

Title:	Full Mouth Rehabilitation – BDS5 Student Case Report
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Authors:	Dr Malikha Khan, General Dental Practitioner, malikhakhan680@gmail.com Dr Ali Nankali, Clinical Reader in Digital Dentistry, Teaching and Innovation Centre, 4 th Floor, 3 rd Office Barts and the London Medical Institute London E1 2AD
Contact Authors	malikhakhan680@gmail.com
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Abstract

Aim and Objectives:

Complex tooth surface loss (TSL) is a challenging condition to treat. The aim of this article to discuss different treatment options and the completion of a TSL case from start to finish. This case report delineates a comprehensive treatment journey undertaken at the Royal London Dental Hospital (RLDH) under the care of a fifth-year Bachelor of Dental Surgery (BDS5) student clinic, observed over a two-month period beginning in March 2024. The treatment team comprised a student dentist, a prosthodontist tutor, and clinical laboratory staff from the Royal London Hospital (RLH). The patient, a 59-year-old male with an unremarkable medical history, exhibited a commendable level of cooperation and understanding of the educational context, acknowledging the extended duration and collaborative nature of treatment typical of a student-led clinic. This case not only highlights the successful clinical outcome but also showcases the capability of BDS5 students to deliver comprehensive dental care effectively.

Methodology:

The PubMed (MEDLINE) search engine was used to collate recent research on tooth surface loss (TSL) and the different treatment options available. The search includes English-language studies only.

Results:

After collaborating with all of the members of the team mentioned, we were able to restore the dentition of a patient with severe TSL and loss of OVD. His satisfaction with the treatment outcome was notable, and he remains under ongoing review.

Discussion:

The primary clinical challenge addressed was severe tooth surface loss, which had led to significant dental secondary issues, including the creation of undesirable spacing. Tooth surface loss is frequently encountered in clinical practice, posing particular challenges in

patient management, especially for those without regular dental care. In the context of Tower Hamlets, where this case was documented, dental service utilization is notably low among adults, and poor oral hygiene is prevalent. Statistics indicate that 77% of the adult population in Tower Hamlets suffers from gum disease, significantly higher than the 50% observed across England (Wright, 2015). Such demographic insights underscore the complexities of managing deteriorating oral vertical dimension (OVD) and the necessity for a multidisciplinary approach to treatment. This article thus serves a dual purpose: it not only documents a successful clinical intervention but also substantiates the educational expertise of advanced dental students within a real-world clinical setting.

Keywords:

Full Mouth Rehabilitation, Tooth Surface Loss (TSL), Dental Restoration, Composite Build-Up, Prosthodontics, Student Clinic, Occlusal Vertical Dimension (OVD), Periodontal Therapy, Dental Case Report, Dental Education

Full Mouth Rehabilitation – BDS5 Student Case Report

Introduction

This case report delineates a comprehensive treatment journey undertaken at the Royal London Dental Hospital (RLDH) under the care of a fifth-year Bachelor of Dental Surgery (BDS5) student clinic, observed over a two-month period beginning in March 2024. The treatment team comprised a student dentist, a prosthodontist tutor, and clinical laboratory staff from the Royal London Hospital (RLH). The patient, a 59-year-old male with an unremarkable medical history, exhibited a commendable level of cooperation and understanding of the educational context, acknowledging the extended duration and collaborative nature of treatment typical of a student-led clinic. His satisfaction with the treatment outcome was notable, and he remains under ongoing review. This case not only highlights the successful clinical outcome but also showcases the capability of BDS5 students to deliver comprehensive dental care effectively.

