

# Complex Esthetic and Functional Rehabilitation with **an Additive Minimally Invasive Restorative Approach**

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Frontal view of teeth suffering from erosion.

The treatment of the patient with extensive tooth wear presents complex challenges, due to diagnosis of often a multi-factorial etiology, and the definitive management of the patient.

Patients may seek dental care to improve their esthetic appearance, without fully comprehending the complexity or problems associated with tooth wear. Typical symptoms that patients present with include poor esthetics, chipping/thinning of teeth, dentinal hypersensitivity, reduced occlusal vertical dimension, and minimal tooth height.

Historically the management of patients presenting with extensive tooth wear was with conventional fixed prosthodontics. This would involve preparation with crowns on the teeth where tooth structures were already compromised. This would increase the biomechanical risk to the dentition due to the reduction of tooth structures, which negatively impact the structural rigidity of the teeth.

Edelhoff and Sorensen [1] found that 62% to 73% of tooth structure can be removed undertaking the preparation to receive either a full coverage all-ceramic crown or porcelain fused to metal crown. Additionally a conventional approach could result in a loss of pulpal vitality of the teeth. Teeth requiring fixed prostheses have a 6-11% requirement for endodontic treatment. This approach is more invasive and is irreversible. [2, 3]

### Clinical case overview

The patient is a 26-year-old female who presents with her chief concern being that of the short nature of her teeth and the ensuing poor esthetics.

A comprehensive history and examination was performed. Her concern was the extensive loss of tooth structure and the chipping of her upper front teeth. The patient had a history of Bulimia Nervosa. This condition consists of recurrent episodes of compulsive binges (consumption of large amounts of food) with or without self-induced vomiting or purgation.

### Diagnosis

The patient was diagnosed to have localized anterior tooth wear due to erosion that had occurred when she was bulimic, with a secondary etiology of bruxism. Chronic exposure to acidic substrates had led to exposure of the dentine (particularly in the maxillary anterior teeth), chipping of the teeth, and was complicated with the parafunctional habits of the patient.

Patients that present with tooth wear often do not display a loss of OVD due to the loss of tooth surfaces occurring at a slow rate,

which allows time for alveolar compensation. In cases where the surface loss is active and rapidly progressing this may lead to loss of occlusal vertical dimension as alveolar compensation may not be keeping up to the same rate. [4] In occlusion, the patient appeared to have a decreased lower face height due to a loss in occlusal vertical dimension, which had not fully been compensated for by alveolar compensation.

The adoption of the Dahl approach allows for restoring the dentition in a more conservative manner and this case will describe the concepts involved in a complex rehabilitation using both direct and indirect restorations with minimal biological risk to the patient. The Dahl (1982) concept refers to the axial tooth movement that is observed when a localized appliance or restoration is placed in supra-occlusion and the occlusion re-establishes full arch contacts over time.

In this patient direct composite resin was applied to the maxillary anterior teeth, which opened up the vertical dimension, with the posterior teeth allowed to erupt into contact, along with controlled intrusion of the anterior teeth. This on average may take 4-6 months. The alternative treatment with conventional prosthodontics would have necessitated carrying out endodontic treatment and crown lengthening surgery for sufficient axial height for adequate retention and resistance form.



Occlusal view of the maxillary dentition exhibiting typical signs of gastric erosion. Note: palatal loss of tooth structure.



Occlusal view of the mandibular dentition.



Template of diagnostic wax-up with access holes for injection of composite.

### Treatment

Following a comprehensive intra-oral clinical assessment including diagnostic photographs, study casts were taken and mounted on a semi-adjustable articulator.

A diagnostic wax up was undertaken, with the requested esthetic changes communicated to the dental ceramist.

Upon completing the work-up, the treatment plan decided upon in consultation with the patient included:



Completed composites immediately after template removal.



Preparation (all-ceramic) for 13 – 23.



Restorations shown on stone model.

### Maxillary

Phase 1: Direct composite 13-23 – Dahl effect

Phase 2: All-ceramic crowns 13-23 and covering of exposed dentinal surfaces of remaining dentition.

