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Minimally Invasive Management of Localized Anterior Tooth Surface Loss Using Composite Injection Moulding and Dahl Technique: A Case Report and Follow-up

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ABSTRACT

The loss of tooth tissue due to wear can be a significant concern for patients, especially when it affects anterior teeth. Many seek dental treatment to restore their worn teeth due to esthetic concerns, difficulties in maintaining oral hygiene, hypersensitivity, and a lack of self-confidence, all of which can impact their quality of life. This clinical report presents the management of a patient experiencing such challenges using contemporary restorative materials and techniques. The patient, who presented with tooth wear and sensitivity, was treated using the composite injection moulding technique in conjunction with the Dahl principle for localized anterior tooth wear. The treatment approach successfully restored both function and esthetics while preserving natural tooth structure. Over a three-year follow-up period, the composite restorations demonstrated excellent clinical outcomes, including improved occlusal stability, durability, and high patient satisfaction. This case highlights the effectiveness of a conservative Dahl approach in treating localized upper and lower anterior tooth wear, offering a minimally invasive yet highly functional and esthetic solution.

Keywords: Tooth wear, Composites, Injection moulding technique, Dahl approach.

1. Introduction

Tooth surface loss due to abrasion, erosion, attrition, and abfraction is a well-documented clinical challenge. Abrasion (interaction with foreign materials) and attrition (tooth-to-tooth contact) are mechanical processes, while erosion results from acid-induced demineralization. Often, erosion exacerbates mechanical wear by softening dental tissues. Abfraction, though still debated, is described as the loss of cervical enamel due to occlusal stress concentration, making teeth more susceptible to combined mechanical and chemical degradation (1,2).

Managing worn dentitions can be difficult; however, the development of adhesive techniques, such as acid etching, has transformed restorative dentistry. By bonding composite materials directly to remaining tooth structure, clinicians can preserve remaining tooth tissue, supporting a minimally invasive, conservative approach (3).

Within this context, the composite injection moulding technique represents a significant advancement in restorative dentistry. It allows for highly precise and minimally invasive restorations that address both functional and esthetic concerns. The technique has evolved in parallel with improvements in flowable composite materials and clinical protocols designed to enhance precision and predictability. The clinical protocol was further developed by Terry and Powers (2014), who described a predictable method using transparent matrices to transfer a pre-planned diagnostic design, such as a wax-up, directly onto the tooth surface, thereby ensuring accurate replication of form and

contour (4). Moreover, Terry et al. (2014) highlighted the successful application of this technique in a range of restorative scenarios, including the management of worn dentitions and closure of diastemas, underscoring its versatility and reproducibility in clinical practice (5).

This clinical report presents the treatment of a patient exhibiting significant tooth surface loss due to these combined wear processes. The case was managed using contemporary materials and the composite injection moulding technique to achieve a conservative, esthetic, and functional outcome.

2. Methods, Materials and Treatment Undertaken

A 67- year-old longstanding, male patient presented for a consultation expressing both esthetics and functional concerns. He was unhappy with the appearance of his "chipped" and "worn" anterior teeth. He disliked his smile in photographs and was concerned about the continual wear to his teeth. He wore a soft mouthguard every night as prescribed by his dentist in the hope of protecting his teeth against further tooth wear due to a history of sleep bruxism (6).

His medical history was unremarkable. His lips were competent at rest, with a low lip line with no gingival display on normal smile. There was moderate to severe anterior crowding on both arches, prominent canines and open gingival embrasures simulating the appearance of "black triangles" between the teeth. There was class-II div-2 incisal relationship with reduced overjet and a traumatic overbite. The incisal edges were chipped and worn, but with good incisal show at rest (1mm-appropriate for patient's age). Incisal edges of upper anterior teeth were flat which did not follow the curve of lower lip line. Midline was coincident with facial midline.

The patient had good oral hygiene with Basic Periodontal Examination (BPE) score of 000/120, a minimally restored dentition, evidence of tooth surface loss with dentine exposure on the lower anterior teeth and the palatal aspects of the upper anterior teeth with Basic Erosive Wear Examination (BEWE) score of 121/131 (7). The lower anterior teeth were significantly shortened with the exception of lower left lateral incisor, which was instanding.

When looking at the lower occlusal plane from posterior teeth to anterior teeth, the lower posterior teeth sit lower and there is a rise going forward towards the anterior teeth. A reversed Curve of Spee is therefore exhibited. The implications of this result in excessive occlusal forces placed on the incisal edges of lower anterior teeth, hence wear, and chipping. The clinical findings and diagnosis of the case is summarized in Figure 1.

Following a thorough history, examination, and special investigations, the following diagnoses were reached, as outlined in Table 1.

The initial treatment involved regular visits to the dental hygienist for subgingival curettage to address generalized periodontitis, followed by a maintenance period for the tissues to settle.

The provision of orthodontic treatment prior to restoration of the teeth was considered to allow the alignment of the teeth and the establishment of an improved occlusal relationship with a more favourable protrusive guidance and provision of interocclusal space necessary for restoration.

The patient was referred to a specialist orthodontist for further consultation. Although fixed orthodontic treatment was recommended prior to restorative intervention, he declined this option due to concerns about the appearance of traditional braces and length of treatment. As an alternative, a restorative approach was proposed, involving the upper and lower anterior teeth only. The aims of treatment were to change the occlusal conditions, provide enough inter-occlusal space to cover exposed dentine and improve esthetics of upper and lower anterior teeth.

It was explained to the patient that restorative treatment undertaken without prior alignment of the teeth may not be the ideal in terms of esthetics and increased loading to the restorations as the position and inclination of the teeth will be unchanged. The patient fully understood and consented to this plan of treatment.

A reorganizational approach was selected due to the extensive tooth surface loss affecting the anterior teeth, steep anterior guidance, and limited interocclusal space for restoration. The patient's occlusal relationship was recorded in the Retruded Axis Position (RAP), which created approximately 1 mm of inter-occlusal space in the transverse axis. This was followed by a planned increase of 2 mm in the Occlusal Vertical Dimension (OVD), providing adequate space to restore the lower anterior teeth to full form and address the palatal wear of the upper anterior teeth, recording of RAP and planning the raise in OVD are shown in Figure 2.