The primary clinical challenge addressed was severe tooth surface loss, which had led to significant dental secondary issues, including the creation of undesirable spacing. Tooth surface loss is frequently encountered in clinical practice, posing particular challenges in patient management, especially for those without regular dental care. In the context of Tower Hamlets, where this case was documented, dental service utilization is notably low among adults, and poor oral hygiene is prevalent. Statistics indicate that 77% of the adult population in Tower Hamlets suffers from gum disease, significantly higher than the 50% observed across England (Wright, 2015). Such demographic insights underscore the complexities of managing deteriorating oral vertical dimension (OVD) and the necessity for a multidisciplinary approach to treatment. This article thus serves a dual purpose: it not only documents a successful clinical intervention but also substantiates the educational expertise of advanced dental students within a real-world clinical setting.

Literature Review

With age, tooth surface loss (TSL) is normal, painless and accepted by most patients. The prevalence of TSL increases from 3% at the age of 20 years to 17% at the age of 70 years (Van't Spijker, 2009). It has also become more common amongst the population; the UK National Health System (NHS) Information Centre Commission survey in 2009 showed an increased incidence of tooth wear from 66% to 76% since the 1998 survey. Tooth wear into dentine was also found to be higher than previously in anterior teeth (Hemmings, 2018).

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Tooth wear is defined as the loss of dental hard tissue through chemical or mechanical processes that do not involve bacteria (Eccles, 1982). This encompasses several non-carious mechanisms: attrition, which is wear resulting from tooth-to-tooth contact; abrasion, caused by contact between teeth and other materials; erosion, which is the dissolution of tooth tissue by external acids; and abfraction, a pathological loss resulting from biomechanical loading forces. Each type has distinct causes and affects different areas of the teeth, as detailed in the table below.

Table 1: Common reasons for loss of tooth tissue (Curtis, 2011).

Process	Definition	Affected area	Etiology
Erosion	Loss of tooth structure caused by acids other than those produced by bacterial plaque	Anywhere, but certain patterns are common	Dietary or gastric acids
Attrition	Loss of tooth structure caused by tooth-to-tooth contact	Tooth surfaces contacting in function, usually occlusal in the posterior, or any anterior surface depending on occlusion	Natural attrition of 35µ year; bruxism in extreme example
Abrasion	Loss of tooth structure caused by rubbing by an extrinsic object	Usually cervical, but could be anywhere	Extrinsic objects such as a toothbrush or abrasive food
Abfraction	Loss of tooth structure in the cervical area	Cervical area	Erosion and toothbrush abrasion; often with occlusal stress

Key risk factors for tooth wear include dietary choices, consumption of acidic substances, parafunctional habits, and bruxism. Gender does not appear to influence the aetiology of TSL; however, males tend to present with more severe TSL (Al-Zarea, 2012). Although considered common, in some cases wear progresses quickly and subsequently becomes pathological. Pathological tooth wear is defined as a condition where the teeth become so worn that they do not function effectively and/or their appearance is significantly damaged before being lost (Sierpińska, 2015). A characteristic trait is abnormal destruction, which may require treatment and can lead to pain, discomfort, functional problems and poor aesthetics (Bartlett, 2011). Due to the multiple factors involved in tooth wear, there can be a variety of clinical appearances which can make diagnosis difficult. Pathological TSL is expected to increase as the population ages and teeth are retained for longer (Nascimento, 2016). Currently, there are no set quantitative boundaries for what would fall under pathological and physiological tooth surface loss. This complexity can make it challenging for clinicians to determine the appropriate timing for dental intervention.

