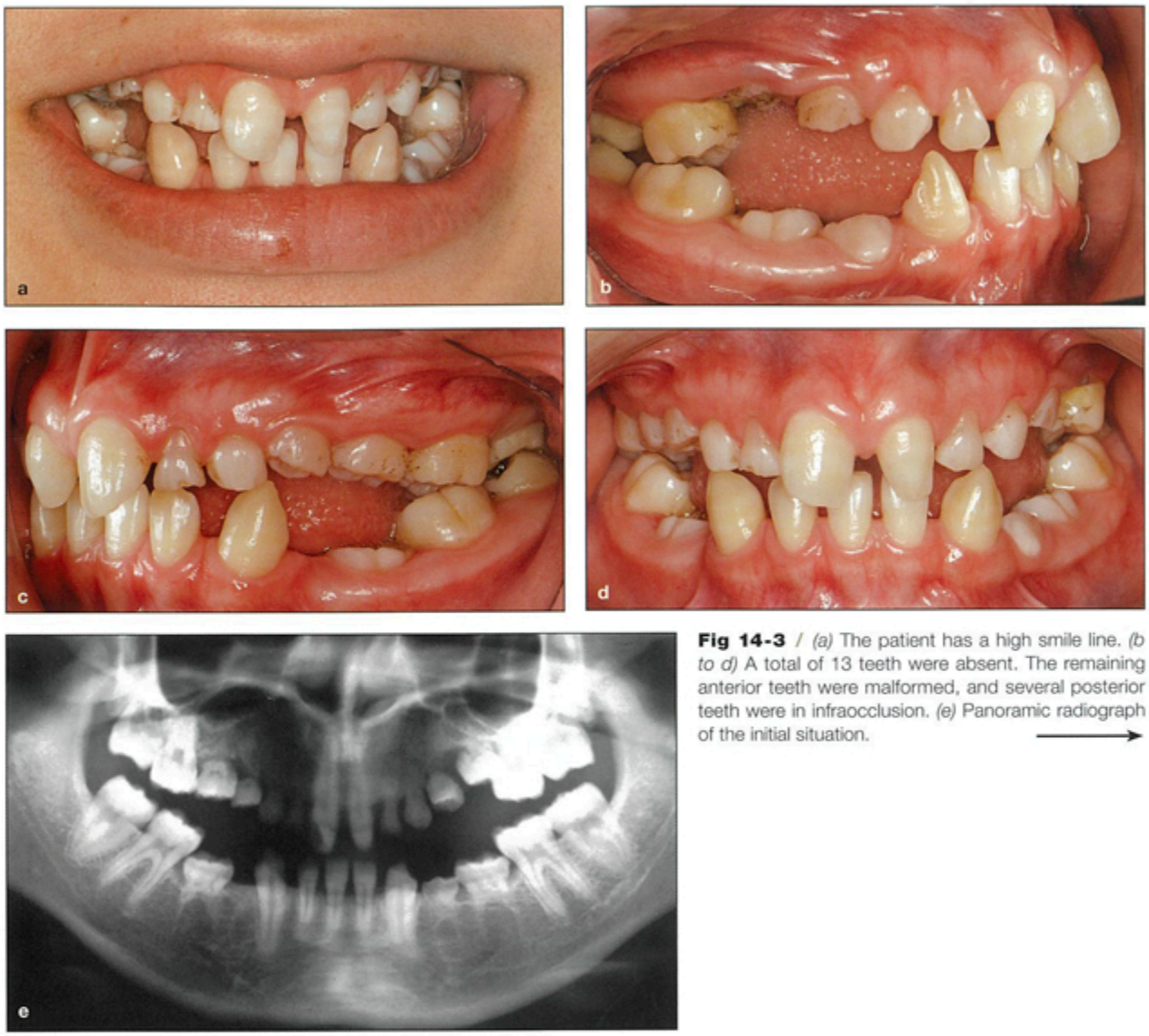


Fig 14-3 / *(a)* The patient has a high smile line. *(b to d)* A total of 13 teeth were absent. The remaining anterior teeth were malformed, and several posterior teeth were in infraocclusion. *(e)* Panoramic radiograph of the initial situation.

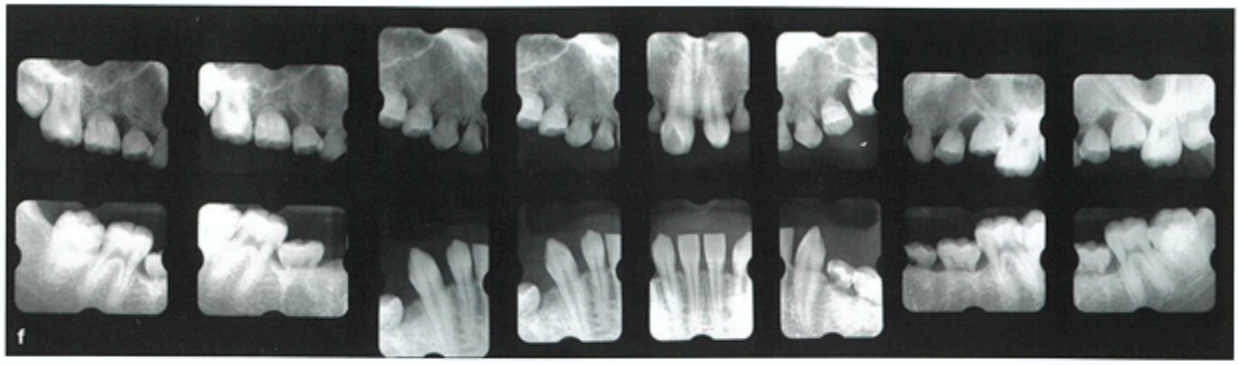
Case 2

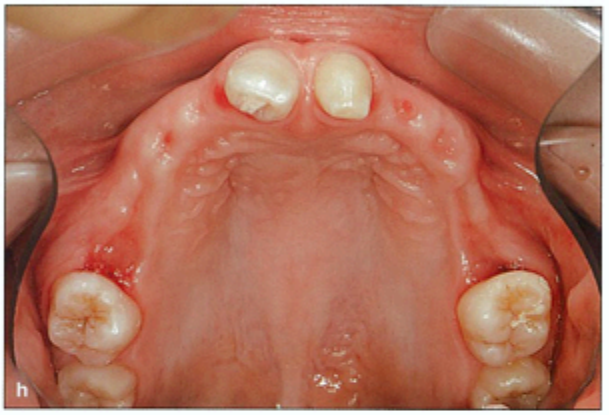
The following were key factors for therapeutic success in this case:

- Space management
- IO sequence in the maxilla
- Combination sequence in the mandible
- Anticipating the implant position

A 19-year-old patient with agenesis of 13 teeth and various hypoplasias was referred by another dentist (Fig 14-3a). The maxillary premolars to lateral incisors were absent, as well as all mandibular premolars and the mandibular left lateral incisor. The maxillary central incisors and mandibular canines were malformed (Figs 14-3b to 14-3f).

The persistent primary teeth were ankylosed with pronounced infraocclusion. The patient has a high smile line. A setup was developed by the orthodontist (Fig 14-3g). Orthodontists are generally inclined to avoid molar movements, but the possibility of anchorage on implants should be taken into consideration. This provides an opportunity to reconstruct the entire occlusion. Using silicone keys, the orthodontic setup was transferred to a radiographic template made of radiopaque acrylic resin to allow for a clinical try-in (Figs 14-3h to 14-3o).[14–17] Therefore, the





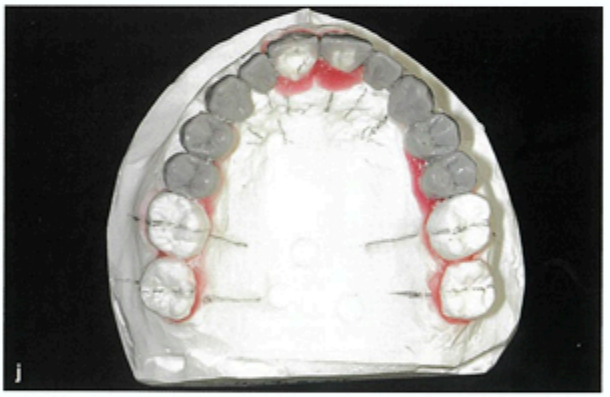


Fig 14-3 *cont.* / *(f)* Apical radiographs. *(g)* The first setup cast developed by the orthodontist. *(h to j)* The implant positions are transferred from the setup cast to the original working cast. First, an orthodontic setup is made for the diagnostic wax-up. The working cast for the diagnostic template is fabricated with artificial reference structures (three depressions in the palate) and copied for the orthodontic setup and the diagnostic wax-up. *(k and l)* The positions of the wax-up are then transferred to the cast.