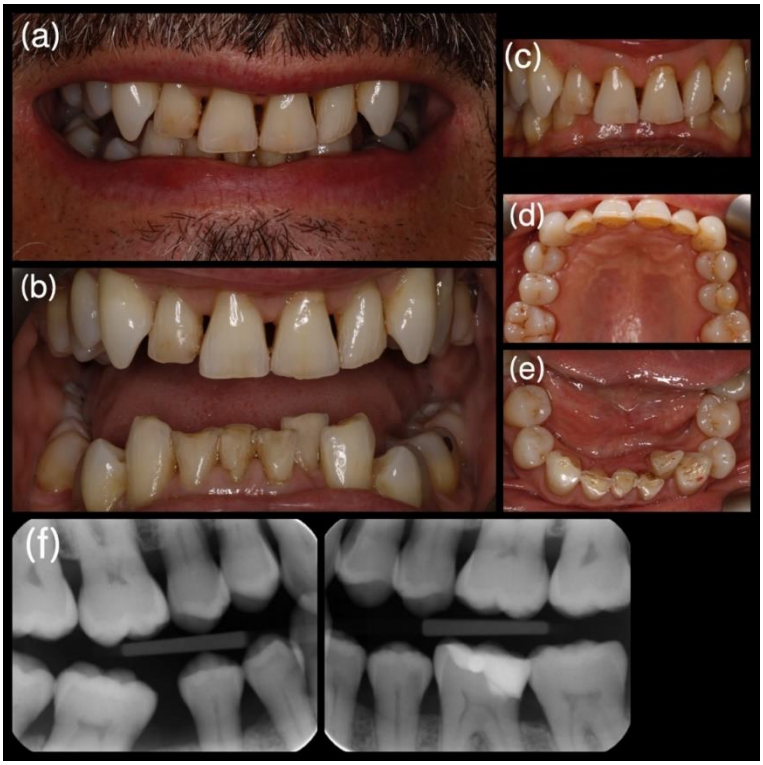


Figure 1: Pre-operative presentation

a) Frontal smile showing low lip-line, minimal to no gingival display, good incisal show, incisal edges do not follow the curve of lower lip, missing gingival papillae leading to appearance of 'black triangles', dark buccal corridors.
b) Intra-oral presentation showing severe crowding on lower arch with instanding LL2, significant toothwear on lower anterior teeth, and dento-alveolar compensation leading to a reversed curve of spee.
c) Occlusion showing class-II div-2 with deep overbite.
d) Maxillary occlusal view showing minimally restored dentition, palatal wear on upper anterior teeth and square arch form.
e) Mandibular occlusal view showing minimally restored dentition, severe crowding on lower arch with instanding LL2, significant tooth wear on lower anterior teeth.
f) Right and left bitewing radiographs showing no coronal radiolucency and 30% generalized horizontal bone loss.

Table 1: Diagnoses of the case based on history, examination and special investigations

Category	Diagnosis
Periodontal	Generalized periodontitis- stage II- grade B- currently stable
Orthodontic	- Class-II div-2 malocclusion - Moderate to severe crowding on both arches - Reduced overjet and traumatic overbite with dento-alveolar compensation on lower arch
Tooth wear	- Localized tooth surface loss on UR2-UL2 and LR2-LL3 due to malocclusion and attritive component - A reversed curve of spee. As a result, excessive occlusal forces are exerted on the incisal edges of the anterior teeth, leading to significant wear and chipping.
Esthetics	- Misaligned teeth - Chipped, worn incisal edges - Triangular shaped UR2-UL2 - Open gingival embrasures simulating the appearance of "black triangles" between the teeth - Incisal edges of upper anterior teeth did not follow the curve of lower lip line when smiling. - Dark buccal corridors due to square arch form - Discrepancies in color

As the posterior teeth exhibited no significant wear, a conservative, minimally invasive approach was chosen.

Composite resin was bonded to the palatal and incisal surfaces of the upper and lower anterior teeth to improve the occlusal relationship and protect exposed dentine. This method also employed the Dahl principle, whereby treating localized anterior tooth wear results in inter-occlusal space in the posterior region. This inter-occlusal space is monitored allowing for gradual re-establishment of posterior occlusal contacts through passive eruption and minor intrusion over time (8,9).

Resin composite was chosen to restore the anterior teeth to achieve a good balance between esthetics and a minimally invasive approach, enhanced by strong evidence supporting its use as a medium-term solution (4,5,6,10,11,12).

The patient was made aware of longevity and need of maintenance (i.e., repairs and replacement) of composite with time. Superior esthetics could have been achieved with the use of porcelain labially and indirect composite (or metal backings, such as nickle chromium or gold) palatally as a sandwich technique for the upper anterior teeth and composite build-up on the lower anterior teeth; however, both patient and dentist opted for the most conservative approach (13).

Treatment planning and step-by-step sequence of treatment implementing the composite injection moulding technique are outlined in flowchart 1.

