A Digitally Constructed Obturator

Oliver Jones - Specialty Registrar in Restorative Dentistry
Abdulrahman Elmougy - Consultant in Restorative Dentistry
Charles Clifford Dental Hospital, Sheffield

Patient Information

36-year-old female patient.

Medical History

Resection of a low grade mucoepidermoid carcinoma of the left hard palate without surgical reconstruction (Figures 1 & 2)

Otherwise fit and well

Dental history

Regular attendance with GDP

Presenting Complaints

Nasal regurgitation of liquids

Hyper nasal speech

Patient Wishes

To eat and speak normally

Examination

Extra-Oral

NAD

Intra-Oral

Left hard palate defect

Gingival and periodontal health

Minimally restored dentition

Occlusion

Class II division II incisal relationship

Diagnoses

Browns classification 2a [1] low-level maxillary defect of the left hard palate.

Treatment Plan

At the time of treatment, the patient did not want surgical reconstruction given the risks involved. It was therefore decided to construct a removable obturator.

Figures 3, 5 & 7 demonstrate the process that was undertaken to construct an obturator traditionally, whilst figures 4, 6 & 8 show the process for digital.

Retention was gained directly from clasping the teeth as well as from within the defect. Stability was provided by rest seats on the teeth and from the remaining hard palate, adhering to principles of obturator design [2,3].

For both prostheses, a decision was made for the use of a soft bulb at the patients request given the soreness and fragility of the tissues surrounding the defect, despite the knowledge that it would require more frequent replacement than a hard bulb.

Figure 1 - Pre-operative retracted view

Figure 2 - Post-operative retracted view

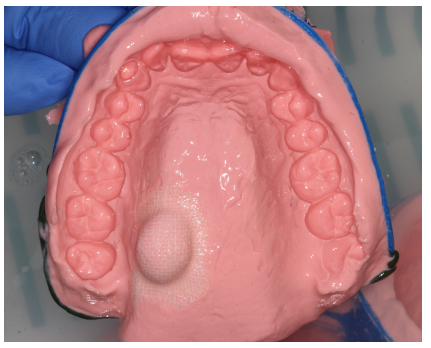

Figure 3 - Alginate & gauze impression

Figure 4 - Intra-oral scan

Figure 5 - Stone working model

Figure 6 - 3D printed model

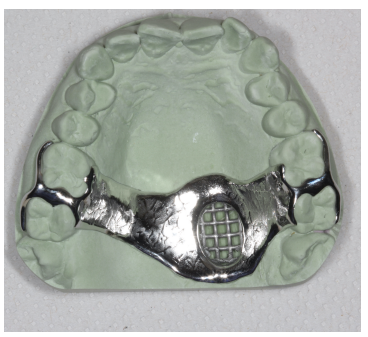

Figure 7 - Conventionally constructed framework

Figure 8 - CAD-CAM framework

Figure 9 - Post-operative retracted view

Traditional Fabrication

1. Primary impression using stock tray, gauze and alginate (Figure 3)
2. Laboratory cast impression and creation of special tray
3. Secondary impression in special tray with alginate
4. Laboratory cast impression, wax pattern design, invest and cast.
5. Framework try in (Figure 7)
6. Laboratory addition of Molloplast B soft bulb
7. Obturator fit

Digital Fabrication

1. Intra-oral scan (Figure 4)
2. Laboratory CAD design of framework. This pattern was milled in wax and then invested & casted in in Vitallium 2000+ (Dentsply Sirona, Charlotte, North Carolina, United States) cobalt-chrome alloy
3. Framework try in
4. Lab add soft bulb
5. Obturator fit (Figure 9)

Discussion

Whilst there is little high-quality evidence for the use of intra-oral scanning to construct removable prostheses [4], this case demonstrates its successful use in a small maxillary defect.

If the defect was larger, or functional muscular movements were required at the peripheries, greater challenges would have been encountered with the use of the intra-oral scanner. This is due to scanning being unable to capture dynamic soft tissue movements due to a lack of suitable reference points to record.

The height of the soft bulb had to be reduced as the scan captured the true height of the defect, the bulb was touching the sensitive inferior turbinate.

Patient's Perspective

The patient found intraoral scanning to be more acceptable than analogue impression, and the obturator more comfortable.

Clinician's Perspective

Intra-oral scanning eliminated the risk of impression material becoming stuck or lost in a small defect. As there was no need to protect the defect, the true height and margins were captured. Fewer clinical visits were required as the intra-oral scan acted as both the primary and secondary impression.

Laboratory Perspective

Given how scanners work and emit light, it could not truly detect the defect undercut and it therefore had to be digitally created on the design software to enable bulb engagement.

Overall, there can be multiple advantages to using intra-oral scanners for the construction of obturators and cobalt-chrome frameworks, but the limitations also need to be considered.

References

1) Brown JS, Shaw RJ. Reconstruction of the maxilla and midface: introducing a new classification. *Lancet Oncol* 2010; **11**: 1001−1008.
2) Desjardins RP. Obturator prosthesis design for acquired maxillary defects. The Journal of Prosthetic Dentistry. 1978 Apr 1;39(4):424-35.
3) Okay DJ, Genden E, Buchbinder D, et al. Prosthodontic guidelines for surgical reconstruction of the maxilla: a classification system of defects. JPD. 2001 Oct 1;86(4):352-63
4) AlRumaih HS. Clinical Applications of Intraoral Scanning in Removable Prosthodontics: A Literature Review. J of Prosthodont. 2021 Dec;30(9):747-62.