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# 2010 INTERNATIONAL ROXOLID CASE CONTEST

# WINNING CASE STUDIES




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*Treatment of Multiple Agenesis with Roxolid® Implants, Screw-Retained Straumann® CADCAM $ZrO_2$ Abutments, and an Adhesive Fiber Reinforced Resin Bridge*

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VANESSA GISLER, NORBERT ENKLING, KERSTIN KRESS

# Treatment of Multiple Agenesis with Roxolid® Implants, Screw-Retained Straumann® CADCAM $ZrO_2$ Abutments, and an Adhesive Fiber Reinforced Resin Bridge

**Initial situation**

A 20-year-old patient presented with multiple agenesis of teeth. After having undergone orthodontic treatment to align her teeth and to obtain a stable occlusion, she was referred to the Department of Prosthodontics at the University of Bern for final prosthodontic treatment. All premolar teeth in the maxilla as well as the second premolars and central incisors in the mandible were missing (Fig. 1).

On each side in the posterior maxilla and in the mandible, a tooth gap of one premolar was kept open after the orthodontic treatment with the intent to close the gap with fixed prostheses, either tooth-supported or implant-supported. While a fixed orthodontic retainer prevented the collapse of the space in the mandible, a removable orthodontic appliance maintained the gaps in the maxilla. The size of these premolar gaps was not uniform, ranging from 5.0 mm in area 20, to 6.5 mm in areas 5 and 12, to 8.5 mm in area 29. The mandibular jawbone was very thin and atrophic in both gap areas.

The patient history did not reveal any contraindication for treatment, there was no intake of medications, and she was a non-smoker. However, there was a lack of adequate oral hygiene and improvement was urgently necessary. The patient reported mouth breathing and – along with the inadequate oral hygiene – she exhibited a generalized gingivitis.

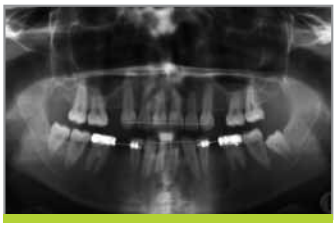
Fig. 1


Fig. 2

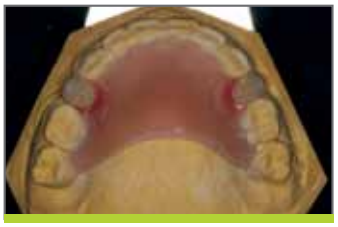
Fig. 3

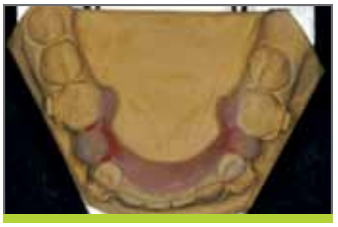
Fig. 4


Fig. 5


Fig. 6


Fig. 7


Fig. 8

In the maxilla, the frenulum of the upper lip had a deep insertion on the crest and a hypertrophic papilla (Fig. 2). All teeth were free from fillings.

The patient did not express any specific wishes regarding the esthetic treatment outcome. With respect to the juvenile age, we expected that her demands would still increase. She did not wear any provisional prostheses and did not wish to have any throughout the future treatment phase.

**Treatment plan**

The first step in the treatment of the patient included oral hygiene measures and her instruction for adequate home care. Master casts were obtained of both jaws and a tooth set-up was performed for detailed analysis to replace the missing teeth. While the gap width of 5.0 mm in area 20 was determined to be too small for the placement of an implant, a single tooth replacement by means of implants was planned for the three other gaps (Figs. 3, 4). The soft tissue in the gaps was at the same vertical level as that of the adjacent teeth and was judged to be of thin biotype (Figs. 5, 6). From the clinical diagnosis, the bone thickness in the maxillary gaps appeared to be sufficient for placement of an implant but was thin and atrophic in the mandible. Based on the clinical and radiographic diagnosis, comprising the tooth set-up, the following treatment plan was determined:

Placement of implants in three gaps (except area 20) with **1)** a bone block graft from chin in area 29, **2)** an external sinus floor elevation with simultaneous implant placement in area 5, **3)** the placement of an implant in area 12 with simultaneous transcrestal sinus floor augmentation, **4)** the placement of an implant in area 29 four months after the grafting procedure, **5)** implant crowns in the maxilla and right side of the mandible, and **6)** a glass fiber-reinforced adhesive resin bridge in the left mandible.