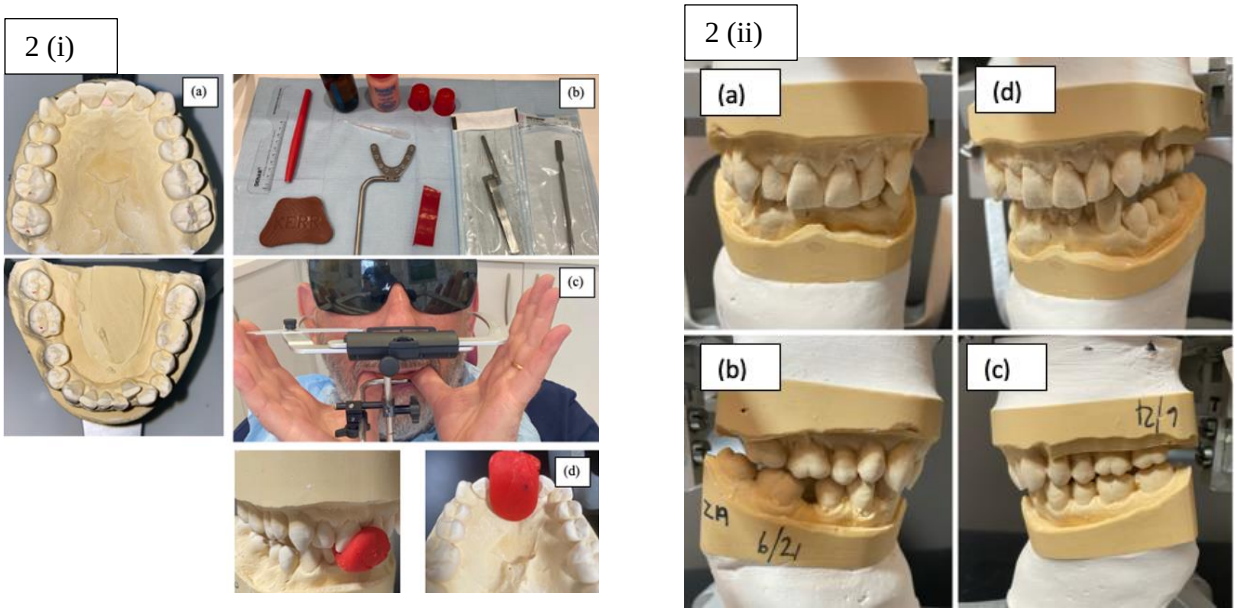


Figure 2 (i): Photos to show the process for making articulated study models. The requirements are; upper and lower casts, facebow record and inter-occlusal record taken in Retruded Axis Position (RAP). (a) Photos of study casts made prior to facebow and inter-occlusal record appointment. (b) Clinical set-up of armamentarium to take a facebow record and make a Lucia jig. (c) Patient having a facebow record taken. (d) Photos of Lucia jig made to deprogramme patient's occlusion and facilitate guiding the jaw into RAP. The GHM mark on Lucia jig was the reference point to ensure that the patient was in RAP (14,15).

Figure 2 (ii): Photos of the articulated models on a Denar II semi-adjustable articulator. (a) Front view in RCP. (b) Right side view in RCP. (c) Left side view in RCP. (d) Front view with proposed increase in OVD in RAP; this was reduced before wax- up to 2mm.

Following the initial consultation and functional record appointment, a diagnostic wax-up was prescribed at a 2-mm increased occlusal vertical dimension (OVD); the amount of opening was determined by esthetic requirements and adequate thickness of composite material palatal of upper anterior teeth and the incisal surfaces of lower anterior teeth to achieve ideal occlusion (Figure 3). The smaller the change in OVD, the less the need for an adaptive response from the stomatognathic system (16).

A wax pattern of the proposed teeth shapes was planned in the dental laboratory for UR2-UL2 in the ideal proportions to restore worn anterior teeth to appropriate width: length ratio with a rectangular incisal silhouette to eliminate black triangles (17), as shown in figure 3. 1mm of wax was added to the palatal surfaces of upper anterior teeth, and 2mm of wax added to the incisal edges of lower anterior teeth equating to the total of 3mm of inter-occlusal space planned by setting the patient's jaw to RAP and increasing the OVD. Palatal surfaces of upper anterior teeth wax-up were planned to allow for vertical stops to ensure that forces were directed through the long axis of each tooth, one ICP contact per tooth and even, symmetrical protrusive guidance leading to immediate disclusion of posterior teeth for ideal occlusion. The existing canine guidance on the patient's right and left sides was maintained (18).

Digital esthetic treatment planning (digital wax-up) and printed model of this would work in the same way as the analogue process.

From the aforementioned wax pattern, a mock-up of the proposed tooth shapes was carried out using bisacryl resin (Protemp, 3M, USA) and putty matrix. Esthetics, phonetics and occlusion were verified at this stage with the patient, and he consented to proceed with the restorative treatment.

The shade of bisacryl material used for the mock-up was A3 Vita shade. It was explained to the patient that selection of the resin composite shade would be based on the shade of his teeth (Figure 4).

The patient requested to have a course of teeth whitening before treatment to lighten the colour of his teeth. He was provided with 16% carbamide peroxide teeth whitening gel by Boutique Whitening (Home-Bleach) along with customised trays to wear over night for 4 weeks, then allow further 2 weeks before taking the final shade for restoration. The shade of patient's teeth prior to bleaching was Vita A2 and post-bleaching was Vita B1.

A stent was taken of the diagnostic wax-up using clear special trays and clear silicone matrix (Exaclear, GC, Japan). This will be used for the injection moulding composite technique as a direct restorative method. Exaclear is a clear vinyl polysiloxane material, completely transparent, records extremely accurate impression and is relatively rigid in thick sections when set. These properties make it an ideal material for composite injection moulding technique, as one can see the injectable composite filling the space as the clinician injects it.

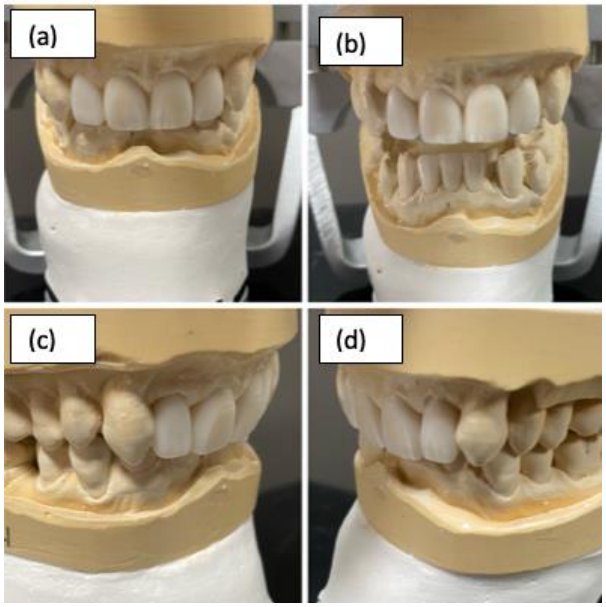


Figure 3: (a) Photos to show esthetic wax-up carried out on UR2, UR1, UL1, and UL2 on the upper arch. The lab was prescribed to close black triangles, add buccally to bring the teeth in alignment to disguise prominence of canines, and level incisal edges. (b) Front view to show wax-up of LR2, LR1 and LL1 on lower arch; the lab was instructed to build those teeth to full form. (c) Right side view to show labial profile of wax-up, secondary and tertiary anatomy. (d) Left side view.

