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Quick and easy prosthetic planning

By Dr. Lieven Renier and Dr. Dominik Muylaert

The primary and most important complaint of this 17-year-old woman was lack of esthetics. She also complained about tooth mobility and limited functional comfort. She was afraid to lose her teeth at “any moment.”

Anamnesis
At the age of 4, an embryonic sarcoma of the naso-pharynx was diagnosed. The sarcoma was treated with chemotherapy, followed with radiotherapy. As a result of this therapy in the very early stage of facial forming, growth of the maxilla and all structures in the field of view of radiotherapy were compromised.

Clinical and radiological examination (Figs. 1–3)
1) Lack of an esthetically pleasing smile line, resulting in reduced self-confidence.
2) Pseudo Class III because of hypoplasia of the maxilla.
3) No root formation in the maxilla, causing tooth mobility and functional disorders.
4) No sinus formation.
5) Missing upper lateral incisors and lower canine.

Initial treatment plan
The initial treatment plan was based on the clinical and basic radiological examination.
• Prophylaxis and oral hygiene instruction.
• Fixed orthodontic appliance in the lower jaw.
• At the age of 18, extraction of the upper teeth, except tooth #16 and #26.
• Removable temporary restoration.
• Three-month healing period.
• 3-D imaging and treatment planning with SimPlant® (Materialise Dental).
• 20 sessions of hyperbaric oxygen therapy.
• Flapless computer-guided implant surgery (Facilitate®, Astra Tech).
• 10 sessions of hyperbaric oxygen therapy and six-months healing period.
• Final prosthetic restoration

Pretreatment and preparation for guided surgery (Figs. 4, 5)
Extraction of the upper teeth except tooth #16 and #26, which will be used as anchorage for the temporary restoration.
Before extraction of the teeth, a temporary removable prosthesis was made, which was seated the day of surgery, so the patient did not have to leave the hospital without teeth.
Original tooth set-up was compensated for and adapted to a more symmetric and esthetic appearance.
Lower teeth were already aligned using fixed orthodontics.

Converting temporary prosthesis into a scan prosthesis (Figs. 6, 8–12)
The Dual Scan Package (Materialise Dental) includes all dental products that are necessary to convert an existing, radiolucent prosthesis into a scan prosthesis. For each clinical procedure, there are clear guidelines to give instruction of how to use the products correctly.

Relining of the temporary prosthesis
First step was to reline the prosthesis chair-side. It is very important to use suitable radiolucent relining material as some materials on the market are radiopaque, thereby causing scatter and artifacts in the images. Relining will enhance patient comfort and accuracy of the additional steps.

The Dual Scan Package contains...
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a sample product of Triad® Dualine® (Trubyte).

Fabrication of a bite index
A bite index ensures that the prosthesis remains well-positioned and the jaws stabilized at the time of scanning. Make sure to use a radiolucent silicone material.

The Dual Scan Package contains a sample product of Aquasil Bite® (DENTSPLY Caulk).

Integrating the Dual Scan Markers
Dual Scan Markers (Materialise Dental) are prefabricated markers and can be integrated in or glued on the surface of the prosthesis. The Dual Scan Markers do not cause scatter, even in CB/CT images, which allows for a correct registration in SimPlant. It is very important to use a radiolucent resin to fixate the markers; otherwise their visibility in the images will be disturbed. Exercise caution in product selection as most materials for fabrication of temporary restorations are radiopaque.

The surface was roughened a little bit and eight markers were glued on the outer surface of the prosthesis. It is important to distribute the markers, some close to the outer border and others close to the tooth-gingiva border.

The same day after the scan was taken, the Dual Scan Markers were removed. When the surface is only roughened and no bonding agent is used, this process is very easy to follow.

The Dual Scan Package contains a sample product of Triad Dualine (Trubyte). It is a dual-cure resin, which allows for fast fixation of the markers when light cured.

3-D imaging and integration of the prosthetic information in SimPlant planning
Two scans were taken with the Scanora® (Soredex) cone-beam 3-D scanner.

The first scan was of the patient wearing the prosthesis with markers and bite index. The second scan was of the prosthesis alone.

It is very important that during the second scan, the prosthesis is positioned in the same way as in the first scan! Both scan data sets were named similarly and saved in a separate folder.

First, the scan images of the patient wearing the scan prosthesis were loaded into SimPlant Pro. Next, using the Dual Scan Module registration wizard, the scan images of the prosthesis were loaded into SimPlant Pro and automatically matched with the original patient data.

Final treatment plan
Based on the prosthetic information and anatomy, the final treatment plan was made and communicated to the patient and her parents. During evaluation of the patient’s anatomy, it appeared as if implant treatment would not be possible without an onlay bone augmentation procedure.

Taking into account the medical history, bone augmentation procedure was not advisable.

When combining the prosthetic information of the temporary prosthesis (which pleased the patient) from an esthetic point of view, the treatment plan needed to be reconsidered.

Taking into account the prosthetic set-up, implant treatment seemed more realistic despite the limited vertical bone height.

As can be seen in the images, this is a very small jaw with a short dental arch, which means that occlusal force will also be limited. Six Osseospeed® (Astra Tech) implants were planned; three of 6 mm, one of 8 mm and two of 9 mm.

At position #11 and #21, no implants were planned because of limited bone volume near the foramen and to avoid phonetic complaints. A pontic design in the frontal area allows for more prosthetic freedom.

Two fixation screws were planned, more or less in the same direction of the implants, to avoid tilting the guide. The more vestibular direction allows for placement during closure with the surgical guide.

Implant surgery
A SAFE SurgiGuide® (Facilitate, AstraTech) was chosen to allow for
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physical depth control and guided implant placement.

A mucosa-supporting surface was chosen to allow for flapless implant placement.

As healing and osseointegration would be compromised, the goal was to work as much as possible in an atraumatic way. With flapless surgery, the periosteum is not removed and, therefore, blood supply is not compromised, allowing for better healing.

In addition, the fit of the temporary restoration is not compromised. The prosthesis can be easily refined at the implant sites, allowing the patient to go home, wearing her temporary prosthesis.

Then there was six months of healing in combination with 10 sessions of hyperbaric oxygen treatment.

Final restoration

The final restoration will be a CAD/CAM milled titanium “wrap around bar.” The bar will be made directly on the implant level as there is no height available for placing an abutment.