Figure 1. Facial image comparing patient before and after treatment.

Case report: Full mouth maxillary and mandibular implant rehabilitation utilising Digital Smile Design (DSD)

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With the recent surge of digital treatment planning being incorporated into a dentist's armamentarium, the advent of Digital Smile Design (DSD) ushers in a more streamlined workflow. Traditionally, there have been outdated methods to incorporate a simulation of what a patient can expect treatment to involve, whilst communicating the exact variables effectively with the patient and the dental team.

This case demonstrates the effectiveness of DSD and how it can be implemented throughout an immediately loaded implant case for an aesthetically pleasing and functional result.

The patient initially presented to us with a heavily decayed dentition, missing teeth and consequent loss of function and aesthetics. The underlying cause was a chronic soft drink addiction amongst a history of social issues including a poor diet and four consecutive pregnancies by the age of 20 in a low socioeconomic climate. Sadly, the patient had no access to ancillary dental care within the last 15 years.

Figure 2. Retracted views of patient's dentition and smile.

Figure 3. Intraoral photographs showing highly carious dentition with missing teeth and loss of OVD.

Figure 4. Pre-operative OPG demonstrating gross caries, failing dentition and impacted wisdom teeth.

DSD is a concept pioneered by Dr Christian Coachman. It is a methodology that encompasses the whole dental team to enable not only the best quality care for the patient, but also to develop the best result throughout the patient's journey through effective communication and reproducibility.

As Dr Coachman states, DSD initially consists of a series of high-resolution photographs and videos that enable integration of the patient's needs, desires, functional, structural and biological issues into the aesthetic treatment. This is tabulated as a frame of reference for the treatment that will be performed (Coachman et al, 2012).

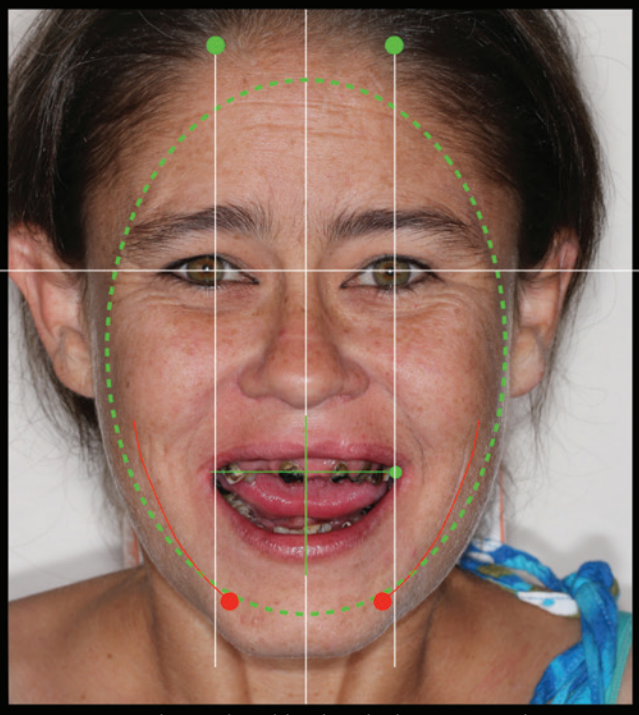

Figure 5. Initial DSD facial landmark alignment used to create ideal smile curve.

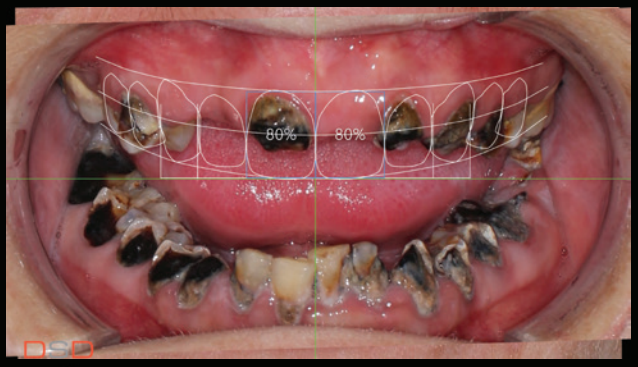

Figure 6. DSD smile curve overlay showing ideal teeth positioning and proportions with considerations to patients age gender and current dentition.

Figure 7. Use of the virtual ruler to assess alveolectomy level based on ideal tooth position.

