

CASE REPORT

Prevention of Accidental Ingestion/Aspiration of Zirconia Crowns: A CAD- based Technique.

Shiney Boruah^a, Vidyashree V Nandini^b, Mathivathani SP^c, Nikhath Sultana N^d

ABSTRACT

Accidental aspiration / ingestion of devices and components during dental procedures is reported in literature. Prevention of such incidents is of utmost importance during diagnostic examinations and treatment. This article enumerates a technique to cement a zirconia crown with a modification utilizing computer aided design to prevent any accidental aspiration / ingestion. This technique involves a design modification on the lingual aspect of the zirconia crown to which a floss can be secured. Post cementation of the crown, floss is untied and the modification design is trimmed off, fined and polished. The technique is a simple modification to the existing method for prevention of zirconia crown aspiration / ingestion.

Keywords: Zirconia crown, Crown Aspiration/Ingestion, CAD CAM Technology

How to cite this article: Shiney Boruah, Vidyashree V Nandini, Mathivathani SP, Nikhath Sultana N. *Prevention of Accidental Ingestion/Aspiration of Zirconia Crowns: A CAD- based Technique. J Clin Prosth Impl* 2024;6(2):83-85. <https://doi.org/10.55995/j-cpi.2024016>

INTRODUCTION

Ingestion / aspiration are iatrogenic unpredictable accidents encountered during dental diagnostic and treatment procedures. Depending on the size and the anatomical path taken by the object, it can get lodged either into respiratory tract or the gastrointestinal tract. The various components which can be potentially aspirated / ingested are restorative materials, teeth pieces, fixed restorations, implant components, rubber dam clamps, gauze packs and impression materials, components orthodontic devices, prostheses. The aspiration mishaps in dental setup is considered the second most common reason for aspiration related issues with lungs. Hou et al. concluded that prosthetic work along with restorative dentistry reported more of accidental aspiration.¹ The likelihood of aspiration is comparatively more while cementation of single tooth cast or prefabricated restorations as it is a routine procedure.

These iatrogenic accidents are attributed to factors like limited mouth opening of patient, semi recumbent or supine treatment position of the patient, accidental jerking and an environment with poorly controlled salivation.¹ Various precautionary measures followed to minimize accidental ingestion / aspiration include the placement of throat screen gauze followed by using a high vacuum suction. The usage of rubber dam, securing tiny components with dental floss and treating patient in a more upright

position are other ways of mitigating this complication. Several techniques have been tried to prevent such mishaps.² In one such technique, crown was casted with a pin² and loop³ on the lingual / palatal surface to which a floss of adequate length was secured. But this technique was applicable to only castable restorations and involved added laboratory procedures.

With the advent of CAD CAM technology and predictable mechanical and aesthetic properties of zirconia, it is considered as one of the preferred restorative materials of choice as a metal free restoration. A systematic review of 16 studies, including 830 tooth-supported and 301 implant-supported Y-TZP-based crowns showed cumulative survival rates of 95.9% for tooth-supported crowns and 97.1% for implant-supported crowns.⁴ The purpose of this technique is to provide a modified design on the lingual surface of CAD CAM milled zirconia crown to avoid accidental aspiration / ingestion. With the help of CAD designing software, crown for the prepared teeth was designed. Floss was secured to the modification design and try in procedure was carried out. Followed by which final cementation was carried out and the modified design was ground off with a zirconia cutting diamond.

CASE DESCRIPTION

- The maxillary and mandibular first molar were prepared according to the principles given by Shillingburg in two patients requiring monolithic

^a SRM Kattankulathur Dental College & Hospital, Kattankulathur
^b Professor & Head, SRM Kattankulathur Dental College & Hospital, Kattankulathur,
^b SRM Kattankulathur Dental College & Hospital, Kattankulathur,
^c SRM Kattankulathur Dental College & Hospital, Kattankulathur,

zirconia crown. The impressions were obtained using polyvinyl siloxane impression material (putty and light body consistency) (Reprosil, Dentsply, Sirona, India) and definitive casts were obtained with type IV dental stone. (Ultrarock, Kalabhai Karson, Mumbai, India)



Figure 1: Designing of two Y-shaped pattern on the lingual surface of the crown

- The definitive cast was scanned in an extraoral scanner (D900 L, 3 Shape, Denmark) and the crown designing was done using a CAD software program (3 Shape Dental System, Denmark). After completion of crown designing, two modified designs were attached on the lingual aspect.