The restorative procedure involved administering local anesthetic *via* buccal infiltration (lignocaine, 2% with adrenaline) to the surrounding region for the teeth being restored. Although no existing restorations are needed to be removed for this patient, the use of retraction cord was required, necessitating the need for a local anesthetic. Resin composite needs to be placed in a dry environment, but with the use of the stent to determine tooth shapes, it was not possible to place the most suitable isolating material, a rubber dam. Therefore, a combination of optragate technique to retract lips and cheeks and retraction cord to retract gingivae and prevent contamination with crevicular fluid was used. The teeth were polished with prophy paste and brush to remove biofilm.

Alternate tooth technique using Teflon tape was used. Note the placement of Teflon tape into the sulcus

of the tooth being restored to minimise excess material extruding into the sulcus (Figure 6). The process is detailed in the treatment protocol flowchart 1.

G-ænial Universal Injectable is a high-strength, injectable composite with a high filler content of 69% by weight, featuring ultra-fine barium particles (150nm) and GC's Full-coverage Silane Coating (FSC) technology giving unparalleled strength, durability and energy-absorbing resilience with high radiopacity.

Figure 4: Series of photos to show mock-up in patient's mouth. Mock-up was made from the wax-up by soaking the models in water for 5 minutes (to prevent putty sticking to the models, as plaster is porous in nature) then taking a putty impression of the wax-up, letting it set, cutting excess away with a scalpel, and cutting V-shaped notches where the papillae sit to ease removal of excess bis-acryl. Vaseline was placed on the teeth, the stent was loaded with bis-acryl and seated in the mouth. (a) Smile view of patient with mock-up in place, bisacryl shade A3 (b) Retracted front view with bisacryl mock-up in place. (c) Occlusal view of upper arch with mock-up in place to show ICP and protrusive guidance across the palatal of upper anterior teeth. (d) Occlusal view of lower arch with mock-up in place to show contacts and protrusive guidance on LR2-LL1. (e) Right lateral view with mock-up in place to show separation of posterior teeth with increase in OVD (f) Left lateral view with mock-up in place to show posterior teeth separation with increase in OVD.