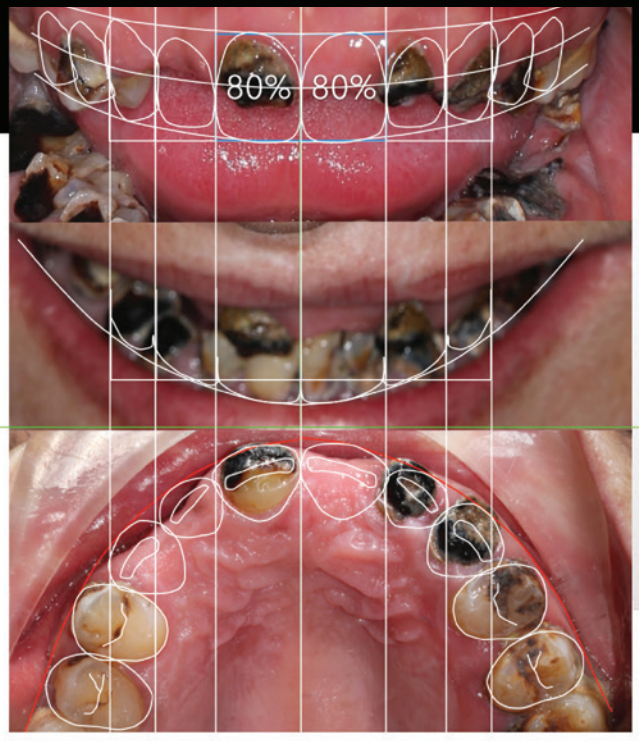

Figure 8. DSD Smile Frame and video assessment.

A DSD workflow was established for this case, which started with ideal dento-facial aesthetics and tooth positions being imprinted onto specific photographs to enable formation of a smile curve (Figures 1-8). Video assessment, phonetics and images of what little remained of the intact dentition were also used in the formulation.

It is important to note that the workflow enables not only effective communication to the patient but is individualised to each patient's dental characteristics based on their facial type, gender and age. This was pertinent in this case as there was not only a loss of OVD but posterior over-eruption and lack of any functional occlusion.

The ideal teeth position and smile curve for the final prosthetic are marked using a virtual ruler to mark alveolectomy position and provide this information both to the surgeon and to the laboratory (Figure 8).

Figure 9. DSD Simulation.

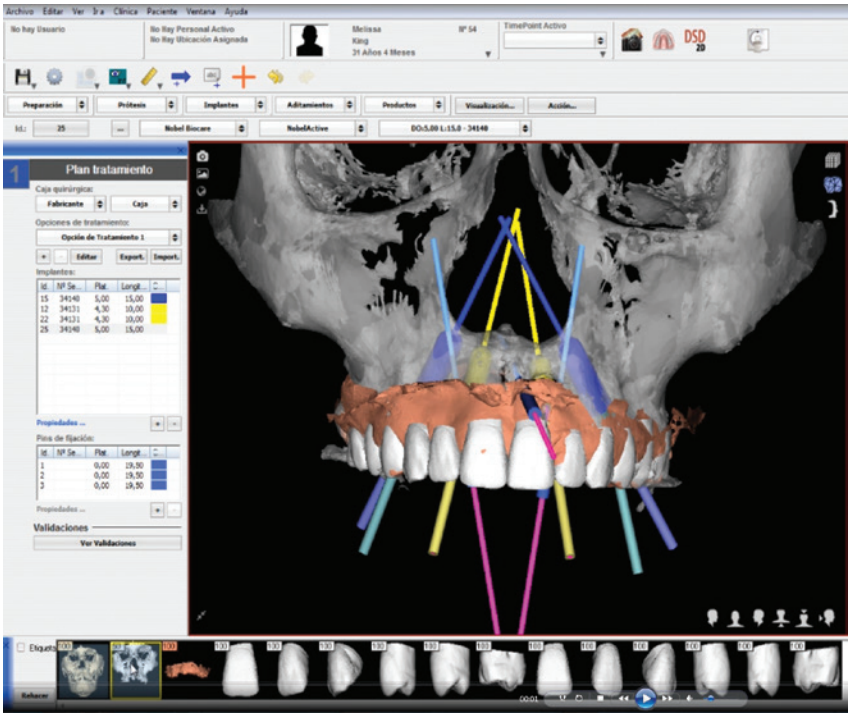

Figure 10. Pre-treatment DSD virtual lab showing combination of patient's CBCT overlayed with ideal implant placements and teeth positions (from the 2D design).

The Digital Smile Design Virtual lab was used to create surgical stents and bone reduction guides that were ideally fabricated and positioned based on the initial 2D smile design.

These modified images can then be transferred onto the STL files of the study models, the Cone Beam CT scan and combined with the Digital Smile Design. This creates the ideal overlay where implant planning and subsequent guide production can occur (Figures 9-10).

Treatment was performed under general anesthetic. All maxillary and mandibular teeth were extracted. Tooth 48 was encased in bone and had a close association with the right inferior dental nerve and was not extracted due to the low chances of clinical sequalae. Surgical guides (Figure 11) were used to assist in achieving a precise alveolectomy with adequate restorative space and implant positioning guides were also used for ideal placement within the planned prosthesis.