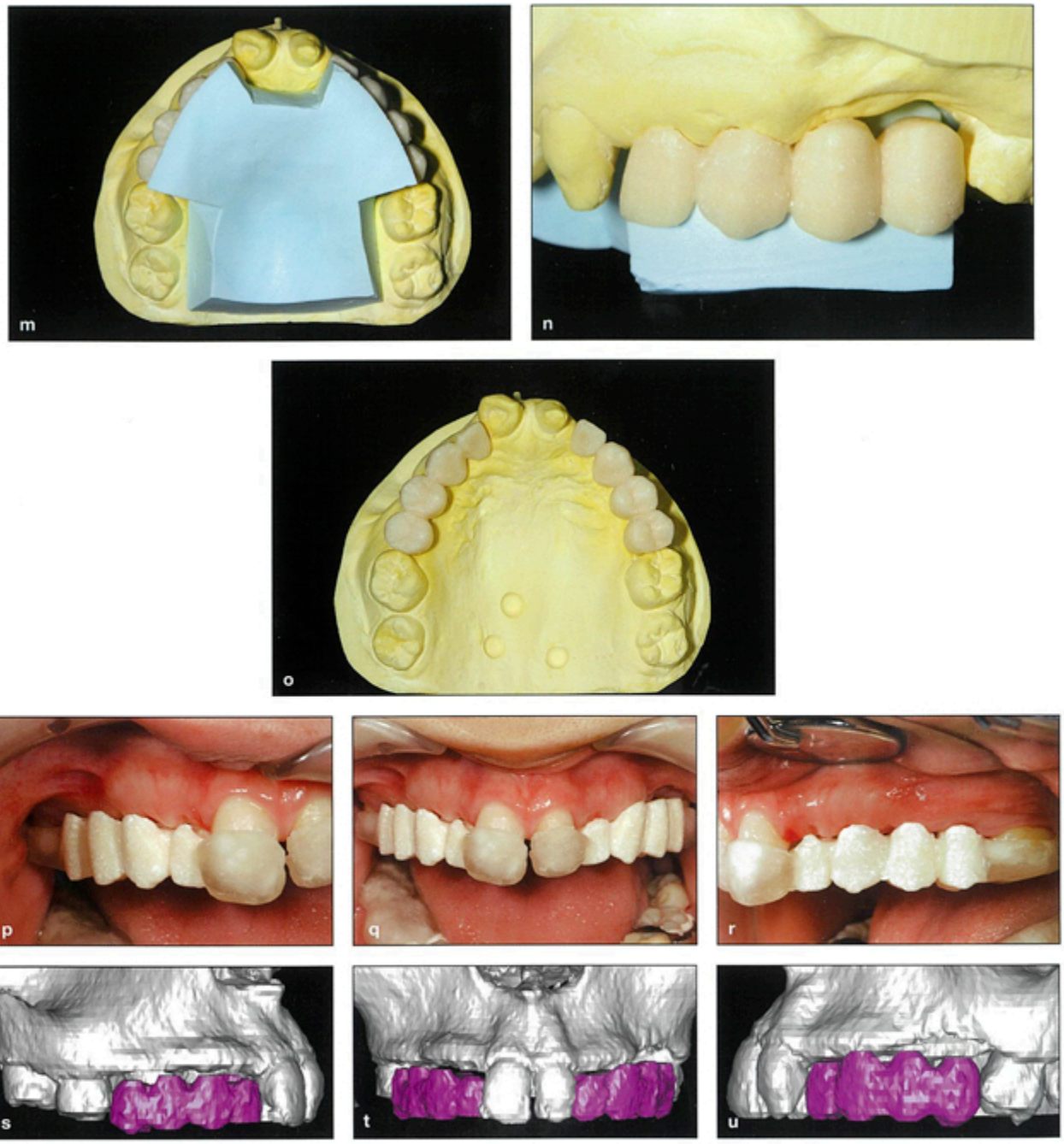
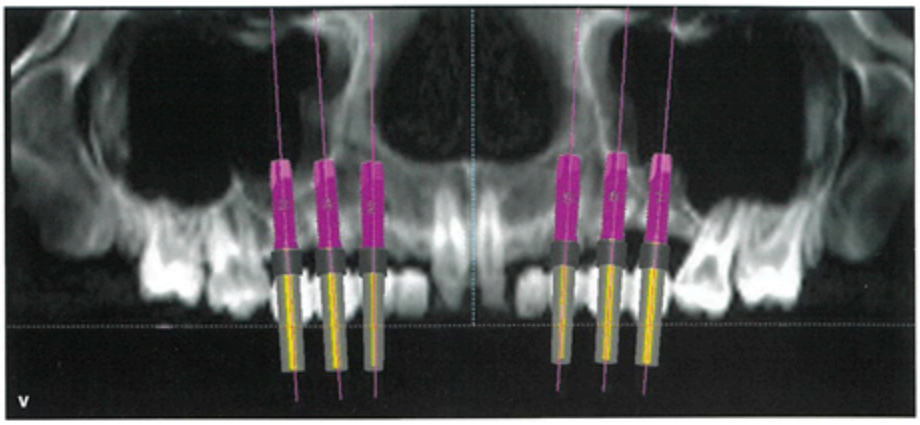


Fig 14-3 *cont.* / *(m to o)* After the wax-up positions are transferred to the working cast, the future implant positions are anticipated and transferred as well.[14–17] *(p to u)* The proportions are analyzed. The diagnostic template fabricated according to the orthodontic setup model conveys an idea of the ideal future shape of the alveolar ridge.

orthodontic proposal to the patient could be tested for plausibility and the anatomical conditions could be analyzed with cone beam computed tomography (CBCT) (Figs 14-3p to 14-3u).

Based on strategic considerations, the maxillary sites selected for implant placement were the canine and premolar sites (Figs 14-3v to 14-3aa; see Box 14-1). A strategically advantageous choice of implant positions is particularly important in cases that also necessitate orthodontic treatment. Orthodontic treatment began as soon as the implants were functioning. In the maxilla, the treatment procedure followed the IO sequence.



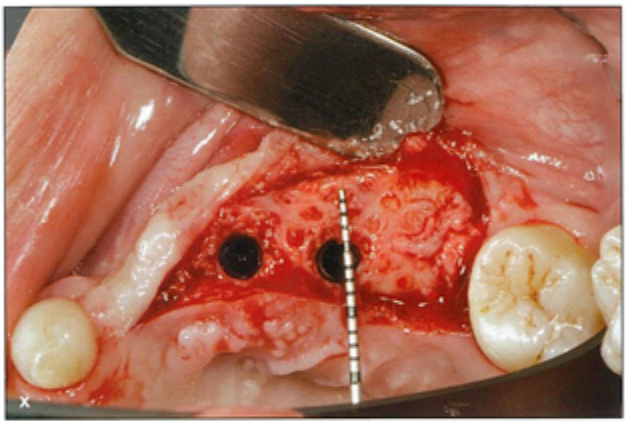


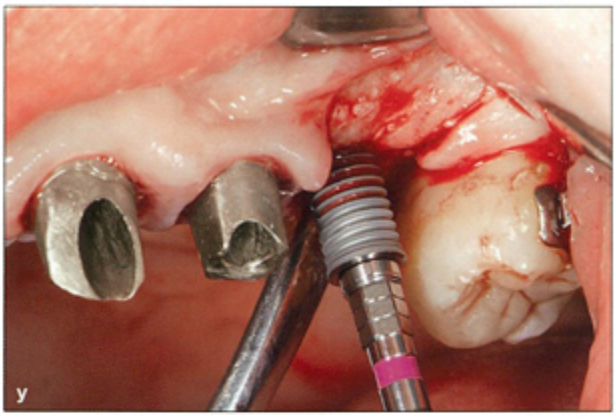
Fig 14-3 *cont.* / *(v)* The implant sites are strategically chosen (see Box 14-1). *(w and x)* Implant placement begins.

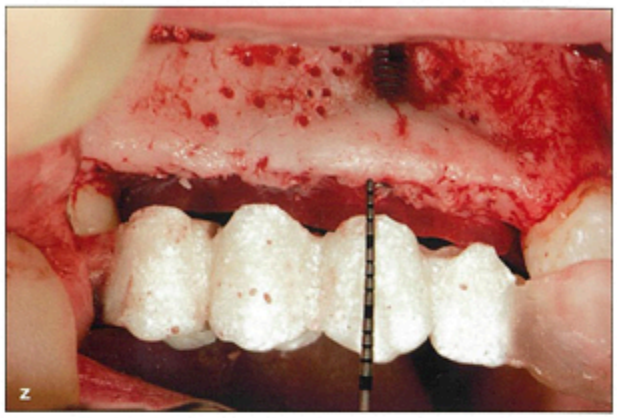
After the success of the first orthodontic treatment, a second orthodontic setup was prepared (Fig 14-3bb). The planned definitive tooth positions can be altered during the course of the orthodontic treatment. In this case, a second setup cast was fabricated and the changes were taken into account.[18] Thanks to extensions mesial to the positions of the lateral incisors, it was possible to react to the changes resulting from the orthodontic treatment by adapting the pontic form.

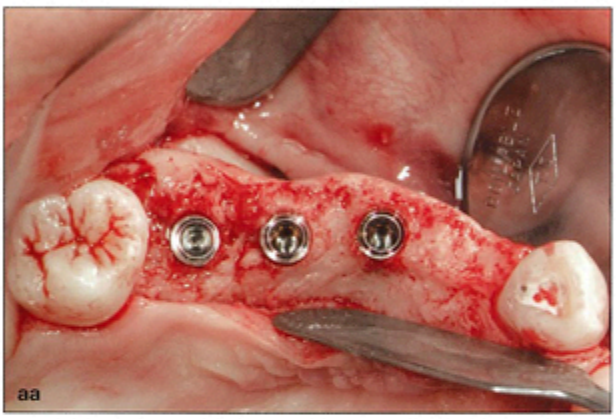
In the mandible, the treatment followed an IOI combination sequence. The space in the gap at the premolar region was assessed as being too small for two adjacent implants, so the canine was to be orthodontically moved away from the planned implant position (Figs 14-3cc to 14-3ee). The first step was implant placement in the site of the second premolar. Using this implant as an anchor, the canine was moved mesially to free up space at the first premolar site for another implant. After adequate space was formed at the first premolar site, the implant was to be placed.

