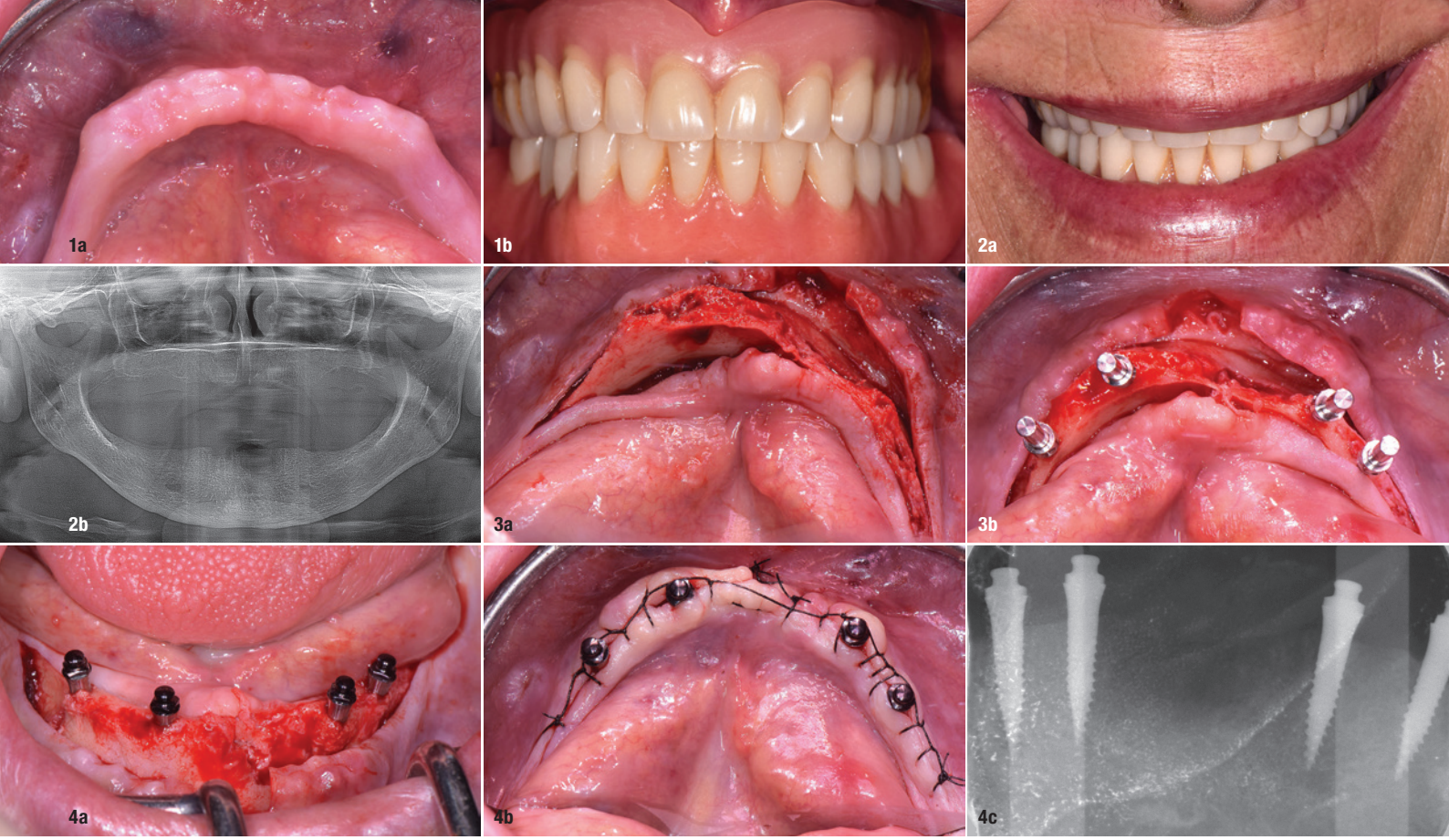


Fig. 1a: Occlusal view before the treatment showing a very thin ridge. **Fig. 1b:** Frontal view of the ill-fitting mandibular denture. **Fig. 2a:** Frontal view of the initial clinical situation. **Fig. 2b:** Preoperative radiograph. **Fig. 3a:** A flap was raised to obtain a clear view of the underlying bone. **Fig. 3b:** Preparation of the four implant sites. **Fig. 4a:** Placement of the four implants. **Fig. 4b:** The flap was closed with a 4/0 polyamide continuous suture. **Fig. 4c:** Radiograph taken immediately after surgery.

