Eur. J. Prosthodont. Rest. Dent., Vol.17, No. 4, pp 170-176
Printed in Great Britain

doi:10.1922/EJPRD_839Al-Salehi07

Restoring Function and Aesthetics in a Patient Previously Treated for Amelogenesis Imperfecta

Samira K Al-Salehi*, Kevin Dooley† and Ian R Harris‡

Abstract - *A 26-year-old male patient presented with generalised gingival recession related to the margins of crowns fitted between the ages of 12 and 15 years. The patient, previously treated for Amelogenesis Imperfecta, suffered a mandibular fracture at the age of 22 years. He had an anterior open bite and in the retruded contact position the 28 and 38 were the only teeth in contact. This case demonstrates the management of compromised fixed prosthodontic care following further growth and trauma. On completion of treatment a good functional and aesthetic result was achieved.*

KEY WORDS: amelogenesis imperfecta, anterior open bite, split cast technique

INTRODUCTION

Amelogenesis imperfecta (AI) is a group of developmental conditions, genomic in origin, that disrupt at least one of the stages of enamel formation[1]. The prevalence of AI ranges from a low value of 1 in 14,000 to a higher value of 1:700 depending on population studies and diagnostic criteria[2, 3]. AI can be classified as hypoplastic (thin and pitted enamel), hypocalcified (enamel easily removable from the underlying dentine) or hypomature (enamel is harder than hypocalcified form with a mottled opaque white to yellow/brown or red/brown colour)[4]. Other anomalies associated with AI include disturbances in eruption[5], congenitally missing teeth[6] and anterior open bite[7].

The treatment of patients with AI is complex often requiring a multidisciplinary team approach involving specialists in Paediatric Dentistry, Orthodontics, Maxillofacial Surgery and Restorative Dentistry[4]. Problems associated with oral function and discomfort require early intervention including preventative and restorative care throughout childhood to early adulthood[8, 9]. AI has also been shown to be associated with marked psychological effects, suggesting that dental treatment could be medically necessary with implications for the patient's overall health[10,11].

In recent years, a number of reports have been published on the management and rehabilitation of AI patients[4, 12-15]. Treatment ranged from preventative to fixed prosthodontic intervention. New techniques and advances in micromechanical adhesion have enabled less invasive, more conservative treatment options[16-19]. The use of direct and indirect resin composite restorations for the treatment of AI in children and adolescents is often a preferred option. Such patients may undergo more extensive treatment, involving indirect restorations, in adulthood[4, 15].

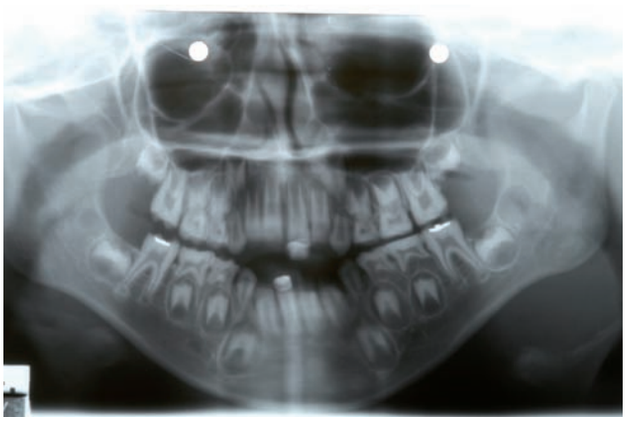
* BDS, PhD, DGDP, FDS (Rest.Dent) RCPS
† B Tech (Dental Technology)
‡ BDS, MSc, FDS (Rest. Dent.) FDS RCS

The case presented here deals with a second full mouth rehabilitation for a 26 year old male patient diagnosed with AI. He was originally provided with multiple crowns between the ages of 12-15 years. Although the original diagnosis of AI could be considered as incidental in relation to the need to repeat the rehabilitation, it is however, important to understand why the patient received multiple crowns in his teenage years and also in relation to his anterior open bite and its possible association with AI.