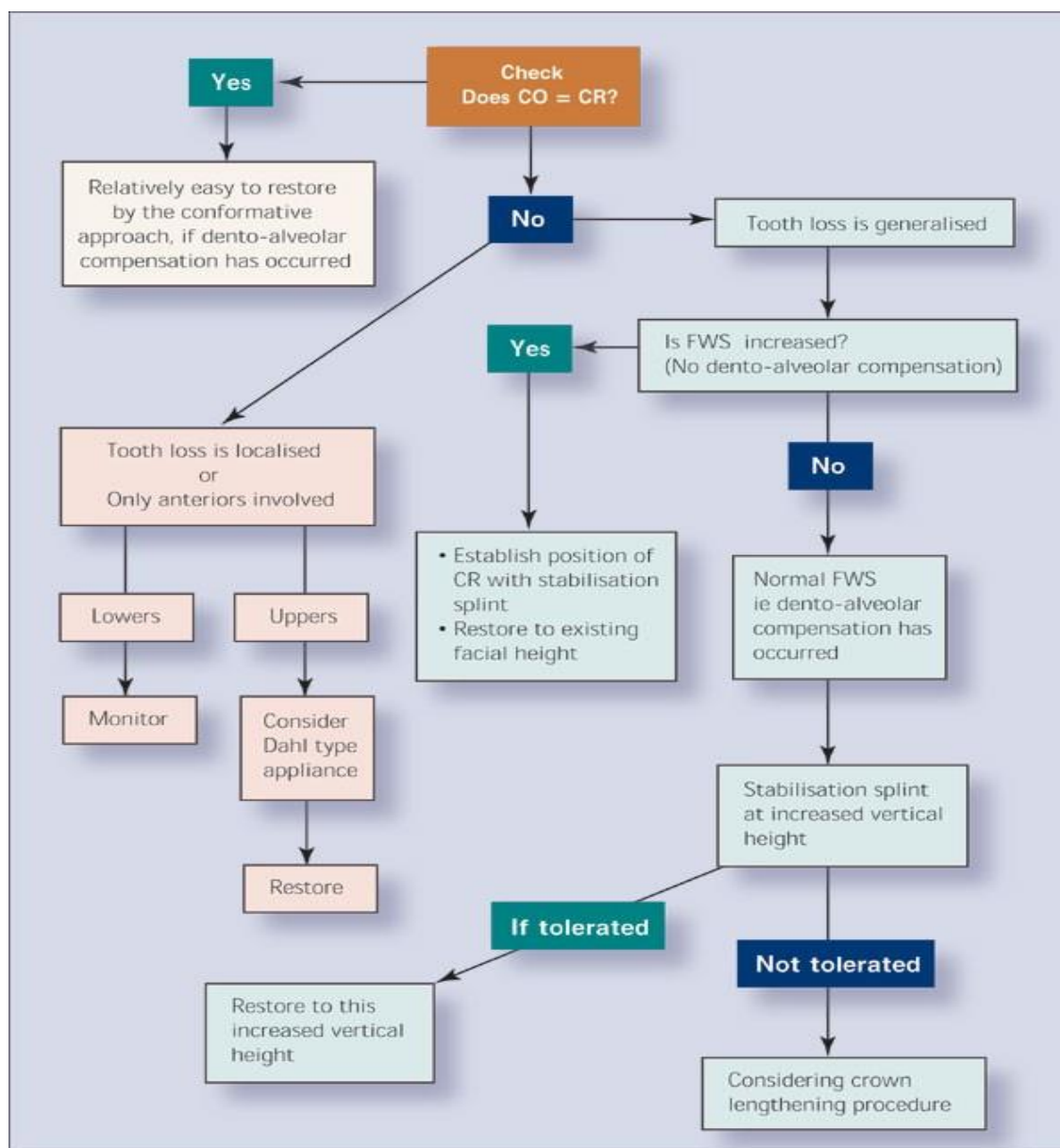
A clinical index can be used to establish the severity of wear and monitor any changes. Although many different clinical indices have been created over time, including the Basic Erosive Wear Examination (BEWE) and Tooth Wear Index (TWI), there is no universal method for recording and defining tooth wear. Tooth wear is also not routinely included in the screening process for patients unless they are already reporting functional or aesthetic concerns, in which case it is investigated. Documenting tooth wear can be difficult as a result. Alternative methods for monitoring tooth surface loss include the use of study models or dental stone casts, clinical photographs, and intra-oral scanners. Popular software options for this purpose include TRIOS Patient Monitoring (3Shape, Denmark) and OraCheck (Dentsply Sirona, UK) (O'Toole, 2023). Another more unconventional method is the scratch test. A scratch is made on the tooth surface with a scalpel blade. At review, the scratch disappearing or appearing less defined indicates that TSL has occurred (Warreth, 2020).