Implant-retained overdenture on a very thin bone ridge

Drs Nicola Alberto Valente, Murali Srinivasan & Nicole Kalberer, Switzerland

Initial situation

A healthy 60-year-old female patient with no medical history presented at our clinic with a non-fitting full mandibular denture. Her chief complaints at this point included the lack of retention of her mandibular denture and poor aesthetics, coupled with difficulty in chewing and embarrassment at social events. The treatment plan comprised the rehabilitation of jaw function and aesthetics with a new set of dentures, including a conventional maxillary complete denture (CD) and a mandibular implant-supported overdenture (IOD) retained by four implants. For standard implants, the ridge would have had to be reduced by a vertical osteotomy in order to gain thickness and to reach the wider portion of basal bone. However, this would cause both a loss of height and a reduction in vestibule depth, which would be unfavourable for the rendition of the prosthesis (Figs. 1 & 2). After evaluating the patient's motivation, the decision was made to use the new Straumann® Mini Implants (2.4 mm diameter) with the integrated Optiloc® retention system for a new denture supported by four implants. The implants were planned for placement in the regions 34, 32, 42 and 44. Due to the very limited width of the ridge, open flap surgery was planned in order to place the implants safely under direct vision.

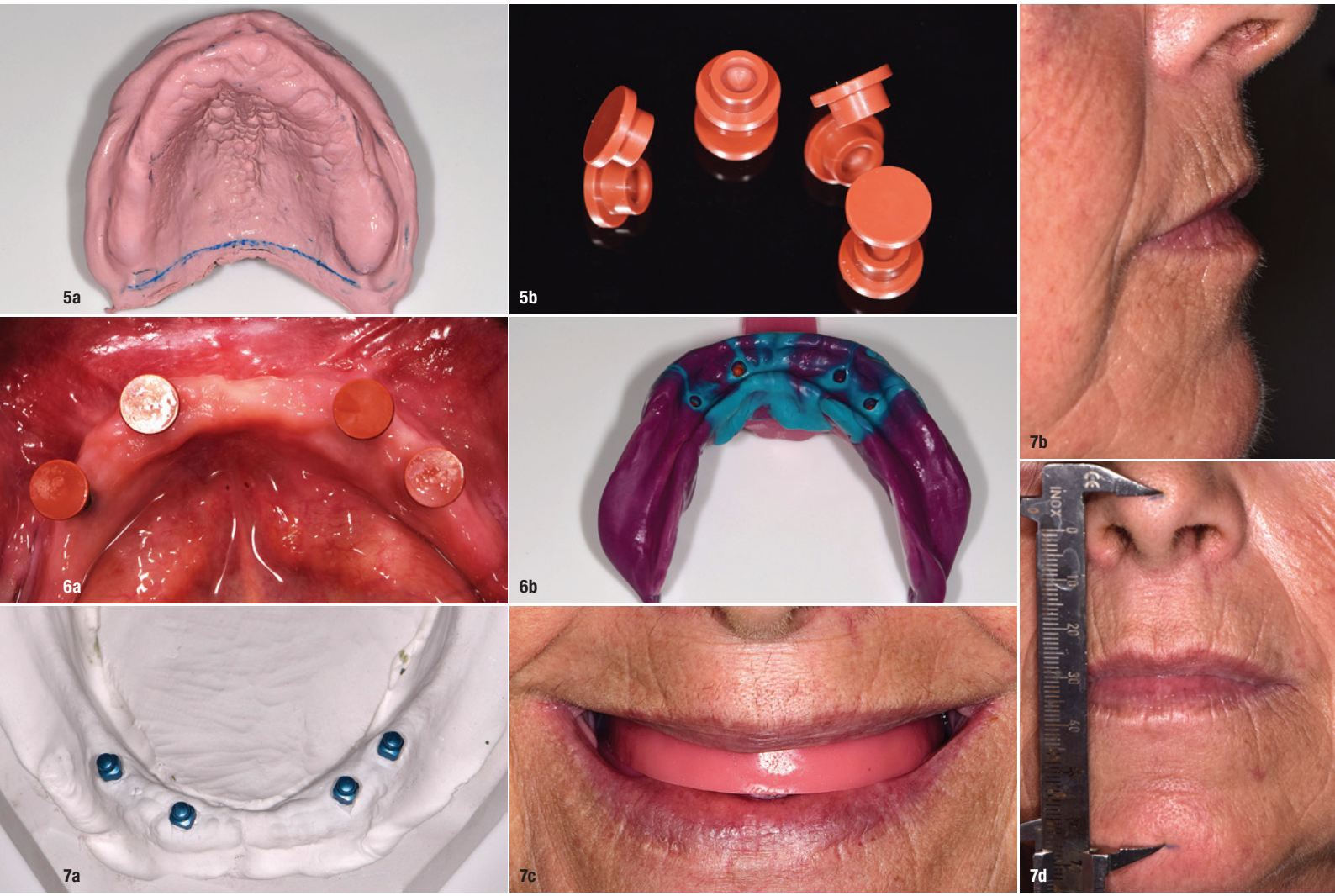
Surgical procedure

After a careful crestal incision, keeping the edge of the blade always in contact with the thin bone ridge, a central release incision was performed. The flap was raised

to obtain a clear view of the underlying bone (Fig. 3a). In the area of the left incisor, the ridge appeared to be too thin for implant placement, probably owing to a previous cystic lesion. The implant that had initially been planned in region 32 was therefore moved to region 33. For the implants in regions 42 and 34, the site was prepared sequentially with the needle drill (1.6 mm diameter) and the pilot drill (2.2 mm diameter), while only the same needle drill was used for the implants in regions 44 and 33. During the preparation of the implant sites, parallelism was verified at all times through the parallel posts (Fig. 3b). Finally, the four implants were placed in the respective sites, initially using the vial caps and then inserted and stabilised with the Optiloc® ratchet adapter and the ratchet itself (Fig. 4a). The flap was closed with a 4/0 polyamide continuous suture (Figs. 4b & c). Owing to the thin bone crest, immediate loading was avoided by grinding resin from the existing prosthesis in order to prevent contact with the transgingival part of the implants during the healing phase.

Prosthetic procedure

After a healing period of six weeks, the patient was referred to the Division of Gerodontology and Removable Prosthodontics at the University Clinic of Dental Medicine in Geneva in Switzerland for the final rehabilitation of her completely edentulous maxilla and mandible, with the Straumann® Mini Implants placed in the latter. During the first consultation, preliminary impressions were taken using an irreversible hydrocolloid impression material. Simultaneously, the patient's conventional mandibular CD was relined using a functional impression tissue conditioning material for better interim retention. In the maxilla, a conventional impression was taken using a customised impression tray, enabling a mucodynamic border moulding followed by a mucostatic final impression using zinc oxide eugenol impression material. In the mandible, the Optiloc® impression/fixation matrices were placed on the Optiloc® before a mucodynamic impression was taken with an elastomeric polyvinyl siloxane



Figs. 5 & 6: A mucodynamic impression was taken. **Fig. 7a:** The master models were prepared using the Optiloc® analogues and standard techniques. **Figs. 7b–d:** Aesthetic teeth exposure was ensured **(b)**, the occlusal planes were checked **(c)**, and the vertical dimension of occlusion was defined **(d)**.

