Case Report

ANNALS OF DENTISTRY
UNIVERSITY OF MALAYA
www.adum.edu.my

Ann Dent UM 2024, 31: 9-12
DoI: 10.22452/adum.vol31no2

A Fractured Maxillary Canine Restored with a Full Ceramic Crown and Class III Malocclusion

Raja Azman Raja Awang[1], Zohiruddin Adnan[1], Noor Huda Ismail[1]

KEYWORDS

Full ceramic crown, malocclusions, maxillary canine

ABSTRACT

A perfect smile always relates to well-aligned teeth. Factors such as fracture, malocclusion, and tooth migration challenge a clinician to restore a patient's appearance and functionality. This case report presented a 32-year-old Malay male patient concerns on his appearance because of a fractured maxillary canine due to motor vehicle accident. There has been no restoration on the tooth since three years ago. After obtaining the patient's agreement, a full ceramic crown was constructed despite being complicated by Class III malocclusion. It is challenging to improve aesthetics and longevity for this patient with a midline shift and diastema of the lower arch, anterior cross bite of tooth 12, and an open bite between teeth 14 and 44. After discussion, the patient agreed and decided on a full ceramic crown of tooth 23 despite being challenged to achieve an ideal occlusion. The patient was satisfied with the crown's quality and aesthetic.

INTRODUCTION

Aesthetic dentistry is a study of beauty concentrating on the smile and providing patient with a pleasuring appearance [1,2]. A successful prosthodontic restoration would give the patient a well-functioning prosthesis with an attractive smile. A Traumatic Dental Injury (TDI) commonly affecting the anterior tooth has disadvantages and psychological consequences, influencing social interaction in how individuals are seen and perceived [3,4]. Moreover, it is limited to manage patient with TDI with a proper guideline during the Covid-19 pandemic because of movement control orders [5]. As a result, a delay in follow up and the final restoration occurred. In addition, associated factors contribute to the postponement of appropriate dental treatment, such as lack of dental health education, socioeconomic status, and awareness of early intervention treatment. For instance, malocclusion conditions affect the aesthetics and other functions such as chewing sufficiently. In Malaysia, a higher case of crowding teeth among young Malay adults was reported in a previous study [6]. Furthermore, multiple malocclusion increases the time to access all teeth surfaces to optimize cleaning. Besides, malocclusions and other dental disorders cause self-esteem reduction, particularly in adolescents [4]. This paper concentrated on the fabrication of a full ceramic crown of maxillary canine with even circumferential thickness. The malocclusion made it challenging to achieve the ideal occlusion after crowning the patient's maxillary canine.

[1]School of Dental Sciences, Hospital Universiti Sains Malaysia, Kubang Kerian, 16150 Kota Bharu, Kelantan, Malaysia
*Corresponding author e-mail: noorhuda@usm.my

CASE REPORT

A 32-year-old Malay male came to dental clinic and requested crown construction for tooth 23. The patient was concerned over the aesthetic of a fractured crown from an alleged motor vehicle accident three years ago. There were no other complaints and no treatment was done to the tooth. The patient's oral hygiene was good. The patient was an active smoker, smoking five cigarettes daily for over ten years ago. Other than that, the patient has no any medical illness.

Upon examination, patient's occlusion was complicated by Class III incisor relationship, Class II half unit canine relationship on right side, midline

shift and diastema of the lower arch, anterior cross bite of tooth 12, and an open bite between teeth 14 and 44, as shown in Figure 1 a). There was no patient's photograph to refer to confirm the original occlusion for canine relationship on the left side. In addition, there was a lack of lateral guidance because of the fractured crown tooth 23. During the right excursion, the second maxillary and mandibular molar teeth showed contact on the non-working side. The periapical radiograph presented horizontal coronal radiolucency approximating pulp chamber, indicating uncomplicated crown fracture, with normal lamina dura, periodontal ligament space and absence of periapical lesion as shown in Figure 1 b).