Fig. 9

Fig. 10

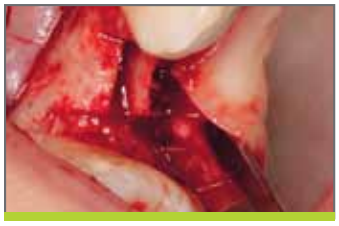

Fig. 11

Fig. 12

Fig. 13

Fig. 14

Fig. 15

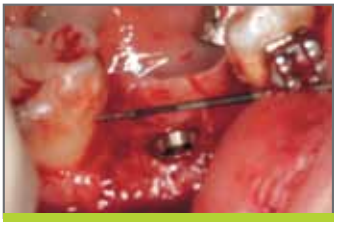

Fig. 16

**Surgical procedure**

A block graft of 8.0 mm × 8.0 mm was harvested from the chin and fixed firmly with an osteosynthesis screw in the defect area 29 (Fig. 7). The edges of the bone block were flattened and particulated xenogenic graft material was used together with a collagen membrane to cover the gap area (Fig. 8). The graft material was slightly over-contoured in relation to the adjacent jaw structure to obtain sufficient bone even after slight shrinkage. The mucoperiosteal flap was sutured without tension (Fig. 9).

When the mucoperiosteal flap in area 5 was raised, a crestal dehiscence of the palatal bone was observed that had not been detected clinically. By means of piezo-electric surgical instruments (Piezosurgery®), a crestal bone splitting was performed, the bone pushed slightly into palatal direction, and the space filled with xenogenic graft material (Figs. 10, 11). A buccal fenestration was prepared for a sinus floor elevation. The sinus membrane was extremely thin and a minimal tearing during loosening from the bone wall could not be prevented (Fig. 12). Therefore, the cavity was lined with a membrane before filling it with particulate graft material. The plan of a simultaneous implant placement was abandoned and the whole area covered with a resorbable collagen membrane. Again, the mucoperiosteal flap was sutured without tension (Fig. 13).

In area 12, sufficient bone width was found and a Straumann® Bone Level Roxolid® implant (Ø 3.3 mm, NC, SLActive® 12.0 mm) was inserted by means of a simultaneous transcrestal sinus floor augmentation (Fig. 14). This procedure resulted in a gain of 3.0 mm vertical height.

Four months after the augmentation procedures in area 29 sufficient bone thickness was obtained to insert a Straumann® Bone Level Implant (Ø 4.1 mm, RC, SLActive® 10.0 mm, Figs. 15, 16). The screw that maintained the block graft in situ was removed. A submerged healing phase of six months


Fig. 17

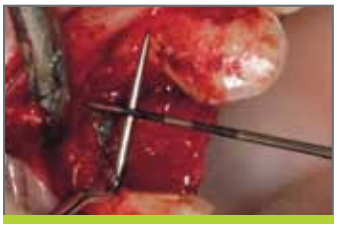
Fig. 18


Fig. 19


Fig. 20


Fig. 21


Fig. 22


Fig. 23


Fig. 24

was maintained. Six months after the bone splitting procedure and sinus floor elevation in area 5 good bone quantity was obtained, and a Straumann® Bone Level Roxolid® implant (Ø 3.3 mm, NC, SLActive® 12.0 mm, Figs. 17–19) was inserted.

After these surgical interventions of grafting, sinus floor elevation, and implant placement, undisturbed wound healing was observed in all areas. All implants were submerged during the healing phase. Four months after the placement of the implant in area 5, the reentry surgery was performed for all three implants and a gingival forming healing abutment was mounted for soft tissue conditioning prior to impression taking (Figs. 20, 21). Simultaneously, an impression was taken in the mandible for fabrication of the adhesive fiber-reinforced resin bridge, which was delivered one week later and bonded under protection of rubber-dam to the neighboring teeth with Tetric® Flow1.

**Prosthetic procedure**

Two weeks after the reentry surgery, impression were taken from all three implants using screw-retained transfer copings and an individually fabricated tray (Figs. 22, 23). The dental technician fabricated the master casts by molding a soft tissue border around the implants from silicon material. She prepared wax frameworks for the three crowns using Straumann® CADCAM copy CAD wax and subsequently scanned them with the Straumann® CADCAM Scanner es1 (Figs. 24, 25). The framework design of the crowns was checked again by virtual imaging at the computer and, where necessary, slightly corrected. The electronic data were then sent to the production center in Leipzig, the frameworks milled from zirconia blocks, and sent back to the technical laboratory. Fit and precision of the frameworks were tested intraorally. Then the dental technician completed the crowns by veneering them with Nano-fluorapatite ceramic (e.max® Ceram1).