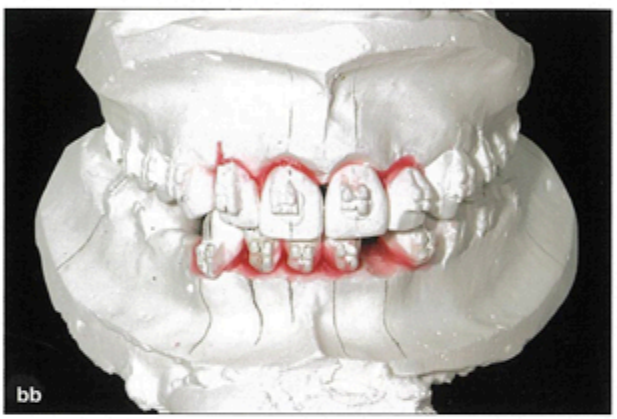
When the 4-mm-diameter implant at the premolar site was restored with a 7-mm-wide crown, there was not enough space to maintain the necessary 3-mm distance from the adjacent implant and 1.5-mm distance from the adjacent tooth (Figs 14-3ff and 14-3gg). The treatment team (ie, orthodontist, dental technician, surgeon, and prosthodontist) must fully absorb these rules and always bear in mind that they apply on both sides of the implant. All team members need to make sure from the start of treatment that, in an IOI sequence, each step is planned not as an individual event but in the context of the overall treatment.

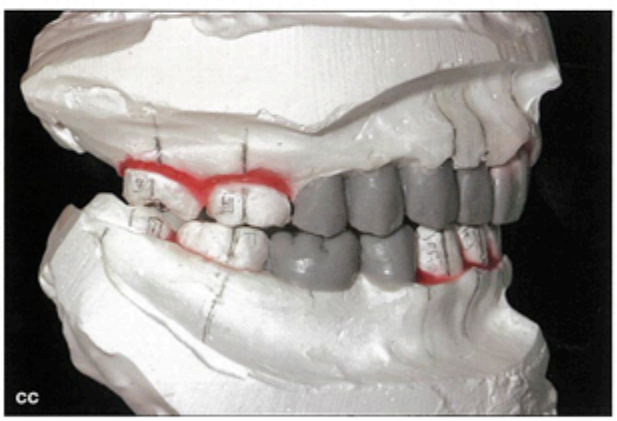
The end result achieved was esthetically and functionally satisfactory (Figs 14-3hh to 14-3rr). However, an even better occlusal relationship could have been created if it had been planned to move the molars as well when using the implant anchors.











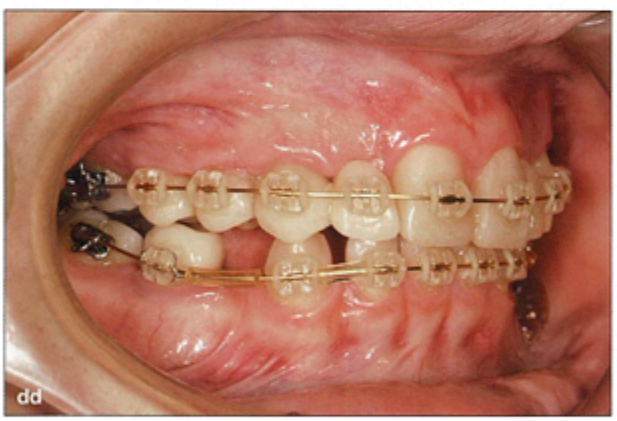


Fig 14-3 *cont.* / *(y to aa)* The implants are placed as precisely and accurately as possible in the planned positions. *(bb)* The second orthodontic setup cast. *(cc)* When planning for the mandible, the problem was the lack of space for two implants and the existing canine. *(dd and ee)* IOI sequence in the mandible.

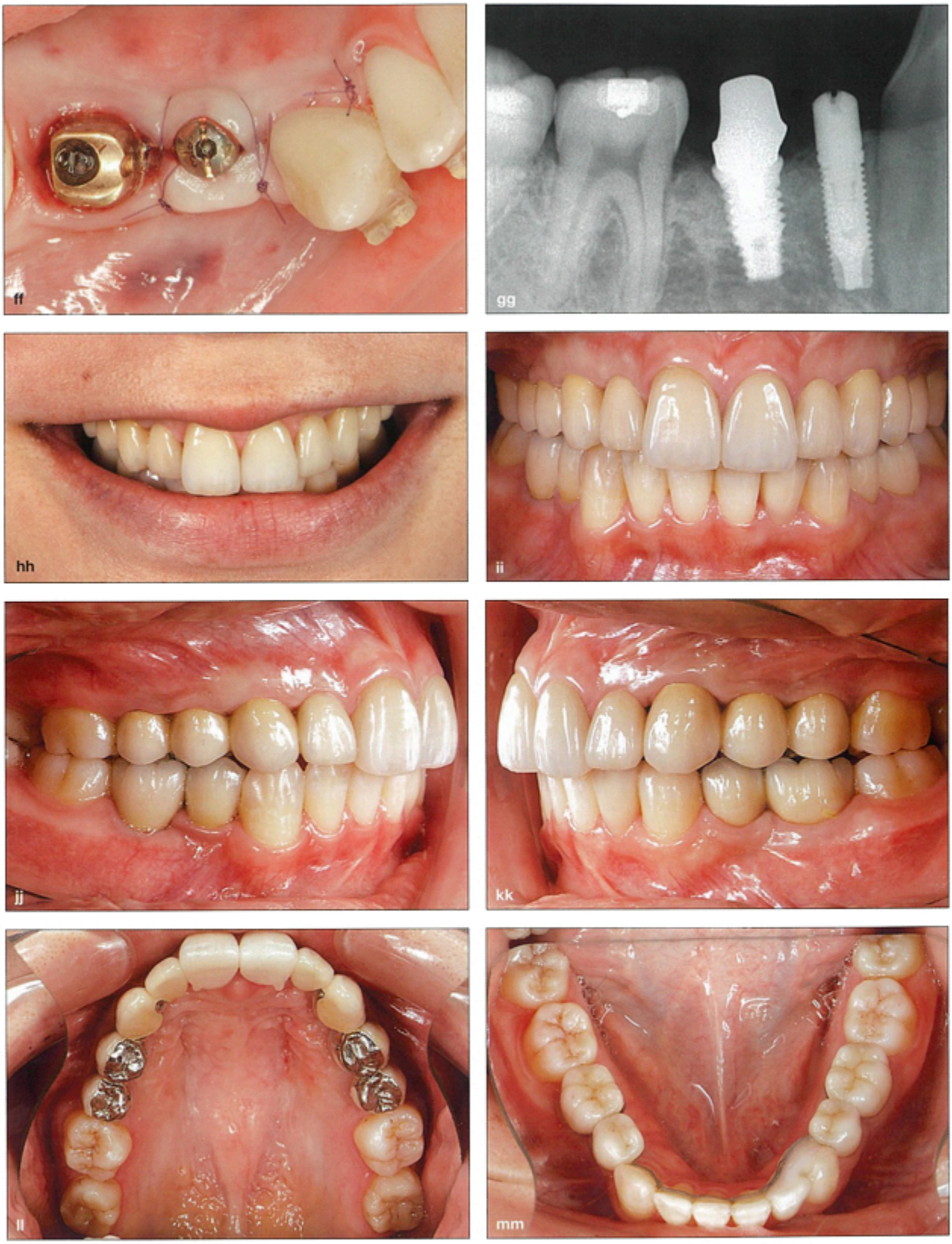


Fig 14-3 *cont.* / *(ff and gg)* When the first premolar implant was placed, there was no space available to maintain the necessary 3-mm distance from the adjacent second premolar implant and 1.5-mm distance from the adjacent natural canine. *(hh)* The patient smiling after completion of the treatment. *(ii to mm)* Frontal, lateral, and occlusal views of the end result. If the treatment plan had included implant anchors to move the molars, a better occlusal relationship could have been established.