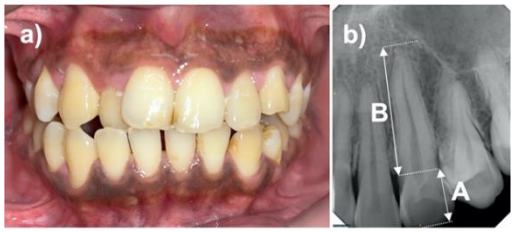

Figure 1 Patient in occlusion: a) labial view of tooth 23; and b) periapical radiograph tooth 23 and the landmarks A – crown height and B – root length used for assessment of the crown-root ratio

Treatment started with scaling and polishing, then composite resin restoration tooth 34. Shade was selected using VITA Classical shade guide before tooth preparation. Shade A3.5 and A3 was chosen for the gingival third and labial face, and the incisal edge, respectively. Figure 2 shows the initial tooth preparation was 1.5mm on the incisal edge with a 1.0mm rounded shoulder margin on both labial and palatal surfaces.

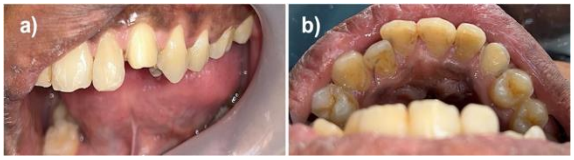

Figure 2 Initial tooth preparation of 23: a) labial view; and b) palatal view

Tooth 23 was prepared using flat-end tapered diamond for incisal and axial wall preparations. Finishing was then done using flat-end tungsten carbide bur. Figure 3 a) shows that composite build-up was done to increase the crown length of the prepared tooth. Composite shade A3 was built up on the incisal edge. Polishing composite was done by tungsten carbide and white stone bur. Using the double cord technique sizes 0 and 00 were placed to visualise the tooth margin, as shown in Figure 3 b). Then, an impression was made using a polyvinyl silicon light body on the tooth margin and a regular body on the special tray.

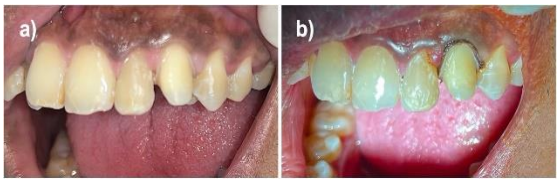

Figure 3 Tooth preparation: a) after composite build-up; and b) double cord retraction technique

A temporary crown was done using Protemp™ Plus and cemented using eugenol free temporary cement (Freegenol, GC, German). Fabrication of full ceramic crown (IPS e.max, Liechtenstein) done and issued after two weeks. The tooth 23 was isolated completely with cotton wool rolls, aspiration, and a saliva ejector to control moisture before and during cementation. The tooth was acid etched and bond for 20 seconds using a universal adhesive (Scotchbond, 3M ESPE, USA). The crown was cemented with Rely-X U200 (3M ESPE, USA). The patient was reviewed after one week, as shown in Figure 4 b) compared to pre-operative treatment in Figure 4 a). Upon examination, the gum surrounding tooth 23 is healthy. According to the patient, the biting and chewing are just fine. The patient was satisfied with the quality and aesthetic of the tooth. The after-six-month appointment was also given to the patient. However, the patient did not attend the visit and was informed that the crown is still in good condition.

Figure 4 a) Pre-operative photograph; and b) A week E-max crown post-cementation of tooth 23