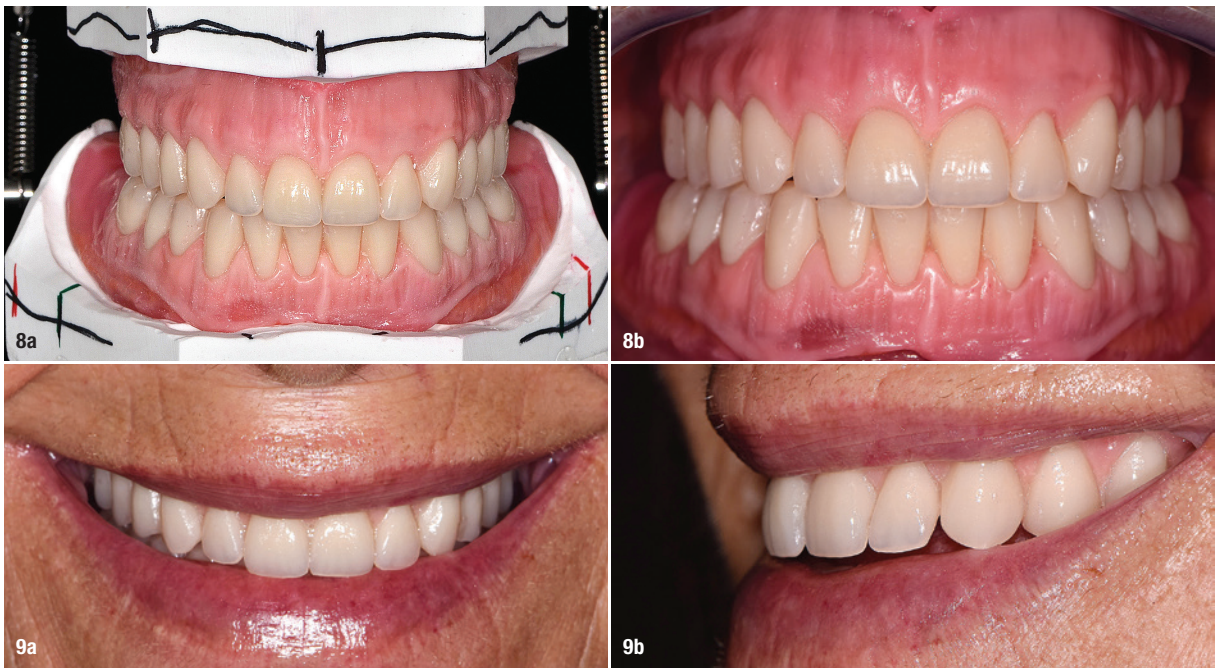


Fig. 8a: Final bite registration was performed. **Fig. 8b:** Photographs of the patient's natural dentition helped in preparing the final teeth set-up. **Figs. 9a & b:** The final set-up was checked during try-in.

(PVS) impression material (Figs. 5 & 6). The preparation of the master models and corresponding wax rims and all subsequent laboratory works were carried out in the Swiss-based dental laboratory Zahnmanufaktur Zimmermann und Mäder in Bern using the Optiloc® analogues and standard techniques (Fig. 7a). The next clinical steps included verification of the upper and lower lip support (ensuring aesthetic teeth exposure), checking the occlusal planes, defining the vertical dimension of occlusion, and final bite registration (Figs. 7b–d).

Communication with the dental laboratory using photographs of the patient's natural dentition was a key factor for successfully preparing the final teeth set-up (Figs. 8a & b). During try-in, the final set-up was checked for lip support, occlusal planes, teeth exposure and occlusal contacts (Figs. 9a & b). Moreover, the patient was able to suggest modifications and give her consent before the final prostheses were prepared. To prevent fractures and ensure the longevity of the mandibular IOD, a polyether ether ketone (PEEK) reinforcement was incorporated in the final prosthesis (Fig. 10). The new conventional maxillary CD and mandibular IOD on the Optiloc® retention system was then finalised in the dental laboratory, placing the Optiloc® housings and processing inserts on all Optiloc® model analogues and following the usual manufacturing procedures. The dental laboratory delivered the completed maxillary CD and mandibular IOD (Figs. 11a & b). During the final consultation, the appropriate retention inserts (low force) Optiloc® were selected and inserted into the housings using the Optiloc® retention insert placement tool (Figs. 12 & 13). The completed conventional maxillary CD and mandibular IOD were then inserted into the patient's mouth, and

Fig. 10: A PEEK reinforcement was incorporated in the final prosthesis. **Figs. 11a & b:** The dental laboratory delivered the completed maxillary CD and mandibular IOD.