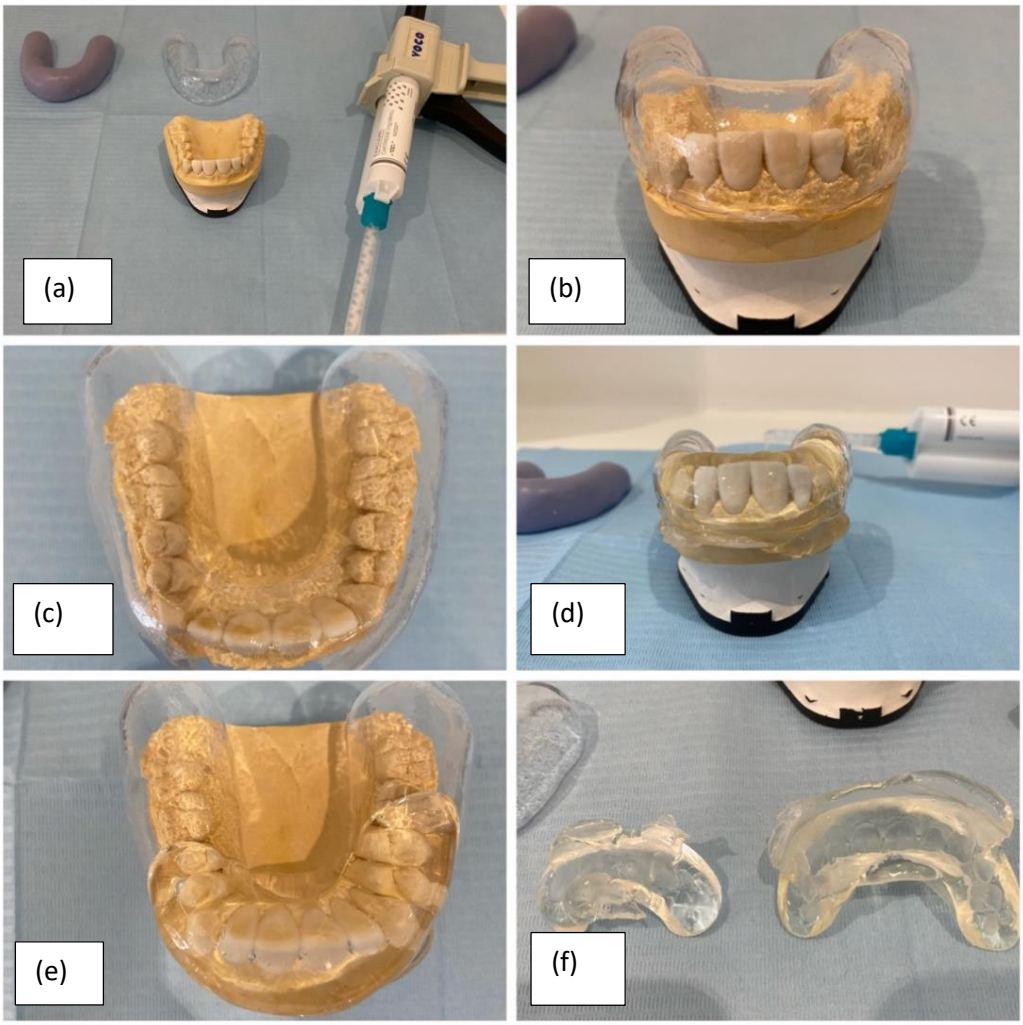


Figure 5: Series of photos to show the process of making Exaclear stent for composite injection moulding. (a) Photo to show armamentarium for the process. The model was soaked in water for 5 minutes, putty material moulded around the arch and allowed to set. Once set, it was removed and a special tray was formed with a suck-down Essix blank. The purpose of the clear special tray is to allow even thickness of material around the wax-up and be able to see through to position the Exaclear material correctly. (b) Front view of special tray over the model. (c) Occlusal view of the special tray over the model. (d) Front view of Exaclear material in the special tray over the wax-up. (e) Occlusal view of Exaclear material in the special tray over the wax-up note 10mm thickness of material all around the wax-up to ensure sturdiness of stent. The model is quickly transported into a pressure pot to set, in order to eliminate air bubbles and harden the Exaclear. (f) Same process repeated for lower arch, view of final stents; excess will be trimmed with scalpel

Difficulties were encountered in removing excess composite due to the material flowing into the pre-existing black triangles spaces due to gingival recession. To avoid this in the future, two wax patterns could be ordered, one full wax-up and one with alternating teeth and in turn make 2 clear silicone stents, which should work better at controlling excess composite (11).

Occlusion was checked with red GHM paper, ICP contacts and dynamic movement on protrusive and lateral excursions marks were the same as the mock-up (figure 7). This is the beauty of this technique; being able to copy/paste the occlusal scheme from the wax-up in addition to visualisation of result by the patient before the restorative appointment as a powerful communication tool.

Right and left posterior segments did not have any ICP stops when checked with Shimstock and no ICP contacts with GHM paper. Patient was informed of this ahead of the appointment and appropriate consent was gained.

