Single upper arch restoration using digital smile design

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The patient presented with a chipped UL6 that he wanted repaired. He was a very anxious patient who attended the dentist on a 'needs must' basis. Key clinical features included:

- Decoronated LL6, retained root
- Gingival recession upper posterior quadrants
- Thick gingival biotype despite some volume loss
- Generalised tooth wear and associated parafunction
- Heavily restored dentition.

Care provided

This was a walk-in patient. He was a phobic patient who attended the dentist only when a problem needed a solution. He had fractured the LL6, most likely as a non-working side interference. The tooth had been sensitive prior to the fracture, but now was less so that the tooth had broken. He was concerned that there would be issues relating to tooth decay if he didn't get it fixed. In addition, he was complaining about the rough edge left on the tooth and this was irritating his tongue.

The tooth was quickly repaired with some composite, despite the fact that he needed a more definitive restoration such as a crown. During the course of this appointment, discussion centred on the tooth wear and the aetiology of the tooth wear was explained to the patient.

The patient was a school principal under a lot of pressure and he noticed that his problems were more common towards examination times. The patient was advised about what was required to prevent further unpredictability, ie, stabilisation splint, and this led to him wanting to know what could be done for his teeth.

The utility of digital smile design was discussed to assess what a patient's potential ideal smile could look like. The patient was interested in this as he had been getting ever more disillusioned about his teeth in recent times, and decried them as 'old man's teeth'.

The digital smile templates came back and a trial mock-up was carried out. Photos were taken to compare to the before and the after. The results were remarkable and immediately the patient emotionally connected with what was possible. Happily, this case would be an additive case, meaning that very little preparation of his teeth would be required to achieve an aesthetic result.

A Dahl appliance was used to increase the occlusal vertical dimension. To supplement the upper porcelain veneers and crowns that were required, further bite stabilisation was required by the provision of implants in the lower left first molar positions. Further full coverage crowns were placed on the LL6, LR6 and LL5.

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Figure 1: Right lateral smile

Figure 2: Central smile

Figure 3: Left lateral smile

Figure 4: Right retracted view

Figure 5: Central retracted view

Figure 6: Left retracted view

Figure 7: Right close-up view

Figure 8: Central close-up view

Figure 9: Left close-up view

Pre-treatment radiography, diagnosis and treatment discussion

Radiographs highlighted excellent bone health generally. None of the upper or lower teeth had any periodontal or apical issues. A CT scan highlighted the bone quality at the implant sites. Diagnosis was as follows:

1. General tooth wear
2. Soft tissue recession
3. Missing LL6 and LR5
4. Loss of aesthetics.

The patient had very low expectations and was just happy that he could be seen compassionately and if his function and aesthetics could be improved then he would be very happy. The treatment objectives were as follows:

- Digital smile design
- Porcelain veneers/crowns/bridge for UL6-UR6, LL5-LL7, and LR5-LR6
- Implant for LL6.

This patient was initially a difficult patient to treat due to his phobia and would require IV sedation to do anything dentally. Once he had seen his digital smile design mock-up, he was able to visualise the final result and he became emotionally connected to the treatment.

The following aspects were considered and the following options for treatment were outlined to the patient:

Figure 10: Full face view – initial presentation

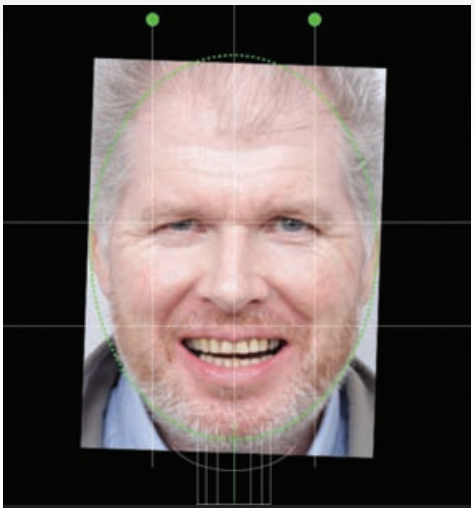

Figure 11: Digital smile design planning

Figure 12: Digital smile design mock-up

1. Place fill/crown UL6 and provide a stabilisation splint full time, or
2. Porcelain veneers/crowns UL6-UR6, lower crowns LL5, LL7 and LR6, porcelain bridge LR5 and LR6
3. Implant placements on LL6
4. Maxillary soft tissue grafting to reposition the soft tissue.