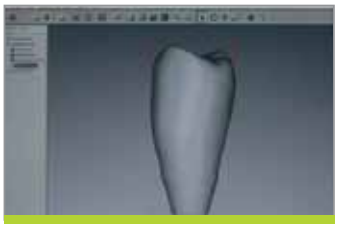
Fig. 25


Fig. 26


Fig. 27


Fig. 28


Fig. 29


Fig. 30

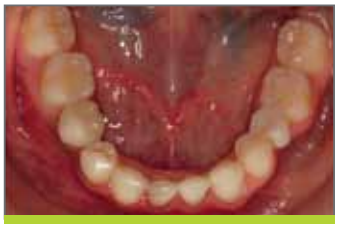
Fig. 31


Fig. 32

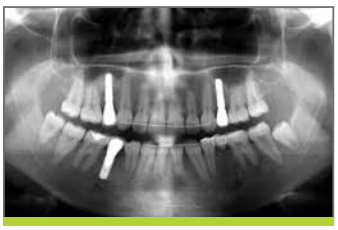
Fig. 33

One week after the try-in session of the frameworks, the three screw-retained crowns were delivered to the patient and mounted to the implants directly at the implant level (Figs. 27–29). The periimplant soft tissue contour around the crowns was in good harmony with the adjacent teeth. Treatment outcome with regard to esthetics, biology and function was excellent (Figs. 30–32). The final radiographs showed well-integrated implants with a stable crestal bone level (Fig. 33).

**Outcome**

A good long-term prognosis of this treatment result is expected. The entire therapy was well planned, the surgical interventions and prosthetic procedures carefully performed step by step. The young patient needed motivation and re-instruction for better home care at several instances and eventually her oral hygiene improved significantly. In fact, during the course of the treatment her esthetic demands increased and she felt disturbed by the frenulum and a hypertrophic papilla between the central incisors. These soft tissue problems were easily resolved by correction with the $CO_2$ laser.


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# Immediate Replacement of Primary Maxillary Right Canine with a Roxolid® Implant

## Initial situation

A 39-year-old female with non-remarkable medical history presented for extraction of the non-restorable primary maxillary right canine (C) and implant replacement (Figs. 1–3). The tooth in area 6 had been removed over 20 years ago because of high impaction.

## Treatment plan

A delayed implant placement was planned to achieve a better control of the soft tissue contour and architecture. The alveolar ridge was narrow with buccal undercut, therefore, a small diameter implant design was treatment planned for the site. The potential for high forces, compromised bone quality and quantity, as well as esthetic demands required the use of a fast healing and strong implant with prosthetic flexibility to achieve the desired goal.

## Surgical procedure

The initial phase involved removal of the tooth in area 6 and placement of an interim removable partial denture to provisionalize the site (Fig. 4). The denture tooth in the prosthesis was shaped as an ovate pontic to contour the gingiva (Fig. 5) while awaiting implant placement (Fig. 6). Two weeks later, a flapless osteotomy with cooled saline irrigation was made in type 3 bone, following the socket contours to help preserve the original canine eminence. During the osteotomy, a buccal fenestration was created apical to the socket of the primary tooth. After completion of the osteotomy using a final drill of ∅ 2.8 mm, the fenestration was grafted with a xenograft material through the osteotomy. A Roxolid® implant (Straumann® Bone Level Implant NC ∅ 3.3 mm, SLActive® 12.0 mm) was placed with primary stability using


Fig. 1


Fig. 2

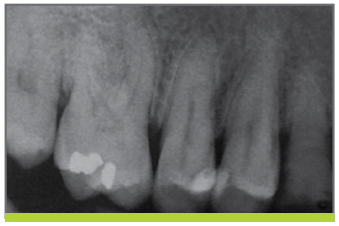
Fig. 3

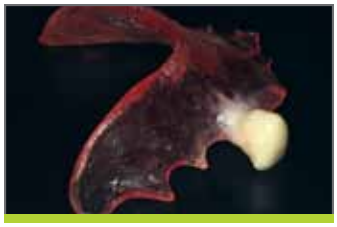
Fig. 4


Fig. 5

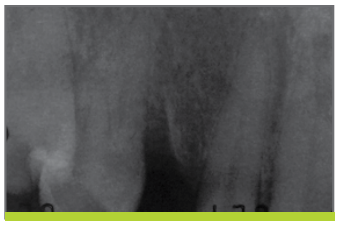
Fig. 6


Fig. 7


Fig. 8

a handpiece at 35 Ncm (Figs. 7, 8). A conical healing abutment (Ø 3.6 mm/height 3.5 mm) was placed and no sutures were required (Figs. 9–11).