The management for TSL will change based on the cause, complexity, severity, patient complaint and aesthetic requirements. The underlying cause may require the patient to be referred for further investigation and involve multi-disciplinary management and liaising with general medical practitioners. An example of such a condition is gastroesophageal reflux disease (GORD) which can require medication or surgical intervention. A patient must also follow lifestyle modifications prescribed by their practitioners, such as splint wearing and dietary changes, before and after treatment to stabilise their condition and protect any future restorative treatment. It is essential the aetiology be reasonably managed by the patient first.

Treatment options will depend on the level of TSL and how reduced the occlusal vertical dimension (OVD) has become. Direct composite restorations are recommended for an OVD loss of less than 2 mm, while indirect ceramic veneers and onlays are recommended for an OVD loss of more than 2mm. Indirect ceramic restorations are suggested for the rehabilitation of an OVD loss greater than 4 mm (Al-Shahrani, 2017). The availability of space for restorations should also be assessed as most patients suffering from tooth wear will experience some level of dentoalveolar compensation and

therefore continue to maintain even occlusal contacts. One approach for patients with a lack of interocclusal space is using the confirmative approach and creating the required space by reducing the existing teeth. This comes with high risks as the teeth are already worn and reducing the axial height further may cause preparations to be unretentive for a conventional extra-coronal restoration or lead to pulpal damage/exposure. An alternative approach is to create the space by increasing the OVD, potentially restoring unaffected teeth (Poyser, 2005). In cases of generalised wear, a conventional full arch rehabilitation can be created at an increased OVD. A Dahl appliance is also an option for creating space, with the thickness matching the amount of inter-occlusal clearance required in the patient. The Dahl Concept refers to the relative axial tooth movement that is observed when a localised appliance or localised restorations are placed in supra-occlusion and the occlusion re-establishes full arch contacts over a period of time (Poyser, 2005). The patient must be informed this process can take 6-24 months to take place and, in some cases, full arch contacts are not achieved, and a different treatment will need to be attempted. A summary of the potential treatment options based on occlusal changes is presented in the image below. It is important to note that there may be variations in the actions taken by different professionals. :

Image 1: Management of a patient with pathological tooth surface loss needing treatment. Sourced from (Davies, 2002). CO: Centric Occlusion, CR: Centric Relation.



Due to the improvement in adhesive techniques and resin composite materials, they can be considered in more clinical circumstances than full coverage crowns. Conventional preparation for ceramic crowns requires tooth reduction between 40% to 70%, while more minimally invasive options like composite preserve dental structure and do not come with the risk of future de-vitalisation or require discussions of elective endodontic therapy (Blasi, 2022). Placing composite restorations for patients with tooth surface wear is a conservative option with a survival rate of more than 90% across 2.5 years (Ahmed, 2015). The Radboud Tooth Wear Project, a recent research project, also reports similar statistics with a 94.8% success and 99.3% survival rate after a period of 3.5 years (Loomans, 2018). On the other hand, it is common for lower incisor composites to shear and chip off (Davies, 2002). It is generally advised to attempt minimally invasive treatment options first, however, in cases where composites continue to fail, crowns should be considered. There are no simple, reliable options to restore lower incisors and there is no right or wrong method (Varma, 2018). Ultimately, the best treatment option will vary from patient to patient.

In conclusion, while the choice between composite restorations and full coverage crowns often depends on specific clinical conditions and patient needs, the advancements in dental materials and techniques continue to support the use of more conservative approaches. These not only preserve more of the natural tooth structure but also minimize the potential for further complications. Clinicians must, therefore, carefully assess each case to determine the most appropriate, patient-specific treatment plan, keeping in mind both the current research and the long-term welfare of the patient.