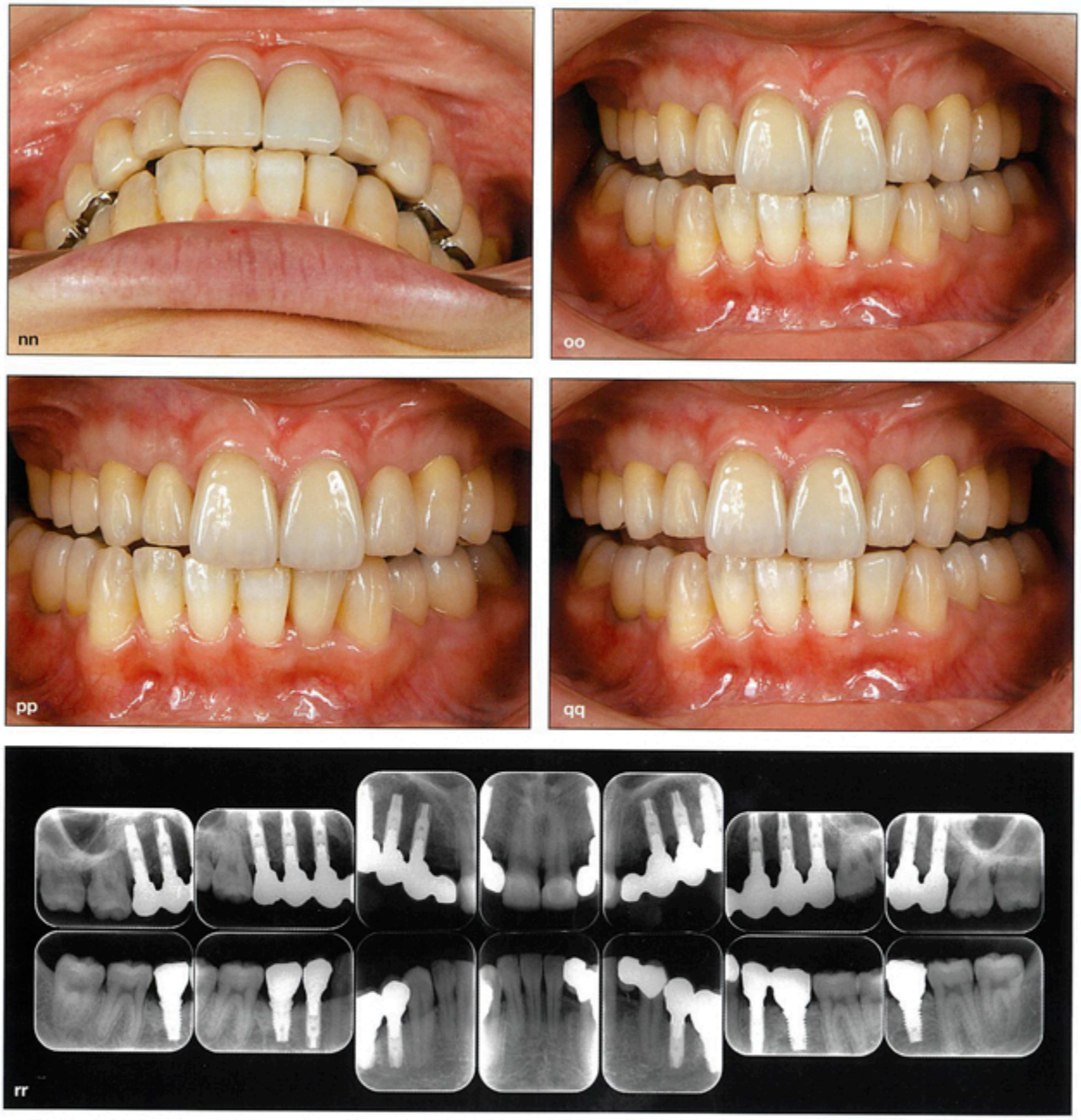


Fig 14-3 *cont.* / *(nn to qq)* Acceptable anterior guidance. The shape of the mandibular anterior teeth was adapted to create correct anterior guidance by using direct composite restorations. *(rr)* Radiographs after completion of treatment. (Surgery and prosthodontics performed by T. Ishikawa; orthodontics performed by K. Kida; laboratory work performed by K. Nakajima.)

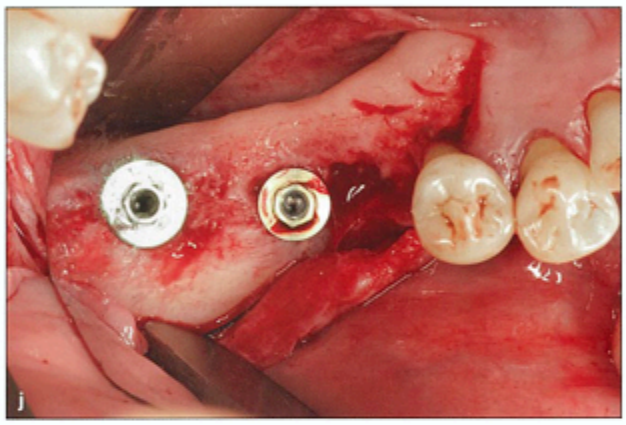
Extensive Tissue Reconstruction

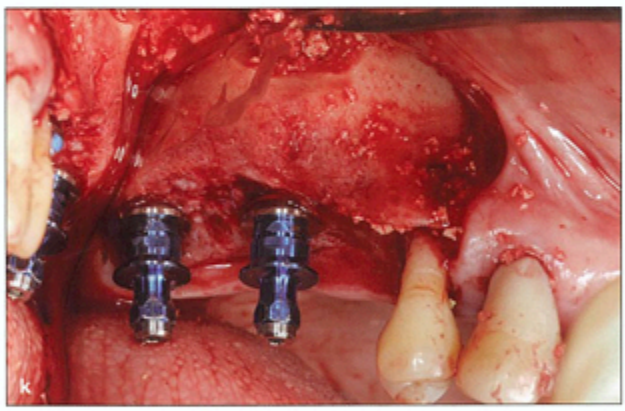
The most common factors causing severe alveolar ridge defects include the following pathologic changes:

- Trauma
- Advanced periodontal diseases
- Sizeable endodontic lesions
- Infections after root fracture
- Neoplasias and malignancies

Esthetic implant therapy can be more complicated when there is severe tissue loss. The design of the definitive restoration is influenced by several factors, including the functional and esthetic demands as well as financial

Fig 14-4 / *(a to d)* Intraoral preoperative situation. *(e and f)* Radiographs before the start of treatment.





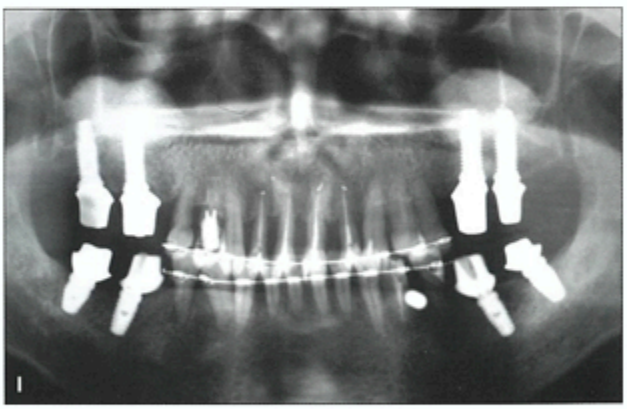


Fig 14-4 *cont.* / *(g and h)* Overjet and position of the incisal edges before treatment. *(i)* The diagnostic template indicates the implant positions that were planned after extraction of the molars not worth preserving. *(j and k)* Implants were placed in the posterior region in the positions planned on the orthodontic setup. *(l and m)* Comparison of the panoramic radiographs before and after orthodontic extrusion.