DISCUSSION

Upper canines are essential in determining facial type while contributing to attractiveness [7]. A few issues must be considered, such as age, patient complaints, and patient history, which are critical to treatment success while improving quality of life. The treatment selection is also weighed based on the patient's assessment, risks and benefits, personal preference, cost, and practitioner's experience [8]. Anterior teeth are a crucial aesthetic region contributing to a perfect smile and patient's satisfaction. All ceramic crown has

become popular and available with advanced materials such as zirconia and lithium disilicate glass-ceramics [9]. Full coverage crown is commonly indicated for endodontically treated teeth, extensive caries, fractured and for abutment teeth of conventional bridge. Treating a broken and carious tooth could protect the remaining tooth structure, thus increasing the longevity and optimizing the patient's oral health [8]. A fractured tooth or traumatic dental injury commonly occurs because of an accident or sports injury; the majority are minor injuries [10]. A definitive treatment for the fractured crown is restoration with accepted restorative materials. In this case, the tooth sustained an uncomplicated crown fracture. Hence, a full ceramic crown was selected. Further tooth preparation would risk the tooth integrity for extensive tooth structure loss [11]. Consequently, this condition increases the risk of other tooth fractures and debonding restoration, particularly direct composite restoration. Other than that, composite restoration can also be prone to colour changes over time and replaced more often than full ceramic crown.

The affected tooth was a maxillary canine, and meticulous shade matching should be ensured, providing a symmetrical and matching aesthetic with the contralateral canine. Despite composite restoration being one of treatment options, a full ceramic crown selection was mainly due to the aesthetic requirement and concern expressed by the patient. After considering its strength and durability, the patient's preferred option is an E-max crown made from a single block of lithium disilicate. Lithium disilicate crown provides a superior aesthetic and conservative tooth preparation [9]. As reported, lithium disilicate was the most preferred choice for the anterior crown (54%), followed by zirconia (17%) and leucite-reinforced glass ceramic (13%) [12]. Compared to zirconia, lithium disilicate can be used in the anterior region without adding a layer of veneering porcelain, thus reducing risk of porcelain chipping.

While managing this case, the first challenge is the short clinical crown height due to a fractured tooth secondary to a motor vehicle accident [13]. This condition resulted in temporary crown dislodgement being brought into static and dynamic occlusion. Besides, there is an association between dynamic occlusion and static occlusion [14]. A composite build-up was done to increase the clinical crown, achieving a minimum height of at least 4mm. Other than the short clinical crown, the possible cause of the dislodgement also includes excessive tooth contact on dynamic occlusion, requiring temporary crown adjustment to achieve an ideal occlusion [14,15]. For this case report, the canine relationship on the right side has caused difficulty in preventing the posterior teeth from contacting. Because of this reason, group function was approached to manage the ideal occlusion for tooth 23, which is also in agreement with a previous literature review [15]. In group function, the tooth 23 was designed shorter and slightly overjet, and posterior teeth contact together anterior teeth during the lateral excursion. The group function occlusion also helps to chew efficiently during lateral movement because of the increased number of tooth contacts.

The next challenge faced was during cementation, when excess cement was not correctly removed, causing it to set and retain on the restoration margin. Most resin cements are available as dual cure cement. The chemical cure of the dual-cure resin cement is sufficient to allow polymerization under the thickness of zirconia and other ceramic restorations [16]. However, the downside is that it reduces the working time of the cement, hence predisposing to cementation error and compromising cementation procedure [17]. Therefore, excessive cement was removed after tack cure and before complete cure.

CONCLUSION

Aesthetic restoration of a fractured maxillary canine and Class III malocclusion is essential in ensuring the patient's satisfaction with the treatment outcome. E-max crown and composite restoration are two main options. However, some pros and cons also depend on the patient's preference. The selection of proper materials and techniques is paramount in achieving the aim and expectation set by the patient and clinician.

ACKNOWLEDGEMENT

The authors thank the staff at School of Dental Sciences, Universiti Sains Malaysia (USM) Health Campus for their cooperation and laboratory support.

DECLARATION OF INTEREST

The authors declare that there are no conflicts of interest.