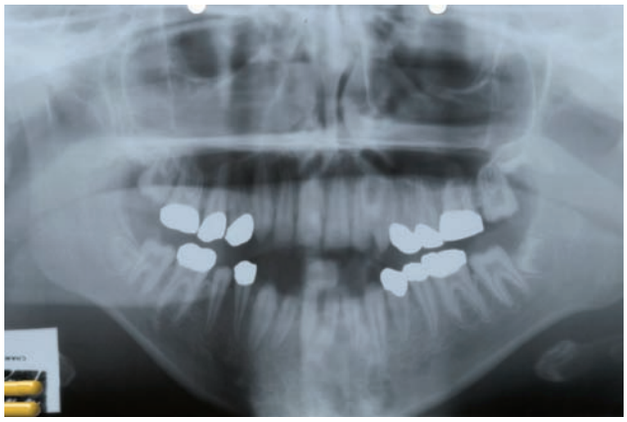
CLINICAL REPORT

A 26-year-old male patient, complaining of loss of masticatory function and generalised hyper-sensitivity of the restored teeth to cold stimuli, was referred to the Restorative Department at a dental teaching hospital. The patient had undergone orthodontic and restorative treatment between the ages of 10-15 years in the Orthodontic and Paediatric Dentistry Departments following diagnosis of AI. Areas of hypo-mineralised enamel and conical shaped anterior teeth can be seen on the panoramic radiographs at the ages of 8 and 13 years (Figures 1a and b). Additionally, he sustained a fractured mandible and maxilla at the age of 22; an added complication.

On presentation, full arch maxillary (Figure 2a) and mandibular (Figure 2b) photographs were taken. Clinical examination revealed generalised gingival recession with exposed root dentine beyond the restoration margins on many teeth and enamel defects affecting 37 and 47. The 32 was developmentally missing and 18, 48 were partially erupted. The patient's periodontal tissues were generally healthy. There were no probing depths in excess of 3 mm but limited amounts of gingival inflammation related to the lower anterior teeth due to minor plaque and calculus build up around the lower anterior porcelain veneers. Full mouth periapical radiographss (not shown here) failed to reveal any carious lesions and demonstrated normal bone support around all the teeth. There was no tenderness or crepitus related to either temporomandibular joint. The patient exhibited an anterior open bite and minor facial asymmetry. The initial tooth contacts in the Retruded



a. 8 years of age



b. 13 years of age

Figure 1. *Panoramic radiographs*

a. Maxillary arch: pre-operative

b. Mandibular arch: pre-operative

Figure 2.

Figure 3. *Mounted casts in RCP*

Figure 4. *Mounted casts following occlusal cast analysis*

Figure 5. *Occlusal views of maxillary and mandibular casts showing occlusal adjustment plan*

Contact Position (RCP) were between 28, 38 (Figure 3). A staged treatment plan over a 12-month period was undertaken which featured two distinct phases.

Phase 1: Occlusal Analysis

A detailed analysis of the patient's occlusion was carried out before operative treatment commenced. Preoperative impressions of both arches were made using an irreversible hydrocolloid material. Pre-contact jaw registration was recorded on the retruded arc of closure using Moyco extra-hard beauty wax reinforced with aluminium foil. Two sets of study casts were made; one set was kept as a baseline record and a duplicate set was used to carry out occlusal analysis and to plan occlusal adjustment. The aim of the occlusal adjustment plan was to make the intercuspal position (ICP) and RCP coincident. The adjustments were carried out on the casts before transferring the adjustments to the mouth. The 28 and 38 were removed from the casts as these teeth were the only initial contacts in RCP. All remaining occlusal surfaces were coloured with waterproof paint. The contacts in RCP and lateral excursions were marked and the interferences removed[20]. Canine contact was achieved on both sides in RCP (Figure 4). The coloured casts, with the removed interferences marked, served as the occlusal adjustment plan (Figure 5). Based on the above analysis, the 28 and 38 were extracted. Further occlusal adjustment was carried out in the mouth (Figure 6), replicating the occlusal adjustment plan (Figures 4 and 5) achieved on the duplicate study casts. Subsequently, maxillary and mandibular full arch impressions were made in irreversible hydrocolloid material and stone casts were made in the laboratory. Two separate recordings of the pre-contact retruded jaw relation were made using Moyco extra-hard beauty wax reinforced with aluminium foil and a facebow transfer was made. The casts were mounted on a semi-adjustable articulator using one of the wax wafers. The split cast method was used to check the accuracy of the mounting and to compare the pre-contact records[20,21]. The split cast method is a simple and quick technique which verified that the jaw relation was reproducible (Figure 7). The newly mounted maxillary and mandibular study casts were also compared with the