The patient confirmed his desire to go for options one, two and three. The patient appreciated that the soft tissue grafting is an important part of the treatment plan, but now was not the correct time for him to do this. He was content that the margins of the posterior restorations would be left at the cemento-enamel junction. As his smile line was favourable, this was not a problem aesthetically either.

Treatment progression

At the first surgical stage, the UL6 was repaired with composite, and an informal consultation and discussion regarding the patient's hopes and expectations took place. A discussion about the use of digital smile design to digitally plan the ideal smile for the patient took place.

The patient returned and had digital design smile photos taken, as well as digital scans of the occlusal surfaces. Using these, milled models were created and restorative templates were made for the mouth. The patient returned and the templates were filled with Protemp acrylic and placed over the patient's teeth. Photos were taken of the temporary result and then a slide show of the before and after photographs

Figure 13: Digital smile design mock-up

Figure 14: Digital smile design mock-up

were shown to the patient. This provided a very tangible idea of what the final result could look like.

From this mock-up, the patient made an emotional connection and committed to getting the upper 12 teeth restored, whilst also restoring his missing and poorly restored lower posterior teeth. Further impressions were taken, and in addition, a face bow registration was sent to the lab to fabricate a definitive wax-up, and as before a restorative template was made.

The LL6 was removed and the inflammatory tissue curetted and the site left to heal and mature for three months.

Composite restorations

This case was to be carried out in a re-organised fashion. A composite Dahl appliance was placed on the upper left to upper right canine using the wax-up and a palatal step to allow axial loading on each tooth.

This allowed posterior disclusion, while also giving the patient a trial run with the aesthetics that we could potentially have from the final restorations.

After two months, the posterior overeruption and anterior intrusion was sufficient to commence the porcelain work. The posterior amalgams were removed and new composite restorations placed. The UL5 porcelain crown was replaced with an acrylic crown. Following the new composite restoration placements, an equilibration was carried out to ensure coincidence of centric relation and centric occlusion.

Figure 15: Right lateral smile

Figure 16: Left lateral smile

Figure 17: Right retracted view

Figure 18: Central retracted view

Figure 19: Left retracted view

Figure 20: Rght retracted close-up

Implant placement

An implant was placed in the LL6 position – a 4x11.5mm Megagen Anyridge implant. A sulcus former was placed at the time of placement. An ISQ reading was taken and this was over 70, suggesting that a rapid restoration of this site would be possible.

Restoration provisions

The digital smile design highlighted that all the restorations would be mostly additive and consequently the veneer preparations would be very conservative. The wax-up template was then filled with acrylic and the veneers were prepared using the Galip Gürel veneer technique.

The upper canine to canine were prepared for porcelain veneers. The temporary anterior restorations with the introduced canine guidance were photographed in a full-face photo and a rubber impression taken to allow the lab to fabricate an incisal guidance table. A1 was chosen for this case.

The E.max veneers were returned and tried in with try-in paste and the photo confirmed that they were in harmony with the smile line. This was confirmed as the patient did not need anaesthetic due to the minimal preparation of the veneers. Rubber dam was applied and floss ligatures were used to keep the dam in position. The veneers were cemented with Nexus light cure clear cement, the excess removed and polished.

At the same appointment, the UL5, UL6, LL5, LL7 E.max porcelain crowns, the UL4 E.max veneer and the LL6 screw-retained Anyridge implant restorations were prepared and impressions taken. These were returned from the lab, tried in and the occlusion confirmed and finally bonded with Nexus dual cure clear for the crowns, and Nexus light cure for the UL4 veneer. The LL6 implant crown was torqued into position and the access cavity filled with Teflon tape and composite.