**Prosthetic procedure**

Immediately after implant placement, a temporary abutment was connected to the implant, prepared (Fig. 12), and a methyl methacrylate shell was relined to fabricate a provisional screw-retained restoration. The crown was adjusted to avoid occlusal contact, polished, and torqued to 15 Ncm (Figs. 13). The screw access hole was sealed with a lightcured provisional composite resin. At the one-week postoperative appointment the patient showed excellent gingival health around the implant site (Fig. 14).

Approximately four weeks after implant placement, the provisional restoration was removed and a closed tray NC impression post was connected to the implant to make the final impression. Notes and photos of the desired shade, contours and surface texture were forwarded to the laboratory (Fig. 15). A CADCAM customized zirconia abutment was designed to provide adequate parallelism and emergence contours. The abutment was scanned to fabricate a zirconia coping, which was veneered with compatible porcelain to obtain proper anatomy, esthetics and function (Figs. 16, 17). About six weeks after implant placement, the restorations were tried in and all necessary adjustments were made. The abutment was torqued to 35 Ncm (Fig. 18), the access hole sealed with gutta-percha and a light-cured composite resin, and the zirconia crown was cemented with a self-etching resin cement (Figs. 19–21). Follow-up postoperative appointments were scheduled at one week and one month. The final restoration displayed excellent gingival health and natural esthetics (Figs. 22, 23).

**Outcome**

The advantages provided by Roxolid® and SLActive® allowed for the use of a small diameter implant in a compromised tooth space with high occlusal forces and high esthetic demands. From an esthetic standpoint, the small


Fig. 9


Fig. 10

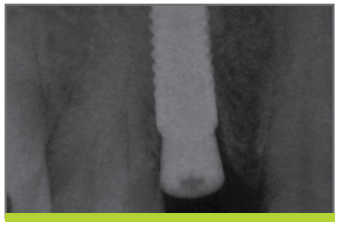
Fig. 11


Fig. 12


Fig. 13


Fig. 14


Fig. 15


Fig. 16

diameter eliminated the potential for additional procedures such as soft tissue grafting to bulk up the highly scalloped thin gingiva. The proven faster osseointegration, as compared to SLA® in an animal model, granted the clinicians the confidence for immediate provisionalization in compromised bone. This provided the patient with her desired fixed provisional restoration and helped maintain the peri-implant gingival contours. The esthetic benefits of this approach are evidenced by the rapid and favorable soft-tissue response obtained in this case. From a functional perspective, the aforementioned factors reduced the number of procedures, thereby decreasing the cost for the clinicians and discomfort to the patient, while delivering the best possible immediate provisionalization. The insertion of the definitive restoration at six weeks in compromised bone allows the patient to resume normal function earlier, providing additional comfort and abbreviating total treatment time.


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Fig. 17

Fig. 18

Fig. 19

Fig. 20

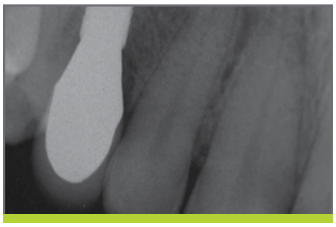

Fig. 21

Fig. 22

Fig. 23

MASSIMO PEDRINAZZI

# Treatment of Edentulous Patient with Two Roxolid® Soft Tissue Level Implants

## Initial situation

In August 2009, a 57-year-old caucasian woman attended the dental practice, asking for an upper and lower oral rehabilitation with two complete removable prosthesis. She was a non-smoker and was not taking biphosphonates. She showed a systemic good health and was not suffering from any disease that would contraindicate implant therapy.

The patient had been already wearing two complete removable prosthesis; her main complaint was about the great instability of the lower prosthesis. Therefore, she was interested in the possibility of increasing the stability of the new lower prosthesis by using dental implants, and, if possible, avoiding an extensive surgery for bone augmentation. The oral examination showed the absence of the complete dentition and a good condition of the mucosa (Fig. 1).

The orthopantomography (Fig. 2) and the teleradiography (Fig. 3) did not reveal any pathological aspect of the bone. The thin alveolar crest was an indication for the application of Roxolid® small diameter implants. The patient's request for a minimally invasive surgery avoiding a larger bone augmentation procedure also had to be considered as a priority.