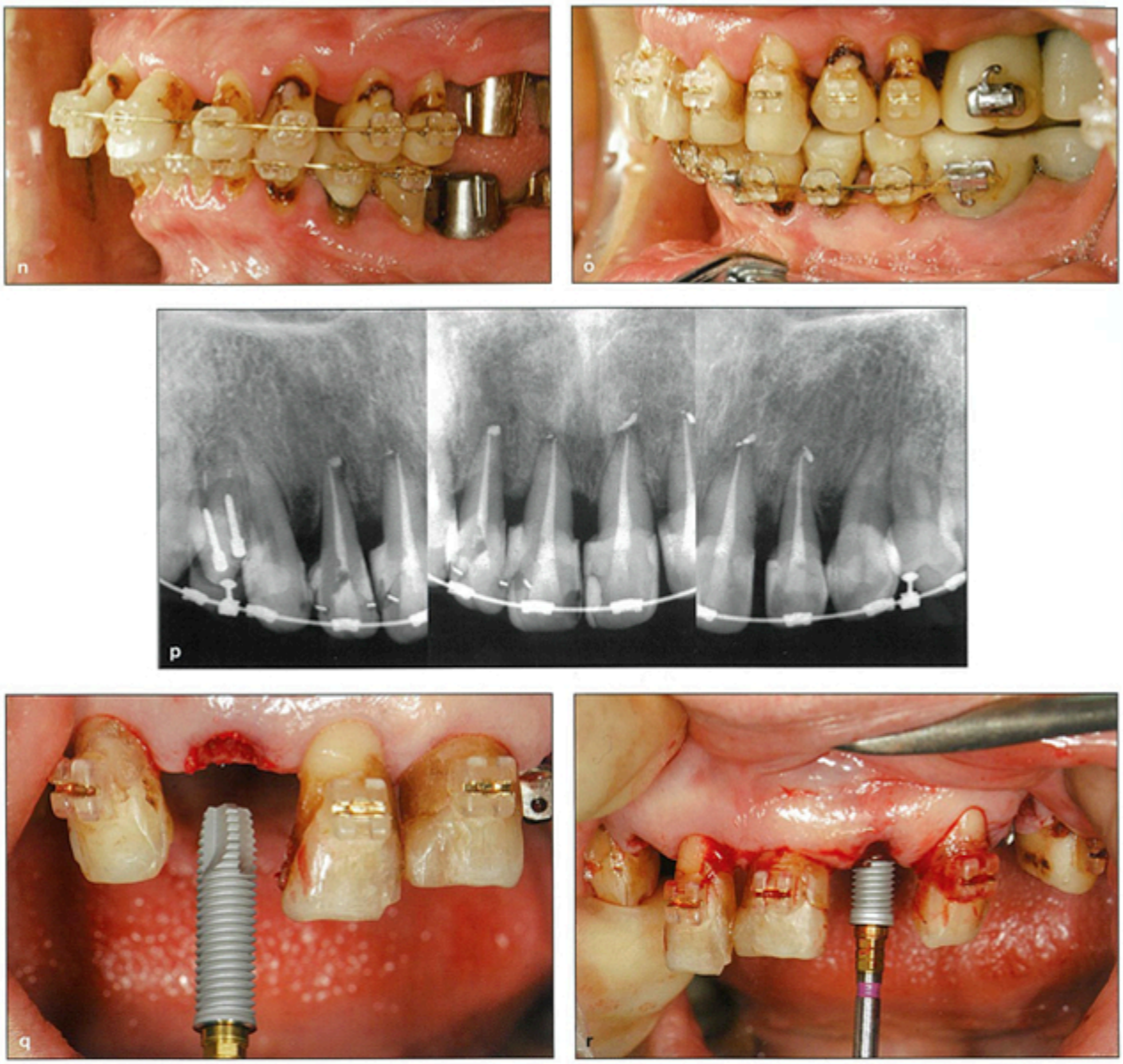
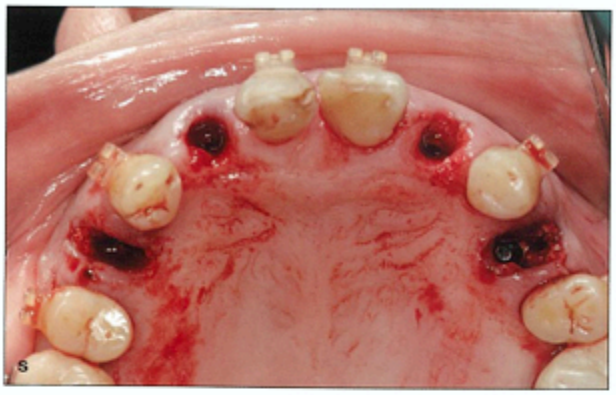
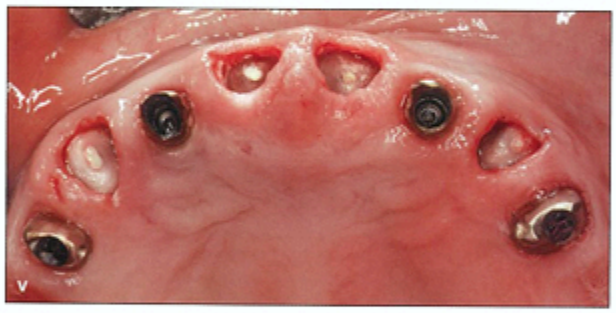


Fig 14-4 *cont.* / *(n and o)* Comparison of lateral views before and after extrusion. *(p)* Each of the incisor roots are in a different position, showing that each tooth was extruded depending on the attachment level. *(q and r)* Immediate implants were placed.

were placed in the fresh extraction sockets of the maxillary lateral incisors and first premolars in a minimally invasive procedure (Figs 14-4q to 14-4t).

The implants were placed in the ideal positions corresponding to the most palatal position within the sockets. After extrusion, the remaining teeth were capable of maintaining the soft tissue frame, but their loss of attachment was too great to support crowns or partial dentures (Fig 14-4u). Extraction of these teeth, even with ridge preservation techniques, would have led to a deterioration in the already optimized hard and soft tissue architecture. This situation is therefore a good indication for the root submergence technique.[24] To avoid relapse of the vertical problems, it is advisable to retain the extruded teeth for as long as possible, preferably at least 6 months, before beginning the root submergence procedure. For the root submergence technique, the crowns of the teeth were cut off, and the pulp was directly capped with mineral trioxide aggregate (MTA) (Fig 14-4v). To avoid the need to harvest soft tissue from the palate, the crowns were cut off at the bony ridge level (ie, more apical than ideal) and the roots were covered with collagen sponge soaked in plasma





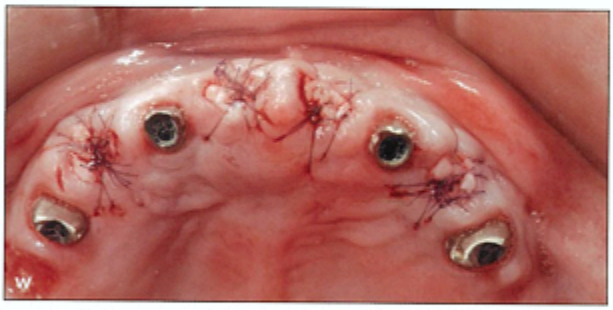
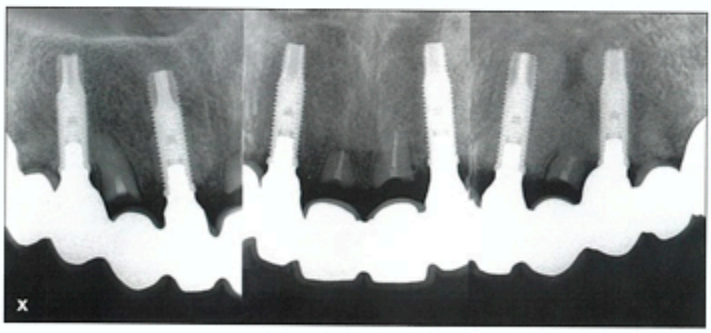


Fig 14-4 *cont.* / *(s and t)* Implants were placed in a minimally invasive procedure. *(u)* Soft tissue situation after incorporation of the implants. *(v)* The vital teeth were cut off at the bone level, and the pulps were directly capped with MTA. *(w)* The roots were sealed with collagen. *(x)* The root submergence technique conserves the bone level. *(y)* The soft tissue is supported by the submerged roots.



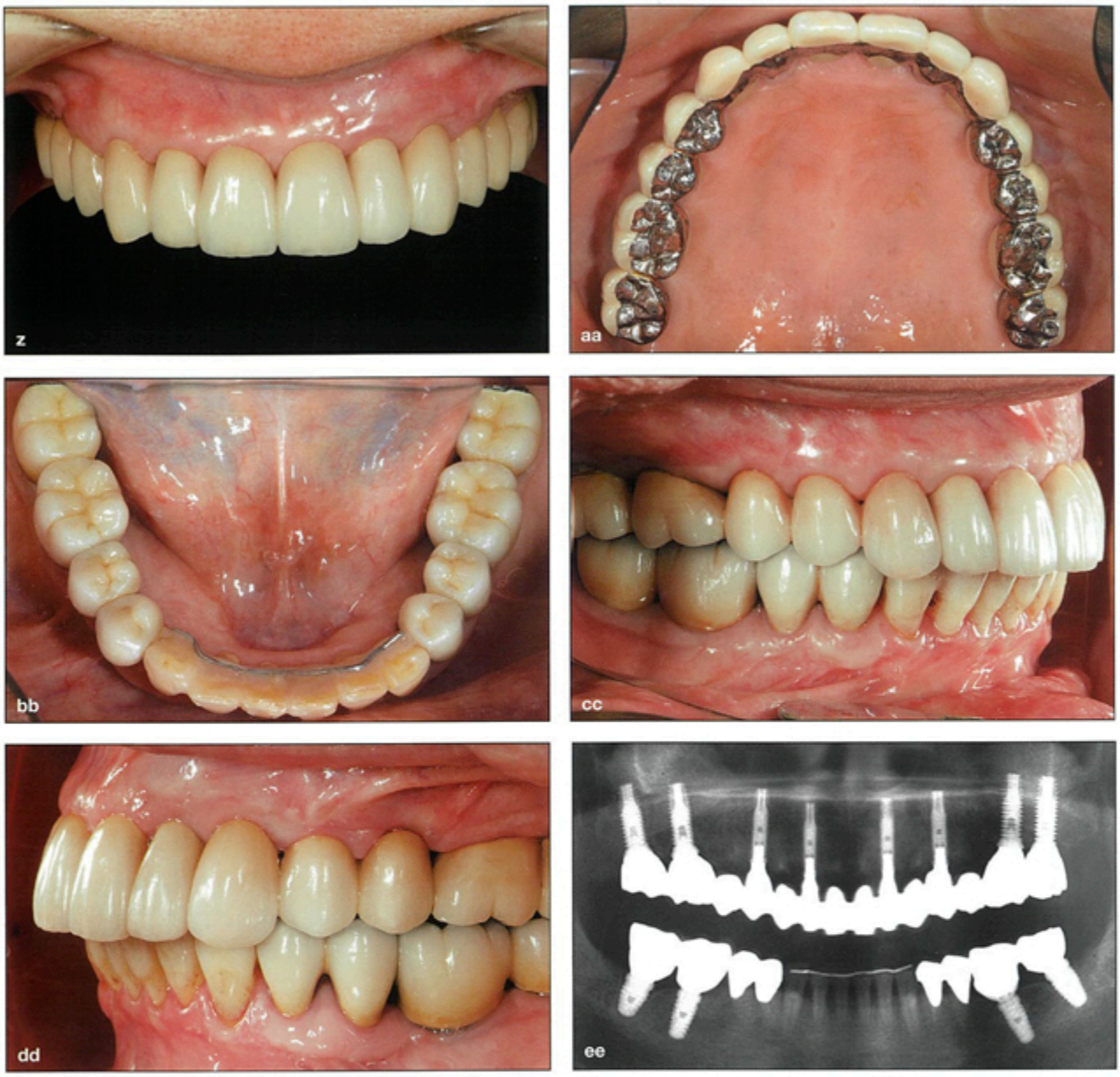


Fig 14-4 *cont.* / *(z to dd)* The definitive implant-supported restorations in place. *(ee)* Panoramic radiograph after completion of treatment.

rich in growth factors (PRGF; Fig 14-4w).[28,29] If complete sealing of the socket is not successful, a small connective tissue graft (CTG) is required. If the patient had agreed to a CTG, the crowns would have been cut about 1 mm coronal to the bony ridge so that supra-alveolar fibers of the root surface would have been preserved.