REFERENCES

1. Ahmad I. An introduction to aesthetic dentistry. Br Dent J Team. 2021;8(5):26–32.
2. Marius N, Ioan B, Neagu M, Hanganu B, Iorga M. Ethical challenges in aesthetic dentistry. Int J Med Dent. 2015;5(4):246–8.
3. Meyfarth S, da Silva CM, Antunes LS, Antunes LAA. Aesthetic-functional reconstruction of dental fracture and its impact on the psychosocial aspect. Int J Burns Trauma. 2021;11(4):328–36.
4. Kaur P, Singh S, Mathur A, Makkar DK, Aggarwal VP, Batra M,Anshika Sharma, Nikita Goyal. Impact of dental disorders and its influence on self esteem levels among adolescents. J Clin Diagnostic Res. 2017;11(4):ZC05–ZC08.
5. Bariah Chi Adam K, Hassan H, Kumar Subramaniam P, Nabilah Ismail I, Adilah Harun N, Shaban Mustafa N. Perspective Chapter: Early Management of Dental Trauma in the Era of COVID-19. In: Moolla A, Gehrke SA, editors. Dental Trauma and Adverse Oral Conditions - Practise and Management Technique. United Kingdom: IntechOPen; 2023.
6. Elfseyie M, Abu Hassan MI, Al-Jaf NMA. Prevalence of malocclusion and occlusal traits of Malay adults (18-23 years) in Shah Alam, Malaysia. Int J Dent Res. 2020;5(2):81–5.
7. Acar YB, Abuhan E, Boyaciyan R, Özdemir F. Influence of facial type on attractiveness of vertical canine position from the perspective of orthodontists and laypeople. Angle Orthod. 2022;92(2):233–239
8. McCracken MS, Louis DR, Litaker MS, Minyé HM, Mungia R, Gordan V V, DG Marshall, Gregg HG. Treatment recommendations for single-unit crowns: Findings from The National Dental Practice-Based Research Network. J Am Dent Assoc. 2016;147(11):882–90.9.
9. Willard A, Gabriel Chu TM. The science and application of IPS e.Max dental ceramic. Kaohsiung J Med Sci. 2018;34(4):238–42.
10. Warren M, Widmer R, Arora M, Hibbert S. After hours presentation of traumatic dental injuries to a major paediatric teaching hospital. Aust Dent J. 2014;59(2):172–9.
11. Bourguignon C, Cohenca N, Lauridsen E, Flores MT, O'Connell AC, Day PF,Georgios T, Paul VA, Ashraf F Fouad,Lamar Hicks, JO Andreasen, Zafer CC, Stephen H, Bill Kahler, Adeleke Oginni,Marc Semper,Liran Levin. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations. Vol. 36, Dental Traumatology. 2020. p. 314–30.
12. Makhija SK, Lawson NC, Gilbert GH, Litaker MS, McClelland JA, Louis DR, Valeria VG, Daniel JP,Cyril M, Rahma Mungia, Michael SM. Dentist material selection for single-unit crowns: Findings from the National Dental Practice-Based Research Network. J Dent. 2016;55:40–7.
13. Sharma A, Rahul GR, Poduval ST, Shetty K, Gupta B. Short clinical crowns (SCC) - Treatment considerations and techniques. J Clin Exp Dent. 2012;4(4):230–6.
14. Al-Nimri KS, Bataineh AB, Abo-Farha S. Functional occlusal patterns and their relationship to static occlusion. Angle Orthod. 2010;80(1):65–71.
15. Miralles R. Canine-guide Occlusion and Group Function Occlusion are Equally Acceptable When Restoring the Dentition. J Evid.-Based Dent Pract. 2016;16(1):41–3.
16. Heboyan A, Vardanyan A, Karobari MI, Marya A, Avagyan T, Tebyaniyan H, M.Mustafa, Dinesh R,Anna A. Dental Luting Cements: An Updated Comprehensive Review. Mol. 2023;28(4):1619.
17. Faria-e-Silva AL, Pfeifer CS. Development of dual-cured resin cements with long working time, high conversion in absence of light and reduced polymerization stress. Dent Mater. 2020;36(10):293–301

Editorial History

Date of Submission: 29 Sept 2023
Review & Revision: 15 Oct 2023 – 3 Feb 2024
Accepted: 6 Feb 2024
Published: 11 Mar 2024