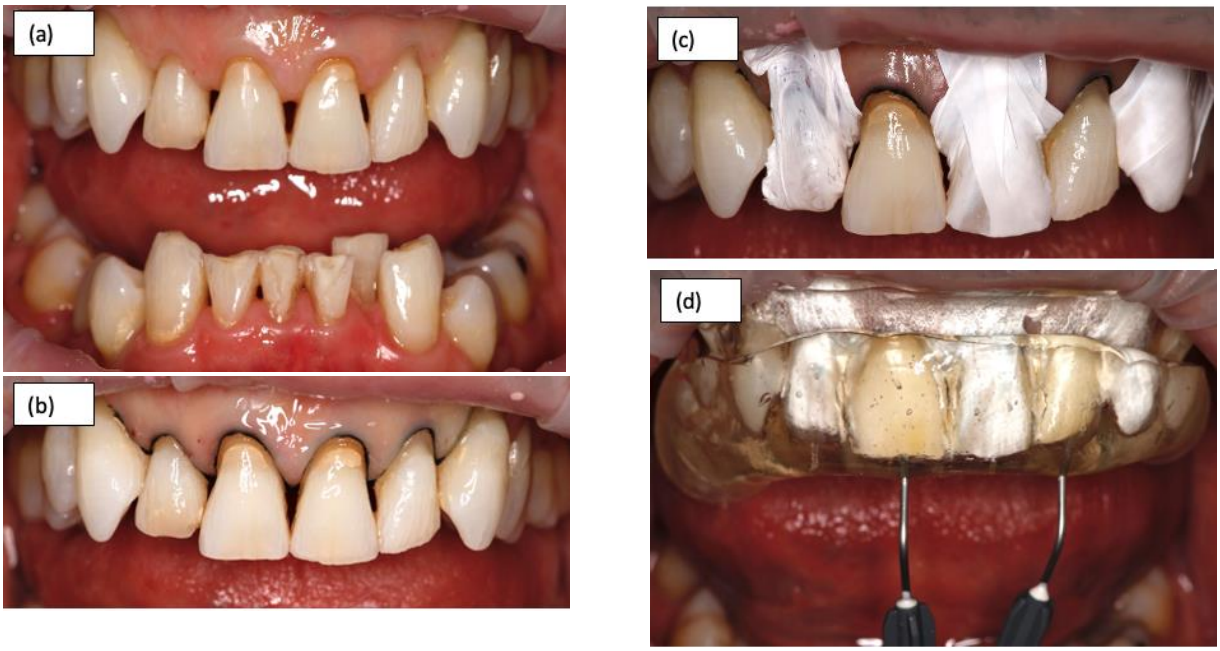
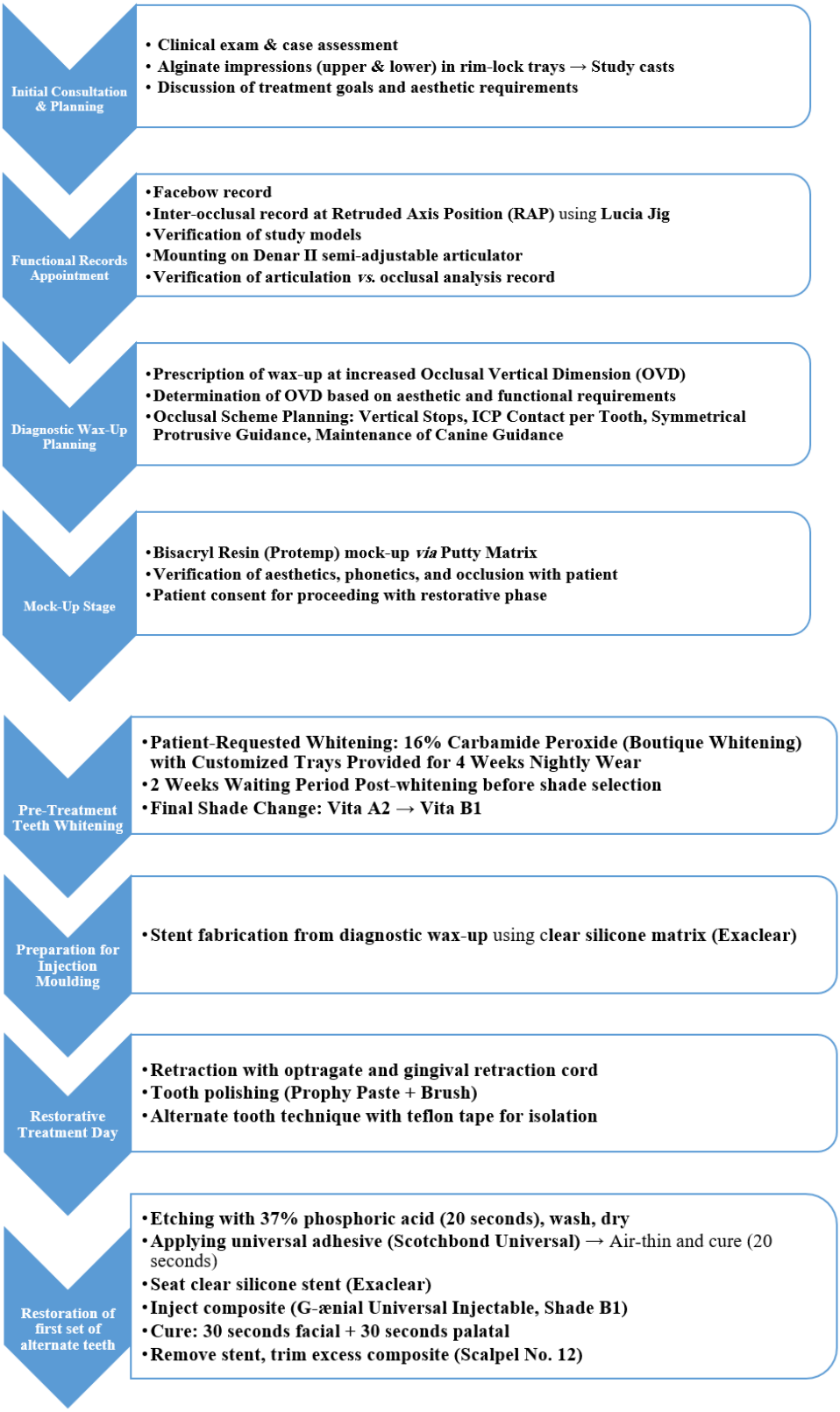
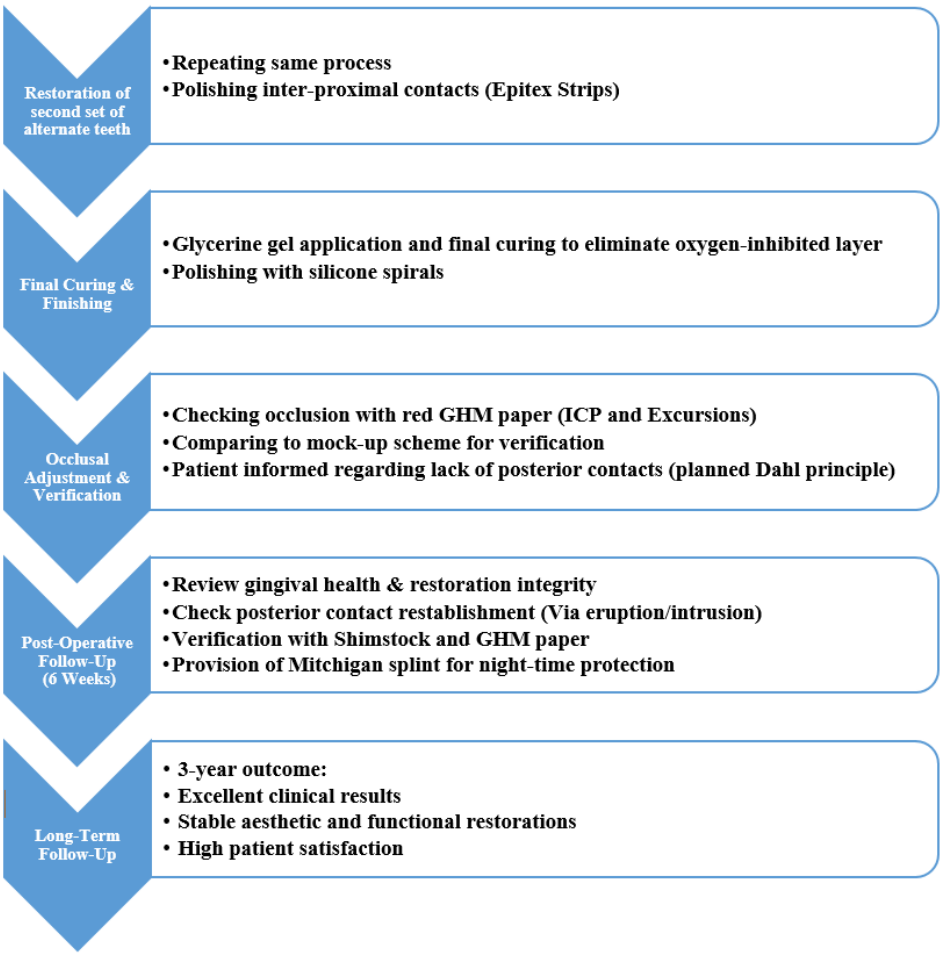


Figure 6: Series of photos to show clinical stages described above. (a) Front view of upper and lower anteriors pre-operatively. (b) Front view of upper anteriors with retraction cords in place. (c) Front view of upper anteriors with teflon tape used to isolate alternate teeth. (d) Front view of upper anteriors with Exaclear stent seated in place and G-ænial Universal Injectable tips inserted ready for injection moulding of UR1 and UL2.

Figure 7: (a) Front-view photo to show completed work on the UR2-UL2 and LR2-LL1; this was after curing with glycerine and rough polishing. (b) Occlusal view of upper arch to show ICP contacts and dynamic movement marked with red GHM paper as it was in the mock-up stage from the wax-up. (c) Occlusal view of lower arch to show ICP contacts marked with red GHM paper.