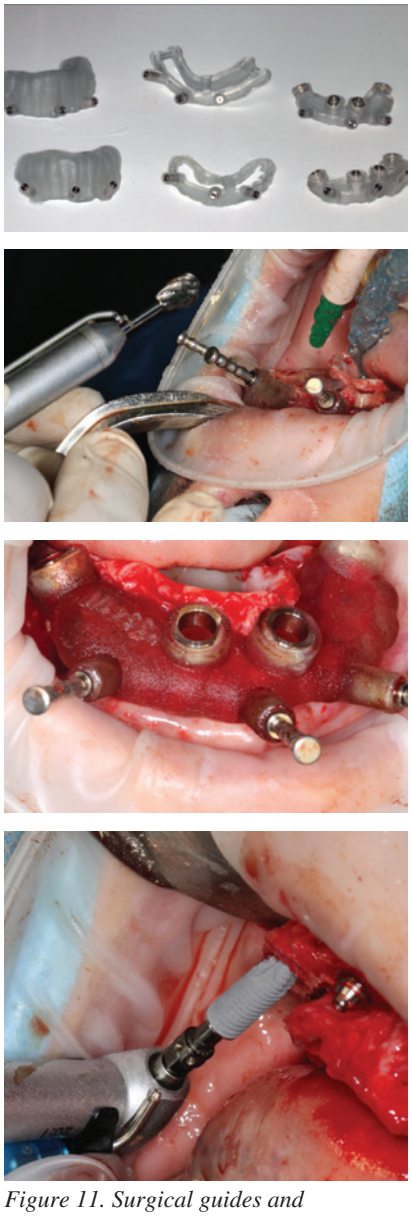

Figure 11. Surgical guides and alveolectomy guides.

Figure 12. Primary try-in with acrylic prosthesis immediately after surgery.

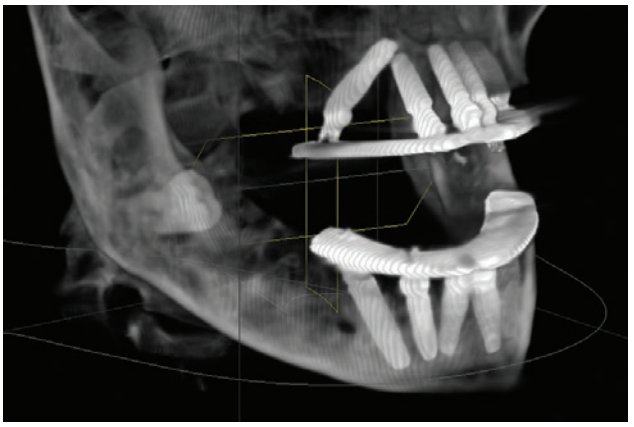

Figure 13. CBCT of final prosthesis.

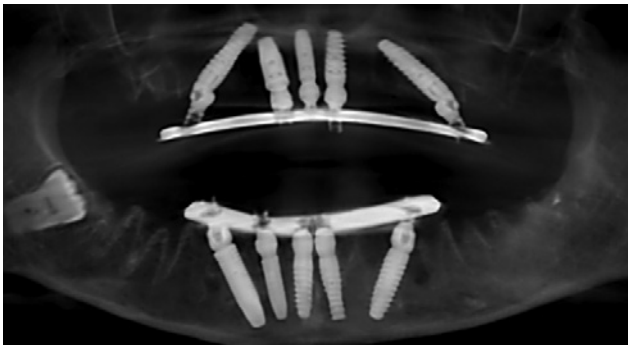

Figure 14. Post-operative OPG showing implant placements. Note 48 was kept due to low chance of complications by leaving the tooth encased in bone and proximity to nerve.

Figure 15. Upper and lower acrylic prosthesis patient can interchange between monolithic zirconia based on aesthetics and function.

Figures 16-17. Post-operative extraoral photographs.

The original plan was for an All-on-4™ on upper and lower arches. Due to the poor quality of the bone and concern about whether adequate torque was able to be achieved, an extra implant was placed in both arches (Figure 13).

At the time of surgery completion, analogue impressions were taken of both arches along with indexing of upper and lower mandibles utilising the printed guide from the virtual DSD lab.

The impression was taken with impression copings and a light activated resin was used to ensure implant stability during the impression. The prosthesis in this case was base acrylic dentition with CoCr floating bar with titanium cylinders (Figures 12-17).

Due to the complex rehabilitation in such a short timeframe, an upper full arch splint was prescribed for nighttime wear. The patient has been given a strict oral hygiene regimen and appropriate appointments for review. To complete ideal facial aesthetics and facilitate neuromuscular change, Botox was placed in the masseter and dermal fillers were used to correct the defect in the upper lip.

We all want ideal treatment for our patients. DSD ushers in a new more streamlined workflow that is used for effective communication with both the patient and your laboratory. As a result, there is high case acceptance due to the consistent functional and aesthetic outcomes. The DSD protocol can be used for complex cases as well as simple anterior restorative cases.

References

Coachman, C, and Calamita, M.A. Digital Smile Design. (2012).