The remaining upper and lower right quadrants were prepared for a mixture of E.max crowns on the UR6 and LR7, and a cantilevered bridge on the LR5 and LR6. This site was originally earmarked for bone grafting and implantation, of which the patient had second thoughts and decided that for financial, surgical and emotional reasons that he would

Figure 21: Central retracted close-up

Figure 22: Left retracted close-up

prefer to go with the cantilevered bridge.

Due to the fact that the LR6 needed to be crowned and also due to the balanced, managed occlusion, a cantilevered bridge was deemed to be an effective implant alternative in the circumstances. The UL4 and UL5 were prepared for E.max veneers. Upon receipt of the final restorations, these were tried in and the aesthetics and occlusion confirmed and the veneers bonded with Nexus light cure clear, whilst the crowns and bridge were bonded with Nexus dual cure clear.

Review and ongoing maintenance

The patient returned two weeks later and the hygiene, the occlusion and the aesthetics were critically assessed. The patient was very happy with the final result. Impressions were taken to fabricate a Tanner splint that was fitted subsequently. This was adjusted over the course of a number of review appointments. The patient uses this every night as an insurance policy. He was informed of the importance of maintaining gingival health and was advised to attend with his hygienist bi-annually.

The treatment was very successful on a number of fronts. The patient's phobia disappeared as he became a very positive patient. His confidence levels improved immeasurably as he was extremely happy with the appearance of his teeth, as well as the security of his more solid bite. The case was very successful in aesthetic considerations, as his smile has broadened considerably, the smile line is more ideal and the final result highly attractive.

Reflection

This case was very enjoyable. To be able to deal with the functional issues definitively and provide a beautiful aesthetic result at the finish is very rewarding. This case was possible principally due to the power of digital smile design. The patient was a very anxious and phobic patient and he only attended the dentist when in pain or discomfort. For him to consider undergoing all the demanding treatments that were required, shows how much of an emotional connection he was able to make with the proposed treatment.

To be able to directly visualise an ideal smile in your mouth, in real time, provides a wonderfully emotive treatment planning tool for the dentist. It allows the clinician to change the patient's point of value and be able to assess why it is worth spending the money required to create a beautiful smile. In addition, it allows the patient to feel in control of the situation, as ultimately it is they who are making the final call on the aesthetics before any operative treatment begins.

The Galip Gürel veneer preparation technique allows us to be as conservative as possible when providing porcelain veneers. The requisite amount of tooth substance is removed to facilitate the veneer provision. In this case, due to the additive nature of the treatment, the whole process was a very conservative one and at no point did the patient have any sensitivity.

The Dahl appliance used in this case is a very useful tool in allowing us to provide reorganised dentistry without having to crown every tooth in a patient's mouth. There is always a concern when using the Dahl technique that the posterior teeth do not re-establish occlusal contact.

However, a study by Gough and Setchell (1999) highlighted that 96% of posterior teeth re-establish occlusal contact. In addition, the fact that we were replacing the posterior restorations prior to crown provision afforded us extra security.

With regard to the final aesthetics, the author feels that the

Figure 23: Full face view

final result is a very natural one. The incisal edges of the teeth mimic the lower labial curve for nicely.

The subtle graduation in colours in the restorations with incisal edge translucency accentuates the result. Most importantly, a nervous patient regained his confidence and has become a model patient who attends regularly for preventive reasons, rather than interventions.

As a number of the upper restorations have supragingival margins, this provides a better bond to the veneer as the vast majority of the bonding is to enamel. The patient is aware that to achieve better health and aesthetics that connective tissue grafting would be ideal to bulk up and reposition the soft tissue in these deficient areas.

The patient is aware that the bulk of the problems related to his grinding and the subsequent abfraction cavities that developed as a result, leading to the soft tissue recession. This problem has been managed by developing canine guidance and also the provision of a tanner splint at night time. The patient has a favourable smile line and does not show the supragingival margins.

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