Flowchart 1: Composite Injection Moulding Treatment Protocol Flowchart





Following the treatment, the patient attended for a review at approximately 6 weeks post-operatively. Gingival health was optimal, composite restorations were pristine, and the posterior segments had returned to contact via a combination of passive eruption of posterior teeth and minor intrusion of anterior teeth (9). There were Shimstock holds on all the teeth and ICP contacts recorded with GHM paper. An impression was taken of the upper arch and the patient was provided with a Michigan splint for night-time wear. This was to protect the restorations from potential nocturnal bruxism.

Studies have shown good survival of composite restorations to increase occlusal vertical dimension in the anterior segment, combined with the Dahl principle in the posterior segments, and general use of composite to restore the anterior worn dentition has shown a good outcome and a long-term survival (11,18). Over a 3-year follow-up period, the treatment demonstrated excellent clinical outcomes and high patient satisfaction.

3. Discussion

The management of localized anterior tooth wear using the composite injection moulding technique in conjunction with the Dahl approach presents a minimally invasive, yet effective, treatment option. By introducing controlled anterior restorations, posterior teeth are temporarily discluded, and over time, the occlusion re-establishes itself through a combination of passive eruption (extrusion) of posterior teeth and minor intrusion of anterior teeth (8,9).

In comparison to other restorative methods, such as the free-hand composite technique, the composite injection moulding technique offers significant benefits in terms of precision, efficiency, and predictability. While freehand composite placement can allow for customisation of anatomy and characterization, it is highly operator-dependent, time-consuming, and technique-sensitive, particularly across multiple anterior teeth.

Conversely, the composite injection moulding technique, through the use of a pre-planned diagnostic wax-up and transparent matrices, enables accurate and reproducible transfer of the ideal tooth morphology and occlusal scheme to the patient's dentition. This method not only improves the efficiency of treatment delivery,

but also enhances the predictability of esthetic and functional outcomes (4,5,11,19).

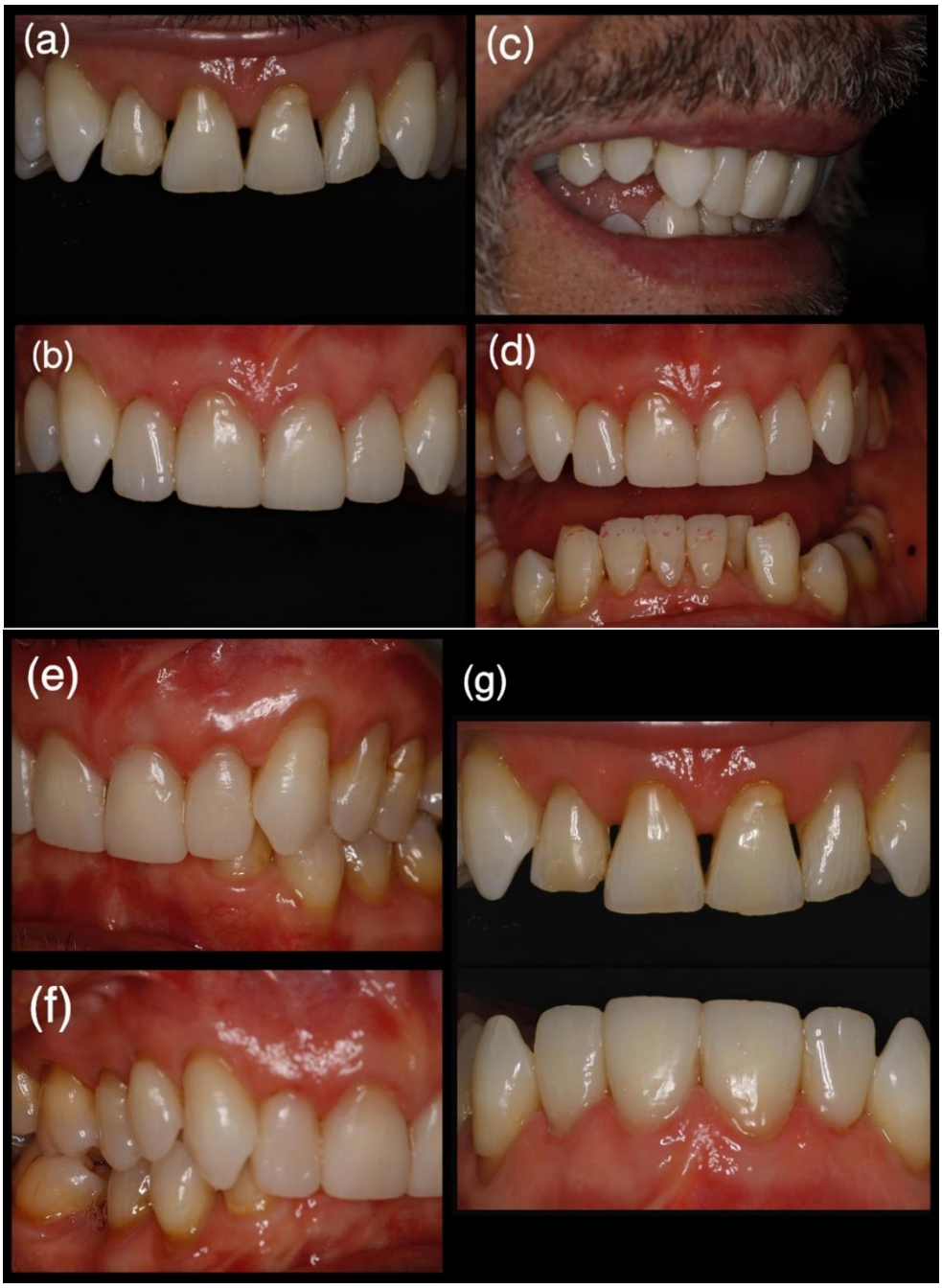


Figure 8 (i): Series of photos to show outcome on 6- week review appointment. (a) Contrasted view of upper anterior teeth prior to restoration. (b) Contrasted view of upper anterior teeth post-restoration on review appointment; (c) Lateral view of patient's smile on review appointment, note as an additive technique that the facial profile was maintained and the teeth are not looking bulbous. (d) Retracted view of upper and lower teeth on review appointment. (e) Retracted view of left posterior segment to show ICP contacts which were re-established *via* the Dahl principle. (f) Retracted view of right posterior segment to show ICP contacts. (g) Contrasted view mirrored before and after the intervention.