History

A thorough dental and medical history must be taken for each patient to fully understand the cause of any presenting disease and formulate a treatment plan best suited toward the individual and their lifestyle and this is not an easy task for an undergraduate student. For a patient to register for the student clinic at the Royal London Dental Hospital (RLDH), they must first complete a referral form. As part of this, they select their reason for seeking treatment and what concerns they would like to be addressed. This patient ticked 'loose teeth', 'holes in teeth' and 'difficulty eating'.



Image 2: Photograph of hard tissues. Patient has existing upper midline diastema. UR1 is Grade 3 mobile.

Upon examination, he has a moderately restored dentition and reports a history of bruxism with a previous prescription of a bilaminar splint. His oral hygiene is fair, his diet is low in sugar and not particularly abrasive. A white lesion is also present on the edentulous ridge in the UR6 area, which is currently under monitoring by the Oral Medicine department within the hospital for potential dysplasia. . The medical history is unremarkable otherwise, with the social history noting long-term heavy and regular nicotine and cannabis use. Fortunately, he quit smoking a few weeks before his first appointment. After further discussion, he expressed concern about the mobility of his front tooth, and he reported severe swelling and pain in the upper right quadrant from a posterior tooth that started a few days ago.

No TMJD or lymphadenopathy was noted, and gingivae appear healthy. There is hyperkeratosis of the UR6 area, consistent with his existing diagnosis but otherwise no mucosal lesions. The teeth present are as follows; UR1, UR2, UR3, UR4, UL1, UL3, UL4, UL5, UL7, LL1, LL2, LL3, LL4, LL5, LL6, LL7 and LR1, LR2, LR3, LR4, LR5, and LR7. Radiographs were taken as a baseline and a periapical view was taken of UL7 and UR1 to investigate the cause of symptoms and mobility. After the first appointment, the patient was diagnosed with the following: generalised periodontitis stage 4 grade C risk factor of ex-smoker, UR7 endo-perio lesion (grade 3 no root damage), UL3 secondary caries, UL2 fracture into dentine, generalised TSL BEWE score 2, distinct defect, hard tissue loss <50% of the surface area and UR1 chronic apical periodontitis.

Treatment Plan

Due to the multiple diagnoses, a treatment plan was created to start periodontal treatment and reviews alongside restorative treatment to holistically treat the patient. It can be seen in the table below:

Emergency Phase	- Extraction of UR7 – Poor prognosis, patient has no interest in restorative treatment.
Preventative Phase	- 6PPC, bleeding and plaque index – To fully investigate the stage, extent and cause of periodontal disease. - Supragingival and subgingival PMPR of sites more than 4mm PPD – Periodontal therapy. - Fluoride Varnish and oral hygiene instruction – Stabilise periodontal disease and reduce caries risk.
Rehabilitation Phase	- Replace UL3 failing restoration. - Composite build-up to restore dentition and occlusal relationship. - Immediate upper acrylic partial denture for UR67 replacement, UR1 to be added after XLA.
Maintenance and Monitoring	Once treatment is complete: - 6-month recall interval. - 12-month radiographic interval.

The aims of treatment were as follows:

1. Stabilising periodontal disease.
2. Restoring failed restorations (UL3).
3. Restoring TSL,
4. Restoring occlusion with its protection for future.
5. Protect the final build-up with a splint.
6. Replace missing teeth, UR67 and UR1 following extraction.
7. Monitor dysplasia (Oral Medicine appointments booked concurrently).
8. Encourage smoking cessation and support the patient.

This report documents the rehabilitation phase and the relevant treatment carried out.

Composite Build Up

To create a stable and physiological dentition to start treatment on, all stages of periodontal therapy were carried out according to BSP guidelines and the patient was confirmed to be engaging. After this,

the plan for a composite build-up was started. Initially, a Willis gauge was used to measure the patient's occlusal vertical dimension (OVD), vertical dimension at rest (VDR) and Freeway Space (VDR – OVD) available to decide an appropriate restorative modality, assess the level of wear and dento-alveolar compensation. The OVD was measured to be 51mm and the VDR was measured to be 57mm.