Figure 6. *Occlusal adjustments completed in the mouth, following extractions of 28 and 38*

Figure 7. *Split cast technique showing that registration 1 (left) and registration 2 (right) are identical*

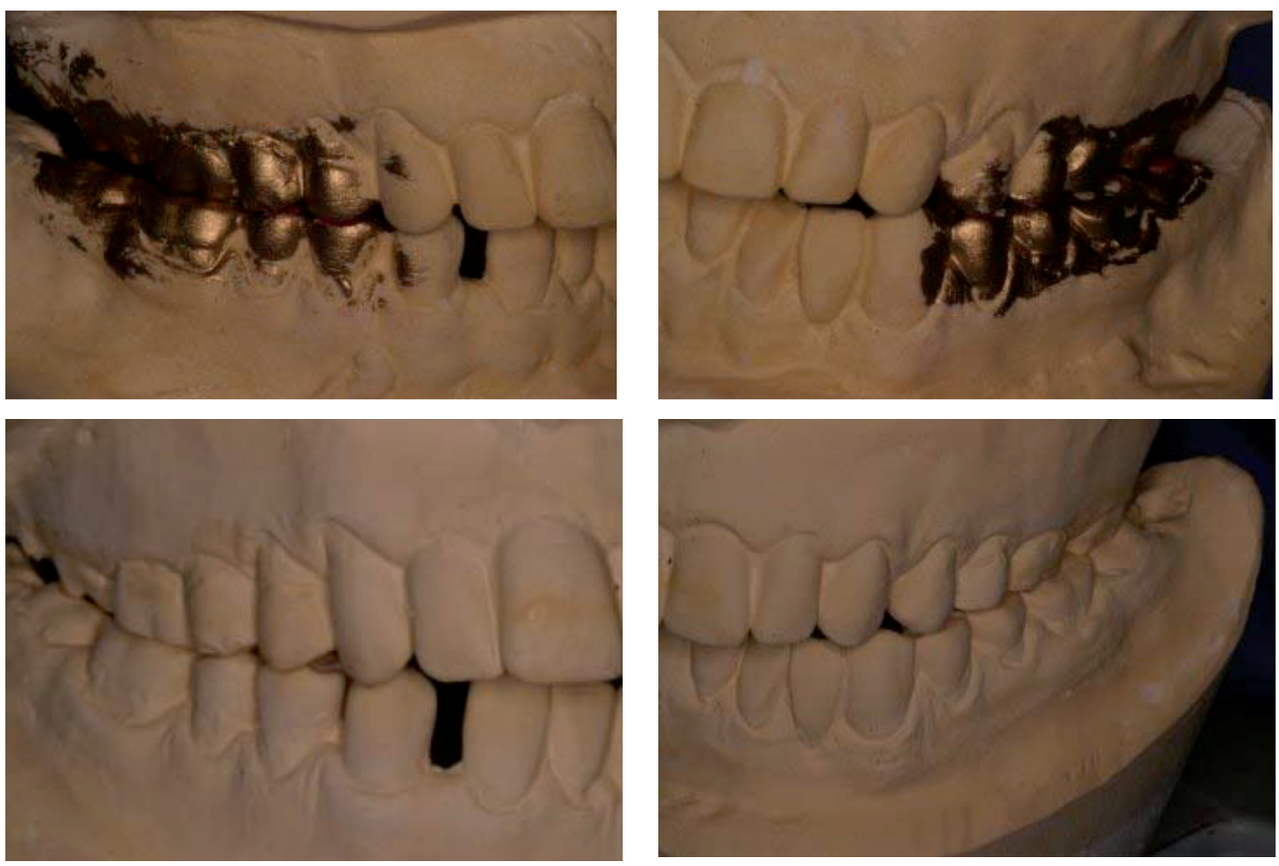


Figure 8. *Comparison of the predicted occlusal scheme (top) with that achieved in the mouth (bottom)*

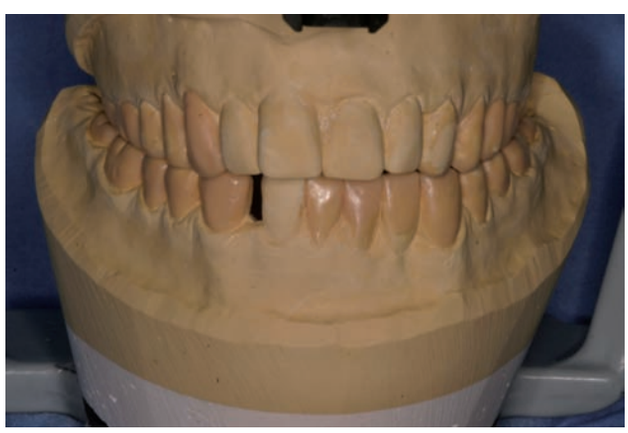


Figure 9. *Diagnostic wax-up*

Figure 10. *Laboratory provisional crowns: 23, 24, 25, 26, 36, 35, 34 and bridge (32 pontic/33 retainer). Silicone indices in place showing control of the occlusion*

original casts on which the occlusal adjustment had been made, demonstrating that the planned outcome had been achieved (Figure 8). In order to control the occlusion, indices were fabricated on the maxillary and mandibular stone casts set in RCP using silicone putty. A diagnostic wax-up was made on a duplicate set of articulated models (Figure 9). Vacuum formed matrices, for use in fabrication of chair side provisional restorations, were also made using duplicates of the wax-up.

Phase 2: Restorative Treatment

During the operative phase of treatment, it was important to retain control of the occlusion at all stages. This was achieved by the use of the silicone putty indices and a staged replacement of the previous restorations.