Figure 8 (ii): Series of photos at 6-month review. (a) Smile view. (b) Retracted front view with teeth in ICP position. (c) Retracted front view with teeth apart. (d) Retracted view of right-side posterior segment in ICP. (e) Retracted view of left-side posterior segment in ICP. No chipping or staining of composites. ICP contacts on all teeth. Patient showed good adaptation to new bite

Concerns regarding the flexural strength and wear resistance of flowable composite resin in comparison to composite paste resin as used in free-hand method has been disproven with the evolution of new highly filled flowable composite resin, such as G-ænial Universal Injectable, which has been proven to outperform a conventional flowable and paste composite resin in terms of wear resistance and flexural strength (20).

Compared to traditional indirect ceramic restorations, this technique preserves tooth structure, making it a viable short- to medium-term solution. However, the technique has limitations, such as the inability to layer composite shades or incorporate special effects like stains and translucency, which may affect esthetic outcomes, in addition to that longevity is restricted by material properties. Despite these drawbacks, clinical follow-up over three years demonstrated positive results, including occlusal stability, durability, and high patient satisfaction.

For these reasons, composite injection moulding was selected in this case, as it aligned with the principles of minimally invasive dentistry and provided a reliable, patient-centred solution to manage localized anterior tooth wear. While acknowledging the limitations related to esthetic characterization and material longevity, the benefits of tissue preservation, functional improvement, and patient satisfaction support its use as an effective clinical approach.

4. Conclusions

This case report outlines how advances in dental materials in combination with implementation of Dahl principle have allowed for a traditionally destructive treatment plan through conventional prosthodontic

pathway to be provided in a minimally invasive manner as a short-to-medium-term intervention (4,5,11,12).

Furthermore, preservation of tooth structure slows progression through the restorative cycle, improves prognosis and allows for further restorative interventions in the future.

Good consent and discussion of all available treatment options with the patient from the outset are key before embarking on the treatment journey, so that the patient is aware of maintenance needs and longevity of the restorations provided.

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Conflict of Interests

The authors have no conflict of interests to declare.

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References

1. Grippo JO, Simring M, Coleman TA. Abfraction, abrasion, bio-corrosion, and the enigma of non-carious cervical lesions: A 20-year perspective. J Esthet Restor Dent. 2012;24:10-23.
2. Shellis RP, Addy M. The interactions between attrition, abrasion and erosion in tooth wear. Monogr Oral Sci. 2014;25:32-45.
3. Murdoch-Kinch CA, McLean ME. Minimally invasive dentistry. J Am Dent Assoc. 2003;134:87-95
4. Terry D.A., Powers J.M. A predictable resin composite injection technique, Part I. Dent Today. 2014;33:98-101.
5. Terry D.A., Powers J.M., Mehta D., Babu V.A predictable resin composite injection technique, Part 2. Dent Today. 2014;33:12.
6. Jagger R. The effectiveness of occlusal splints for sleep bruxism. Evid Based Dent. 2008;9:23.
7. Bartlett D, Ganss C, Lussi A. Basic erosive wear examination (BEWE): A new scoring system for scientific and clinical needs. Clin Oral Investig. 2008;12:S65-S68.
8. Poyser N, Porter R, Briggs P, Chana H, Kelleher M. The Dahl concept: Past, present and future. Br Dent J. 2005;198:669-676.
9. Magne P, Magne M, Belser UC. Adhesive restorations, centric relation, and the Dahl principle: Minimally invasive approaches to localized anterior tooth erosion. Eur J Esthet Dent. 2007;2:260-273.
10. Hamburger JT, Opdam NJ, Bronkhorst EM, Kreulen CM, Roeters JJ, et al. Clinical performance of direct composite restorations for treatment of severe tooth wear. J Adhes Dent. 2011;13:585-593.
11. Peumans M, Geštakovski D, Mattiussi J, Karagiannopoulos K. Injection moulding technique with injectable composites: Quick fix or long-lasting solution? Dentistry [Internet]. Dentistry.co.uk. Dentistry Online; 2023.
12. Rajarajan S, Nathwani N, Nejatian T, Fine P, Leung A. Longevity of anterior composite restorations for localized tooth wear: A scoping review. Dent J (Basel). 2023;11:255.
13. Mehta S, Banerji S, Millar B, Suarez-Feito J-M. Current concepts on the management of tooth wear, Part 2: Active restorative care 1: the management of localized tooth wear. Br Dent J. 2012;212:73-82.
14. Nassar MSP, Palinkas M, Regalo SCH, Sousa LG de, Siéssere S, et al. The effect of a Lucia jig for 30 minutes on neuromuscular re-programming in normal subjects. Braz Oral Res. 2012;26:530-535.
15. Patel M, Alani A. Clinical issues in occlusion, Part II. Singapore Dental Journal (SDJ). 2015;36:2-11.
16. Calamita M, Coachman C, Sesma N, Kois J. Occlusal vertical dimension: Treatment planning decisions and management considerations. Int J Esthet Dent. 2019;14:166-181.
17. Magne P, Gallucci GO, Belser UC. Anatomic crown width/length ratios of unworn and worn maxillary teeth in white subjects. J Prosthet Dent. 2003;89:453-461.
18. Gulamali A, Hemmings K, Tredwin C, Petrie A. Survival analysis of composite Dahl restorations provided to manage localized anterior tooth wear (ten-year follow-up). Br Dent J. 2011;211:E-9.
19. Ammannato R, Ferraris F, Marchesi G. The “index technique” in worn dentition: A new and conservative approach. Int J Esthet Dent. 2015;10:68-99.
20. Rajabi H, Denny M, Karagiannopoulos K, Petridis H. Comparison of flexural strength and wear of injectable, flowable and paste composite resins. Materials (Basel). 2024;17:4749.