The 'Freeway Space' is described as the space between the maxillary and mandibular occlusal surfaces when the mandible is in the rest position, and should be 2–4 mm. Therefore, the patient should have an OVD of at least 53mm and the OVD was planned to be increased by 2mm. Too much Freeway space can lead to deep creasing at the corner of the mouth (both sides usually) and poor appearance of the tooth. Both of these complaints were present in this case and the patient reported that his teeth cannot be seen at rest or when he is speaking.

As part of the next stage, a diagnostic wax-up was created to plan the build-up existing teeth and final aesthetics of each tooth pre-appointment. These casts were then duplicated using the agar technique to create an immediate denture matching the new OVD as well as a bilaminar splint to protect the final build-up. Another copy of the splint was requested to be used as an injectable mould to use during treatment. The injectable composite resin technique is a method that uses a transparent index for accurate and predictable translation of a diagnostic wax-up into composite restorations without the need for tooth preparation (Geštakovski, 2019). Once the lab work was completed, the patient was booked into the next available appointment.

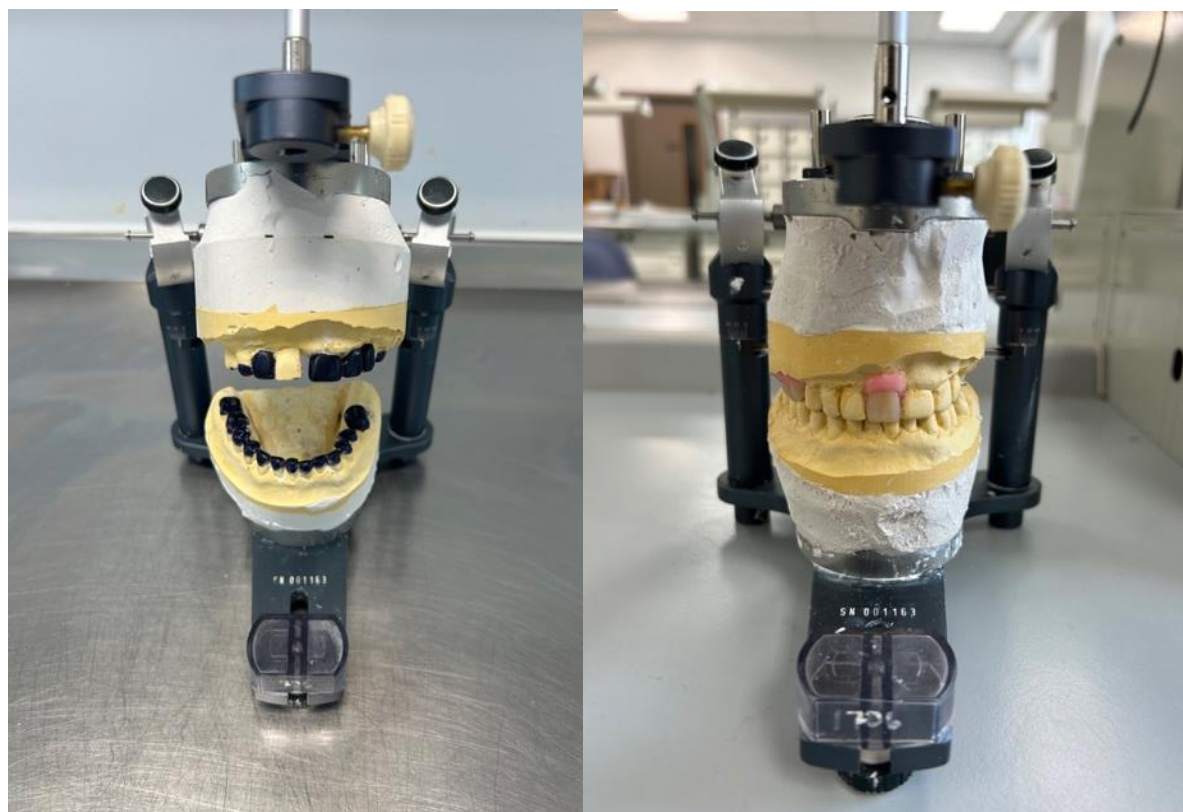


Image 3: The image on the left shows the diagnostic wax up. This was then duplicated to create the image on the right with the new immediate denture in wax.