The 23, 24, 25, 26, 36, 35, 34 crowns and 33/32 metal ceramic bridge were first removed, the preparations refined and chair side provisional restorations fabricated using the vacuum formed matrices. Impressions were made using an addition cured silicone impression material in custom-made, light-cured trays. Subsequently, laboratory made provisional restorations were fitted (Figure 10). This Figure also shows the silicone putty indices, used to control the occlusion. Next the 13, 14, 15, 43, 44, 45 crowns were removed and replaced with laboratory made provisional restorations as before (Figure 11). The 16 and 46 full gold crowns were left in place at this stage to act as occlusal holding contacts (Figure 12). The posterior occlusion was now established. Subsequent treatment was carried out in stages, as for conventional crown and bridgework. An aesthetic try-in of the anterior ceramic restorations was carried out (Figure 13) and minor changes were made prior to completing the porcelain firing and final glazing. The 17 and 27 were not restored as the patient was not experiencing sensitivity from these teeth. There was sufficient enamel present on the 17 and 27, making them durable.

The final occlusal and aesthetic outcome corresponded exactly with the original wax-up produced during the planning stage. ICP was coincident with RCP. Canine guidance was achieved on right lateral excursion and group function on left lateral excursion (Figure 14 a and b). At a three-year review appointment (Figure 15), the patient was completely satisfied with both appearance and function.