### Phase 1: Composite Resin Build-ups (Dahl concept)

Each tooth was prepared by abrading with 27 micron Aluminum Oxide and a total etch adhesive technique (Optibond Solo Plus, Kerr Dental) was utilized. Placement of resin composite (Herculite Ultra, Kerr Dental) was accomplished with the aid of a template formed from the anatomy established from the diagnostic wax up (Figure 7). Please note that the composite was heated which improves the flowability of the resin that allows injection into the template.

The use of the template allows the placement of composite to form the contour and incisal length of the teeth as planned from the diagnostic wax-up (Figure 8). This will allow minimal adjustment at completion of the restorations. The posterior teeth were separated by approximately 3mm, and the patient was then assessed over the next four months where the posterior teeth came into contact. At this stage the composites can be replaced with final restorations.

### Phase 2: Maxillary Indirect Restorations

The final restorations were fabricated with pressed lithium disilicate (e.max – Ivoclar Vivadent) materials using a B1 LT ingot. The lithium disilicate restorations were individually placed to assess marginal fit and contact points. The restorations were then placed with a clear try-in gel to display to the patient prior to permanent cementation, who then gave approval for the final cementation.



Completed all-ceramic (e.max) crowns with posterior teeth in occlusion.



Each restoration was etched with 4.5% hydrofluoric acid for 20 seconds, followed by cleaning of the chemical salts by rinsing and insertion into an ultrasonic bath with distilled water. After air drying each restoration was then silanated for more than 60 seconds.

As the ceramic restorations are thin, cementation requires the restorations to be adhesively bonded with resin cement. A strong, durable resin bond provides high retention, [5] improves marginal adaptation reducing microleakage, [6] and increases fracture resistance of the restored tooth and the restoration. [7] The teeth were adhesively bonded with a total etch technique (Optibond Solo Plus, Kerr Dental) and restorations bonded with a light cure resin cement (NX3 Nexus, Kerr Dental) for the teeth.

The author prefers to initiate cementation using the central incisors as a starting point, which allows correct orientation, symmetry and balance. After the central incisor restorations are placed, the subsequent left and right side restorations were then placed using the same technique.


The restorations were then adjusted and finished with ceramic polishing and finishing techniques. Once the margins were no longer detectable with an explorer, they were polished with rubbers and diamond polishing pastes. The occlusion was evaluated and adjusted in centric occlusion, lateral and protrusive movements and finally in the chewing envelope.

Due to the nocturnal bruxism habit a full maxillary occlusal splint was fabricated with careful instructions on its use.



Smile (lateral view).

### Conclusion

The aim of managing the worn dentition should be to determine the etiological factors and institute an appropriate preventive program to protect the remaining tooth structures whilst restoring function, occlusal stability and esthetics. Treatment planning involves understanding the etiological factors involved, to the planning of the steps involved with the reconstruction of the dentition for both functional and esthetic requirements. A minimally invasive approach is preferred and the use of the Dahl approach has been demonstrated. 

### Acknowledgements/References

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**Best gurus in dentistry:** My good friends Drs Sascha Jovanovic and John Kois. They are both leaders in their respective fields and I've had the opportunity to learn and share some of the knowledge that I've learnt to others in our wonderful profession.

**Best dental conference experience:** FDI Kuala Lumpur, Malaysia. It is always fun to lecture in Asia as dentists here are so motivated to learn and are enthusiastic about their dentistry. They also have a sense of humor and are willing to have a laugh even at my poor jokes!

**Best advice for dentists:** My best advice for dentists is to keep learning and educating themselves. It allows you to be a better dentist, makes your job more rewarding professionally. It is certainly more fun and keeps you enthusiastic about new developments in dentistry.

**Best advice for patients:** The best advice for patients are to look after their teeth as once they get their adult teeth, this is the only set that they will have. Brushing your teeth is just one part of a regimen that should include flossing, the use of a fluoride toothpaste and don't forget what you eat and drink. Many foods are not only rich in sugar but also can contain acid, which can lead to tooth erosion with irreversible damage to the teeth.

**Best place to relax:** Maldives is an unforgettable place where one can unwind, enjoy the sun and sand with total relaxation. The islands are like a paradise where one can enjoy total bliss.