Owing to a good strategic choice of pontic positions and use of the root submergence technique, remodeling processes after extraction could be avoided and tissue preserved (Figs 14-4x and 14-4y). This is reflected in the definitive restoration with the improved interdental bone level and an ideal vertical level caused by the submucosally preserved roots (Figs 14-4z to 14-4ee).

After completion of the treatment, professional maintenance therapy must always be matched to the patient's individual risk of periodontitis. For this patient, monthly SPT was scheduled with the dental hygienist (Figs 14-4ff and 14-4gg).

Fig 14-4 *cont.* / *(ff)* The patient is educated to clean with dental floss as part of periodontal maintenance therapy. *(gg)* Condition 2 years after completion of the treatment. (Surgery and prosthodontics performed by T. Ishikawa; orthodontics performed by K. Kida; laboratory work performed by K. Nakajima.)

Case 4

The clinical problem in this case was severe vertical tissue loss caused by trauma. The following were key factors for therapeutic success:

- Space management due to decrease in the number of teeth to be replaced
- Two-stage GBR
- Soft tissue augmentation

The 25-year-old patient had sustained a trauma in the esthetic zone in an automobile accident 10 years earlier. The tooth loss had been treated with a fixed partial denture. As the patient got older and continued to grow, the damaged abutment teeth were unable to erupt correctly, which led to an extensive vertical bone deficit and open bite (Figs 14-5a and 14-5b). Because of the high smile line, this vertical defect was much more difficult to reconstruct esthetically (Figs 14-5c and 14-5d). The full extent of the tissue defect was evident after extraction of the maxillary central incisors, which were not worth preserving (Figs 14-5e to 14-5g).

A wax-up was created, and a 3D radiologic diagnostic assessment was performed using CBCT scans. The diagnostic wax-up revealed the solution to the limited mesiodistal space and adverse gingival contour of the remaining anterior teeth: the four lost teeth could be replaced with three units, and the left first premolar could take the place of the canine (Fig 14-5h). The diagnostic template and CBCT scans revealed the exact size of the defect (Figs 14-5i to 14-5k). It was planned to place three implants and simultaneously perform 3D bone augmentation in a single operation.

The implants were placed in the prosthetically ideal position. The shoulders of the implants projected beyond the local bone by as much as 6 mm vertically. The occlusal view after implant placement showed a favorable bone foundation for vertical augmentation (Fig 14-5l). For horizontal augmentation, a bone thickness of at least 2 mm at the platform on the buccal aspect is sufficient and counteracts any negative effects of recession and papillae loss caused by normal bone remodeling.[30]

There are three possible intraoral vertical references for bone augmentation (Figs 14-5m and 14-5n): *(1)* the bone level should lie 4 mm apical to the interproximal contact or the papilla apices; *(2)* the bone level should lie on the imaginary line through the adjacent bone apices; *(3)* the interproximal bone level should be located 2 to 3 mm coronal to the implant platform. The interproximal bone height (ie, 4 mm) and the line between the bone apices bordering the gap (*white line* in Figs 14-5m and 14-5n) show that there is a vertical augmentation requirement of 9 mm. After implant placement, the third reference (ie, 2 to 3 mm coronal to the implant platform) defined the same augmentation target (ie, 9 mm) as the other two references. This confirmed the correct relationship between the planned superstructure, the existing attachment level at the adjacent teeth, and the implant positions.[8]

Fig 14-5 / *(a)* Initial situation with pronounced vertical tissue loss and open bite. *(b)* The extent of vertical tissue loss becomes clear in the lateral view. *(c)* The very high smile line exposes the defect, presenting another challenge. *(d)* The radiographs show the excessive vertical bone loss. *(e and f)* Frontal and occlusal views of the ridge 3 months after extraction of the central incisors. There is an extensive 3D defect. *(g)* Frontal view before bone augmentation. *(h)* Diagnostic wax-up with the left first premolar switched to the canine site.

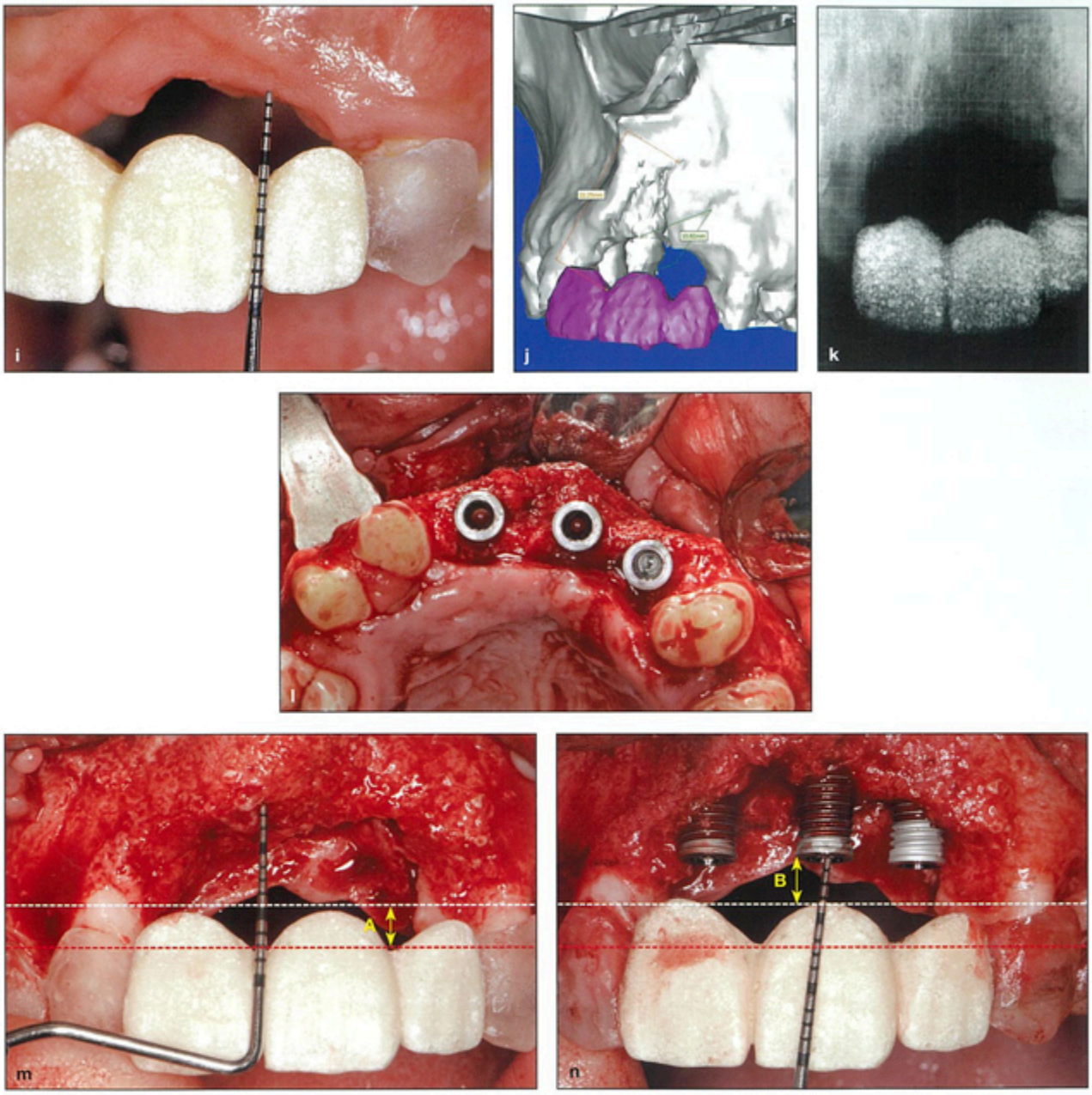
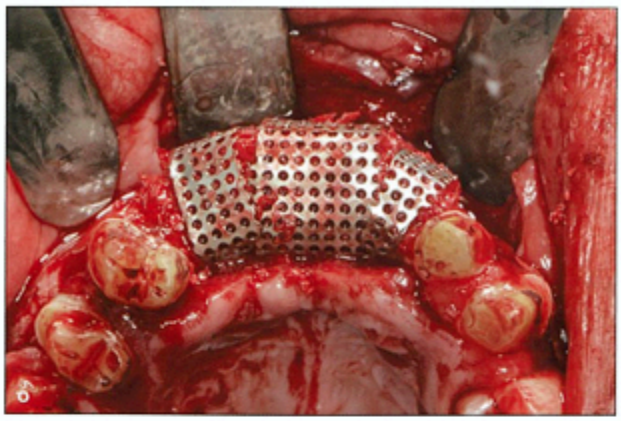
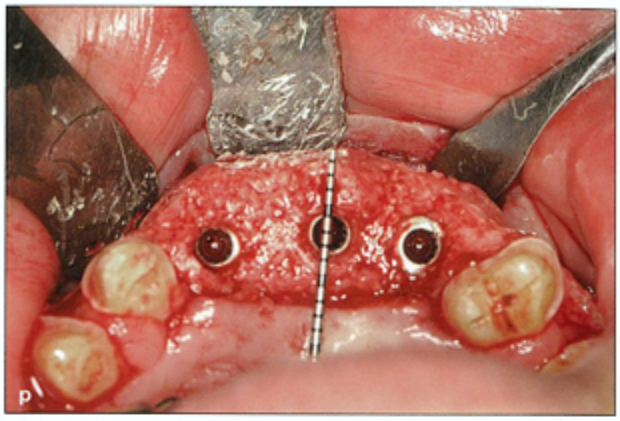