DISCUSSION

Patients with AI can present complex and challenging dental abnormalities. As well as disruption in enamel formation, they often have underlying skeletal abnormalities (e.g. anterior open bite in about 43% of cases[22]) and congenitally missing permanent teeth. Management of such patients requires a multidisciplinary approach and the treatment, from childhood to adulthood, is best carried out within a dental hospital/ specialist unit. The restorative care for such patients must take into account the stage of dental development, periodontal condition, maxillary and mandibular growth and the development of the patient. The importance of early planning, treatment and multidisciplinary care for patients with severe AI is crucial to the successful outcome of such cases[23].

In the present case, this patient's unusual occlusion may be attributed to continued dento-alveolar growth and eruption of second and third molars after the original crowns were fitted. Instead of the indirect restorations, which had been provided in his teenage years, direct composite restorations would now be a preferred option. Direct composite restorations offer a more conservative approach and can be easily modified during dento-alveolar development, but do need regular monitoring. This is particularly relevant as major advances in adhesive dentistry, have been made in recent years.[16, 18,19] The use of adhesive restorations in

Figure 11. *Laboratory provisional crowns: 13, 14, 15, 23, 24, 25, 36, 35, 34, bridge (32 pontic/33 retainer), 43, 44, 45*

Figure 12. *Posterior occlusion established with laboratory made provisionals and original 16-46 gold crowns in place acting as "occlusal holding stops"*

Figure 13. *Try-in of anterior ceramic crowns at the bisque bake stage*

a. Canine guidance in right lateral excursion

b. Group function in left lateral excursion

Figure 14. *Final restorations*

Figure 15. *Final restorations at the patient's three year review appointment*

children and adolescents diagnosed with AI is strongly recommended in order to try and prevent a lifetime commitment and maintenance of extensive restorative work. Ideally, definitive fixed prosthodontic treatment should be carefully planned and provided, if necessary, in adulthood for the AI group of patients.

A repaired mandibular fracture at the age of 22 may have been a further contributory factor. Retaining occlusal control was critical to the success of this case. A number of measures were taken to ensure that the final occlusal scheme coincided exactly with the planned scheme. The importance of care taken and time spent on the diagnostic and planning phases of advanced fixed prosthodontic work cannot be overemphasised.

A number of different methods for recording retruded jaw relations have been described in the literature[24-26]. The method used in this case was bilateral manipulation of the mandible. Two preformed wax wafers reinforced with aluminium foil were used for recording the pre-contact retruded jaw relation. In cases where the accuracy of the record may be in doubt, a split cast technique can be used to verify the registration[21].

An accurate diagnostic wax-up and provisional restorations provide a further opportunity for assessment of the occlusion and aesthetic requirements[27]. The diagnostic wax-up illustrated that, in order to achieve a canine protected occlusion in left lateral excursions, long canines would be required which would not harmonise with the patient's smile line. Therefore, a canine protected occlusion was provided in right lateral excursion and group function in left lateral excursion[28].

This case required close liaison with a skilled dental technician at all the clinical and laboratory stages. Therefore, in addition to clinical skill, a high degree of technical skill and support is also a prerequisite when dealing with complex restorative cases[27].

MANUFACTURER'S DETAILS

- Bayer Alginate, Bayer Dental, Henry Schein INC, Melville, USA.
- Moyco extra-hard beauty wax, Thompson Dental Manufacturing Company Inc., Missoula, MT, USA.
- Die spacer, Dentifax, Buffalo, NY, USA.
- Silicone putty indices, Sheraexact 85, Shera, Espohlstrasse, Germany.
- Protemp 3 Garant, 3M ESPE, Dental Products, Seefeld, Germany.
- Addition cured silicone impression , Extrude, Kerr Corporation, Romulus, MI, USA.
- Laboratory made provisional restorations, VitaVM Lc, Bad Sackingen, Germany.

ADDRESS FOR CORRESPONDENCE

Dr. Samira K Al-Salehi, School of Dentistry, The University of Manchester, Manchester, M15 6FH, U.K.
E-mail: samira.al-salehi@manchester.ac.uk

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