At this stage, the injection mould and immediate denture had been created. Treatment was carried out in stages as follows:

1. Teeth cleaned and dried.
2. Isolation of individual teeth achieved with cotton wool rolls in the buccal sulcus and lingual surfaces. The patient had a tongue thrust and this was managed by the assistant using a dental mirror.
3. PTFE tape was disinfected and used for teeth isolations.
4. The injection mould was initially sectioned into three pieces (two posterior and one anterior) and then seated. A small hole was created in the highest accessible point on occlusal surface of teeth and in the incisal edge for the anterior teeth with a flame-shaped bur.
5. Shade A4 flowable composite selected, closest match. The tip of the cartridge was inserted into the mould and slowly injected.
6. Composite set for 10 seconds with the injection mould seated and 20 seconds with the mould removed.
7. Insulations and excess materials were removed on each step.
8. Restorations shaped with coarse Soflex discs and finished with polishing spirals under water spray condition.



Image 4: Anterior mandibular teeth built up with composite. Contact of LL1 re-established at one appointment before polishing.



Image 5: Final outcome. Occlusion checked for even contacts with articulating paper.

The general shape of the maxillary and mandibular teeth was achieved at the first appointment as well as the extraction of UR1. Unfortunately, the immediate denture did not fit, and so impressions were retaken at the next appointment. This was due to the shrinkage of the cast. After impressions, the anatomy and colour of each individual tooth were established, and the immediate denture was fitted. The patient was very happy with the final result.

Conclusion

Typically, a complex case like this would be referred to either the post-graduate clinic in RLDH or sent back to a GDP to manage. However, with the right support from staff and thorough treatment planning as well as commitment from the student, difficult restorative cases can be treated. Managing this patient in a student clinic posed a lot of challenges. Injection moulds are not commonly used by undergraduate students and are complex to use due to issues achieving moisture control. It can also be difficult to prevent excess composite from setting on adjacent teeth. Due to multiple duplications of the initial impressions, there was some shrinkage of materials, resulting in a poorly fitting and unstable immediate denture. Fortunately, this patient has a low lip line and was very understanding

about external lab complications. He was able to tolerate a missing central incisor for a week and a half between appointments. A new denture was made in-house as quickly as possible. Complex wear cases can be difficult to manage, especially in a student clinic with limited appointment times and varying clinical approaches. A definitive treatment plan can be difficult to decide as there are always different ways to view things. Visual aids such as wax-ups proved to be successful in this case for visualising the patient's occlusion and creating a final outcome to aim for. With support from tutors and clinical staff, a holistic and aesthetic outcome can be achieved.

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Abbreviations:

Abbreviation	Description
<u>BDS5</u>	<u>Fifth-year Bachelor of Dental Surgery</u>
<u>BEWE</u>	<u>Basic Erosive Wear Examination</u>
<u>CO</u>	<u>Centric Occlusion</u>
<u>CR</u>	<u>Centric Relation</u>
<u>GORD</u>	<u>Gastroesophageal Reflux Disease</u>
<u>NHS</u>	<u>National Health System</u>
<u>OVD</u>	<u>Occlusal Vertical Dimension</u>
<u>PTFE</u>	<u>Polytetrafluoroethylene</u>
<u>RLDH</u>	<u>Royal London Dental Hospital</u>
<u>RLH</u>	<u>Royal London Hospital</u>
<u>TSL</u>	<u>Tooth Surface Loss</u>
<u>TWI</u>	<u>Tooth Wear Index</u>
<u>VDR</u>	<u>Vertical Dimension at Rest</u>