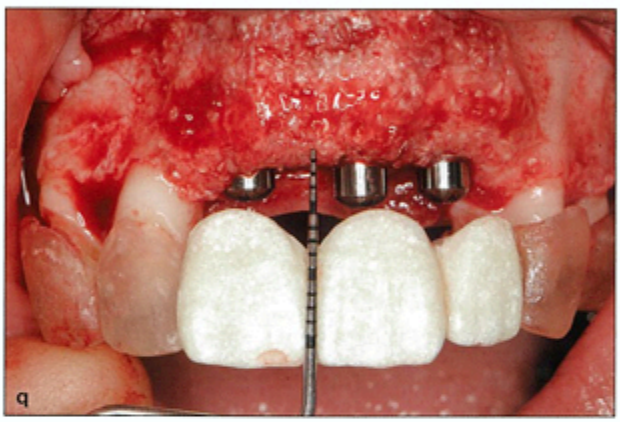
Fig 14-5 *cont.* / *(i to k)* After extraction of the teeth not being preserved, the tissue healed, and the full extent of the defect became apparent. The diagnostic template and CBCT images revealed the exact size of the defect. *(l)* The implants were placed in the prosthetically ideal positions. *(m and n)* The surgical template indicates the ideal vertical position of the implant shoulder and the target for bone augmentation. Vertical references can be used for bone augmentation in this case. The *white line* passes through the crestal bone apices of the adjacent teeth, and the *red line* passes through the papilla apices. The crestal bone should lie 4 mm apical to the papilla apex (A). The implant shoulder should lie 2 to 3 mm apical to the future soft tissue or crown margin (B).

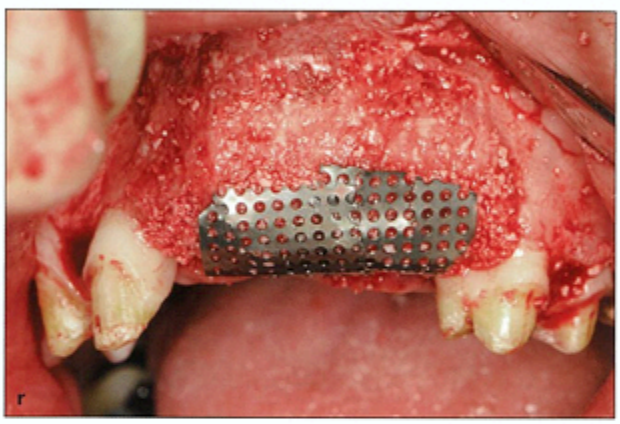
After augmentation with autogenous bone chips and anorganic bovine bone mineral (ABBM), the augmentation material was covered with three titanium meshes followed by a collagen membrane (Fig 14-5o). After successful incorporation of the augmentation material, a distinct gain in tissue was observed so that 4 mm of bone had been regenerated buccal to the implants (Fig 14-5p).

Looking at the vertical conditions, however, it was evident when considering all three references that there was still a space of 2 to 3 mm requiring bony filling so that









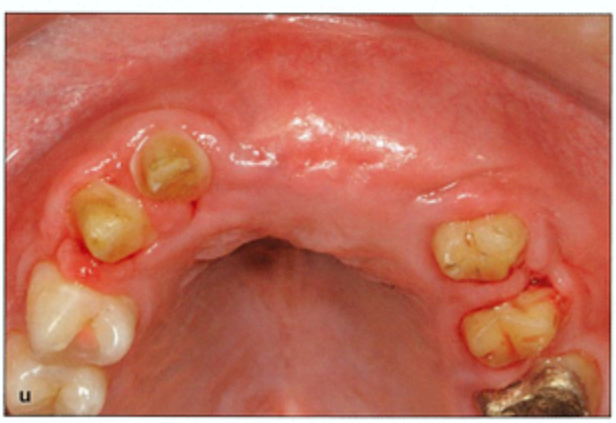
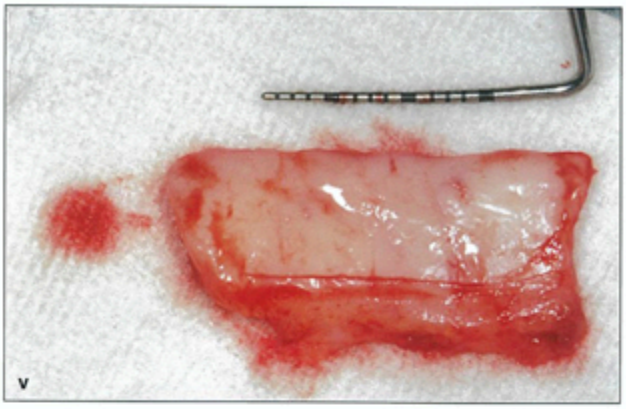
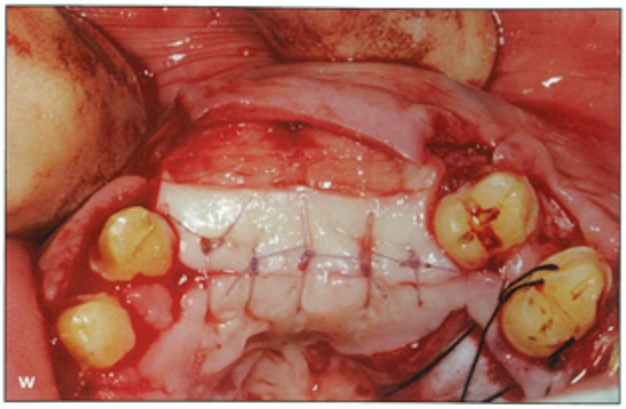


Fig 14-5 *cont.* / *(o)* The space for bone regeneration is secured with simple titanium meshes. *(p)* View after the first GBR. The implants were completely covered with regenerated tissue. After 7 months, the vestibular bone thickness was more than 4 mm. *(q)* The 3-mm-long healing abutments defined the target for the second GBR. There was still a shortage of 2 to 3 mm of bone for establishing papillae. *(r)* During the second GBR, the healing abutments served as vertical stops for the titanium mesh. *(s)* After 7 months, the surgical template showed that the regenerated tissue height fully satisfied the vertical requirements. *(t)* After bone augmentation, it becomes clear that there is insufficient keratinized tissue available. *(u)* The occlusal view reveals an insufficient vestibular ridge contour.





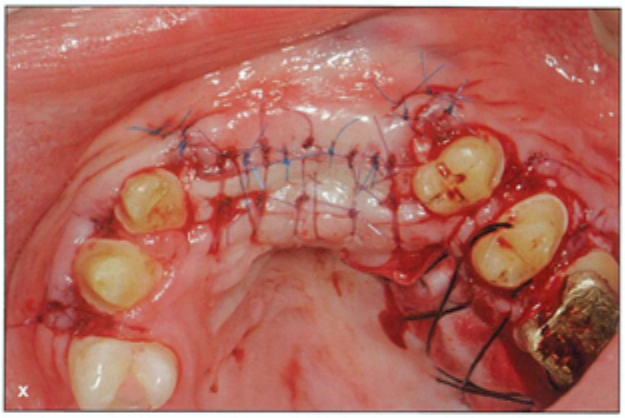


Fig 14-5 *cont.* / *(v to x)* Soft tissue augmentation was completed with a full-thickness graft with connective tissue and a keratinized strip.

the esthetically important papillae could be established (Fig 14-5q). A second augmentation was performed with titanium mesh, with healing abutments providing vertical support (Fig 14-5r). After another 7 months' healing, a total of 9 mm of bone was vertically augmented in this manner (Fig 14-5s).