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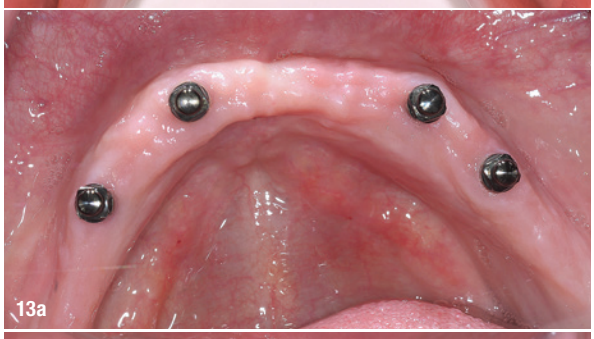
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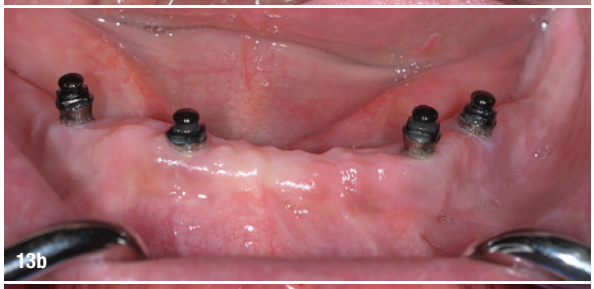
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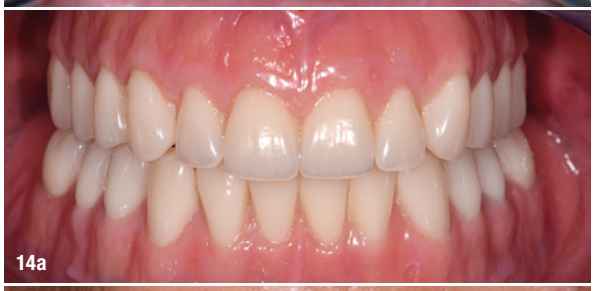
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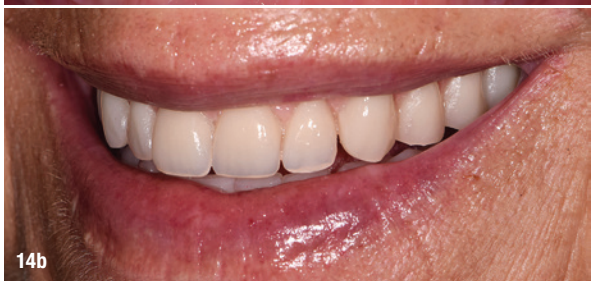
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Figs. 12a & b: Retention inserts (low force) Optiloc® were selected and inserted into the housings using the Optiloc® retention insert positioning tool. **Figs. 13a & b:** Occlusal and frontal view at the final consultation. **Figs. 14a & b:** Frontal view of the inserted completed conventional maxillary CD and mandibular IOD.

final post-insertion and denture hygiene instructions were given to the patient (Figs. 14a & b).

Conclusion

The case was successfully handled. The patient was highly satisfied and reported increased functional comfort and social confidence. The use of four 2.4 mm diameter Straumann® Mini Implants to support a mandibular overdenture has proved to be a reliable technique, which guaranteed satisfactory results both for the operator and the patient in a case where traditional techniques with larger diameter implants were not possible.

Editorial note: The surgical procedures were performed by Dr Nicola Alberto Valente and prosthetic procedures by Dr Nicole Kalberer supervised by Dr Murali Srinivasan.

about the author

Dr Nicola Alberto Valente graduated in dentistry from the University Cattolica del Sacro Cuore of Rome, Italy. He completed his Master of Science in Oral Sciences and his specialty program in periodontics at the State University of New York at Buffalo, NY, USA. He is a Diplomate of the American Board of Periodontology and has had an ITI Scholarship from the University of Geneva, Switzerland. He has worked as Chef de Clinique in the Unit of Oral Surgery, Service of Maxillofacial Surgery of the University Hospitals of Geneva, University of Geneva until 2019. He will start his new duties as Clinical Assistant Professor at the State University of New York at Buffalo in 2020.

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