## Treatment plan

Based on the situation found, the treatment plan was set up as follows: placement of 2 Straumann® Roxolid® Soft Tissue Level implants (Standard Plus RN Ø 3.3 mm, SLActive®, 10.0 mm) in the lower jaw (in the area between the two mental nerves), implant-retained removable denture with LOCATOR® abutments in the lower jaw, and a traditional prosthesis in the upper jaw.


Fig. 1

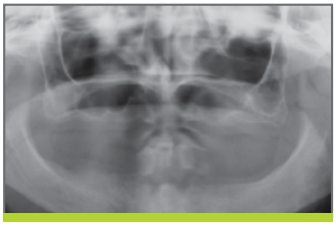
Fig. 2

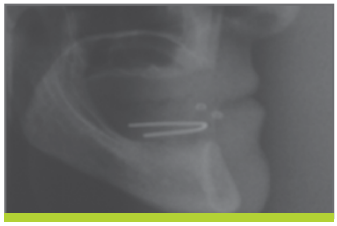
Fig. 3


Fig. 4


Fig. 5


Fig. 6


Fig. 7


Fig. 8

## Surgical procedure

Oral surgery was performed in local anesthesia with infiltration and block anesthesia of the two mental nerves, executing an incision through keratinized mucosa in the interforaminal region of the edentulous mandible (Fig. 4). Moreover, an incision along the midline was realized to enhance the mobility of the mucoperiosteal flap. The mental foramen were identified in order to place the implants 5.0 mm mesial of each mental nerve (Fig. 5). After bone exposure, implant site preparation was done using rounds burs and spiral drills according to the surgical protocol (Fig. 6). The parallel pins into the implant sites clearly showed a narrow ridge situation, a good indication for the use of two narrow implants without GBR procedure (Figs. 7–10).

The implants were inserted with an adapter attached to a special contra-angle (Fig. 11). After the insertion (Fig. 12), the transfer parts were removed and two healing abutments (3.0 mm height) were screwed in (Fig. 13).

A fine atraumatic suture material (Polyamide 5-0) was used (Fig. 14). After surgery, the patient was discharged with chemical plaque control using chlorhexidine-digluconate (0,12 %) and anti-infiammatory treatment. No complications (such as pain or edema) were reported and the sutures were removed after 7 days.

## Prosthetic procedure

After 6 weeks of healing (Fig. 15), the orthopantomography showed a good osseoingration of both implants (Fig. 16). Therefore, it was appropriate to start the prosthetic phase. Using an individual cast tray, a polyether precision impression was made. A mounted cast and teeth setup were used to evaluate aspects of design, occlusion, phonetics, esthetics and facial support (Fig. 17). Six weeks after surgery, a good soft tissue healing was reached around both implants (Fig. 18), which made it possible to place two LOCATOR® abutments (2.0 mm height, Fig. 19). A complete removable prosthesis was attached in the upper jaw and the LOCATOR® kit with

Fig. 9


Fig. 10


Fig. 11


Fig. 12

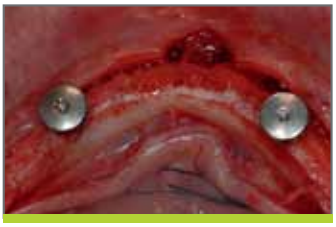
Fig. 13


Fig. 14

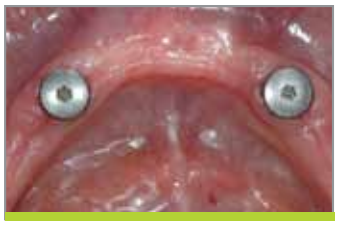
Fig. 15

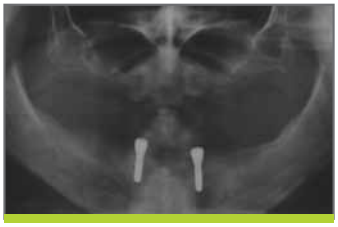
Fig. 16

soft retention (blue) in the lower (Fig. 20). Occlusion, function and esthetics were checked with the patient's satisfaction (Figs. 21, 22).

## Outcome

The patient did not report any complication with the prosthesis at the 1-month follow-up. Her expectations could be satisfied completely – through a simple, affordable and minimally invasive implant-based restoration.


## Acknowledgment

I would like to express my gratitude to the C& P Dental Lab for the highly accurate technical support they have provided in this case.



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Fig. 17

Fig. 18

Fig. 19

Fig. 20

Fig. 21

Fig. 22

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