A deficient ridge can lose keratinized tissue as well as bone. The releasing incision of the periosteum of the mucosal area does not increase keratinized tissue—it stretches the flap and moves the mucogingival junction coronally. When vertical ridge defects are treated, bone augmentation alone is often not enough for an esthetic result.[31–33] In this case, the soft tissue contour after bone augmentation was still not ideal; there was a soft tissue deficiency despite the adequate bone ridge (Figs 14-5t and 14-5u). Therefore, soft tissue augmentation was also required. The size of the soft tissue graft was calculated on the basis of the vestibular displacement. To correct the shift of the mucogingival junction and maintain adequate soft tissue thickness, a combination graft with an 8-mm-wide band of keratinized tissue was harvested from the palate and sutured palatally in the deficient area (Figs 14-5v to 14-5x). The native keratinized tissue was shifted labially to gain thickness, maintain an esthetic appearance, and hide the grafted area from view. After the graft was incorporated and the tissue had matured, soft tissue conditioning was begun with the definitive abutments and a provisional restoration (Figs 14-5y to 14-5aa). The procedure reduces tissue loss compared with multiple abutment disconnections and reconnections and additionally helps to preserve the regenerated bony ridge.[34–36]

The esthetic prognosis increases with a strategically placed pontic instead of three adjacent implant restorations. To improve the soft tissue contour in the region of the right lateral incisor, extrusion of that tooth was planned. Extrusion started 2 months after incorporation of an implant-supported provisional restoration (Figs 14-5bb to 14-5dd). The tooth was extruded by 2 mm within 1 month, then retained for 5 months. The soft tissue was left to mature for 10 months before the definitive restoration was placed. The abutments and provisional denture were used to condition the soft tissues, creating an esthetic contour (Figs 14-5ee).

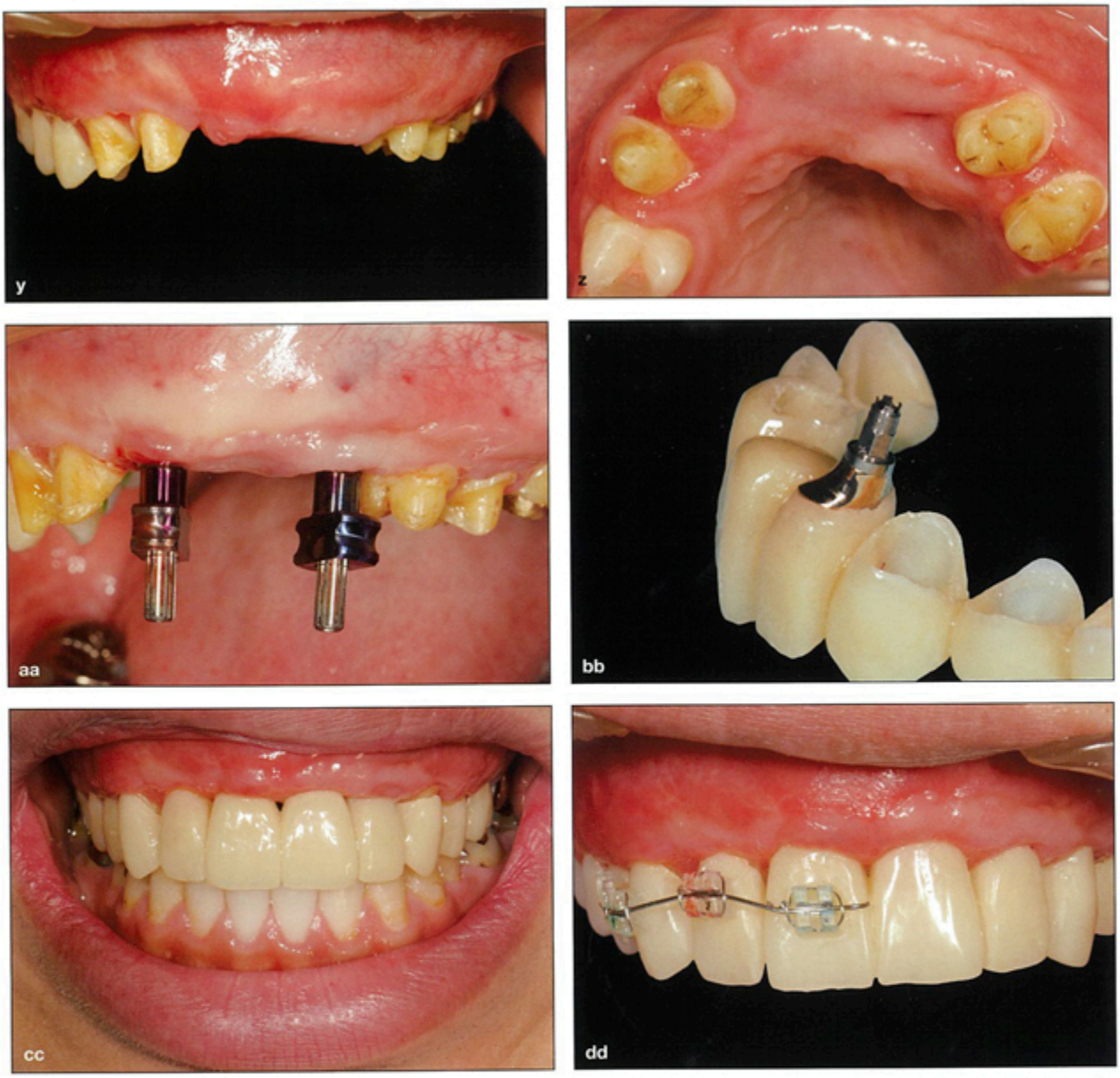


Fig 14-5 *cont.* / *(y and z)* Situation 2 months after soft tissue augmentation. The 3D ridge contour was improved; this change cannot be brought about by bone augmentation alone. *(aa)* Impressions were taken for the definitive abutments after soft tissue healing, when the healing abutments were connected. *(bb and cc)* Soft tissue conditioning was subsequently started with the definitive abutments and a provisional restoration. *(dd)* The right lateral incisor was extruded to improve the soft tissue level.

Radiographs after completion of the treatment show that the bone was regenerated up to the level of the crestal bone of the adjacent teeth (see Fig 14-5kk). The height of the tissue was preserved by using a strategically placed pontic instead of three adjacent implants. Platform switching also seems to have had a positive effect on bone preservation around functioning implants.

This case illustrates how long it can take to treat complex cases. It is essential to allow enough time to ensure good results in cases with severe defects. None of the treatment phases should be rushed. In this manner, even given an extreme preoperative situation, it was possible to achieve a very good esthetic outcome, which is still stable 6 years after treatment (Figs 14-5ff to 14-5mm).

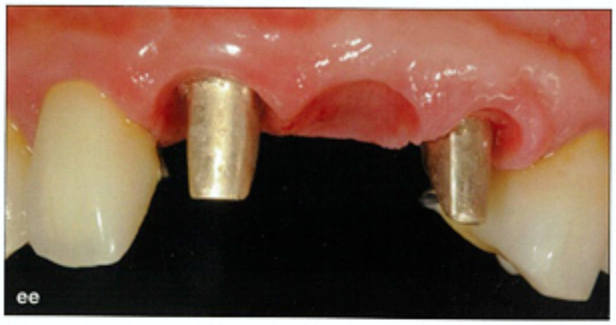


Fig 14-5 *cont.* / *(ee)* The contoured soft tissue before the definitive restoration was placed. *(ff to jj)* End result. The anterior guidance was correctly established with the original left first premolar functioning as the left canine.

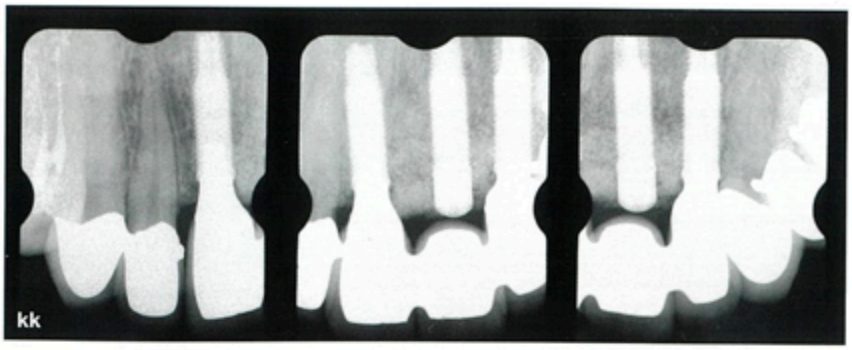


Fig 14-5 *cont.* / *(kk)* Radiographs after completion of the treatment. The bone had been regenerated up to the height of the bone apices at the teeth bordering the space. The implant at the left central incisor site was ultimately left as a "sleeping implant" to enhance the esthetic outcome. *(ll)* Lateral view of the patient smiling 3 years after completion of the treatment. *(mm)* Six years after treatment, the regenerated tissue offers satisfactory support and framing of the natural-looking restoration. (Surgery, orthodontics, and prosthodontics performed by T. Ishikawa; laboratory work performed by K. Nakajima.)

Case 5

The problem in this case was severe vertical tissue loss caused by trauma. The following were key factors for therapeutic success:

- Vertical augmentation with distraction osteogenesis
- Horizontal ridge augmentation with bone spreading and GBR
- Soft tissue augmentation

This middle-aged patient wanted esthetic rehabilitation of her anterior dentition. A vertical tissue defect had developed as a result of advanced periodontitis. The four missing maxillary incisors had been replaced by a partial denture, and the missing tissue had been replaced with a silicone gingival mask (Figs 14-6a to 14-6e). Prostheses such as these are subject to rapid color changes and will impair phonetics and the taste of food. The patient desperately wanted this situation to be improved.