Modification 1: Two Y-shaped pattern from CAD designing tool were selected. The patterns were connected in the middle third of the lingual aspect of the crown to form a closed loop (Fig 1).

Modification 2: A single Y-shaped pattern was selected from CAD designing tool. The Y-shaped pattern was attached to the middle third of the lingual aspect of the crown (Fig 2).

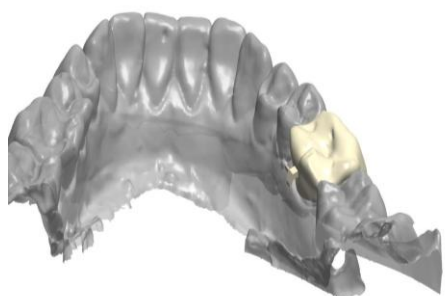


Figure 2: Designing of Single Y-shaped pattern on the lingual surface of the crown

- The design details were transferred to the milling machine (Zenotec Hybrid Select, Weiland, Germany) monolithic zirconia crowns (Sagemax,

USA) were milled. The milled monolithic zirconia crowns were sintered in a furnace (Zenotec fire cube, Weiland, Germany) for 8 hours (Fig 3,4).



Figure 3: Milled Zirconia Crown with two Y-shaped pattern

- A 20-inch floss was tied to the loop and secured with a knot (Fig 5). The crown was inserted on to the prepared tooth and the floss was passed through the interproximal surface with the free end of the floss extending extra orally. The crown was evaluated for its fit, proximal and occlusal contacts.



Figure 4: Milled Zirconia Crown with single Y-shaped pattern



Figure 5: Zirconia Crown with floss attached

• Zirconia crowns were luted with glass ionomer cement (Type I, GC Fuji, Japan). The loop was removed intraorally by using a diamond rotary instrument under copious water spray and this was followed by two steps polishing (ZilMaster, Shofu, USA). In first step blue diamond polishers of medium grits were used followed by which final polishing was carried out using yellow diamond polishers of fine grit.

DISCUSSION

The aspiration / ingestion of foreign bodies in dental set up can be manifested as a wide range of conditions like peritonitis, pneumonia, damage to digestive tract or abscess formation. In some cases, the foreign object gets easily passed out through stool in two to five days' time.⁵ The foremost principle to be considered is prevention by properly assessing high risk patients and procedures. Preventive steps during dental treatment is essential along with education of staff about emergency protocols. The technique entails a simple cementation of crown with minimal chance of accidental aspiration / ingestion. Wilwerding attached a 18 gauge sprue wax to the wax pattern of the crown and casted the pattern.² The design was in the shape of a pin and slippage of floss was possible.³ Ulusoy et al designed a V shaped loop and casted the crown to overcome the disadvantages of slippage of floss.³ These modifications required additional laboratory steps and time. Nakajima et al secured dental floss on the lingual surface with an instant glue.⁶ The technique described in this study involved the fabrication of two modified design on the middle third of the lingual surface of the zirconia crown using computer aided design software. Simple modification in designing eases technical steps and makes the procedure easy to use. The modified design aided in safe try in and cementation procedures of the zirconia crown. After luting of the monolithic zirconia crown, modification design were trimmed intraorally using fine diamond abrasive burs. Major concerns are the phase transformation of zirconia and crack propagation on adjustments made on sintered zirconia.⁷

Deeper surface flaws are created when using coarse grinding diamond while surface damage is significantly reduced on using a fine diamond point. It is advisable to use a fine diamond before the final stage of polishing. Though coarse and fine polishing can generate heat, pulpal damage may not occur due to the low thermal conductivity of YTZP. As a precautionary technique, it is advisable to use copious water spray and low polishing speeds of up to 10000 rpm only.

CONCLUSION

By using CAD- CAM modified designs on the lingual surface of the crown the risk of crown aspiration and ingestion can be reduced effectively during dental procedures.

CONFLICT OF INTEREST

There is no conflict of interest

REFERENCES

1. Urvi SL, Rupinder B. Ingestion and Management of Posterior Esthetic restorative Crown in Pediatric Dental Setup. 2018;5(3):29-33
2. Wilwerding TM. Preventing aspiration or ingestion of single fixed restorations. J Prosthet Dent. 1990;63:489.
3. Ulusoy M, Toksavul S. Preventing aspiration or ingestion of fixed restorations. J Prosthet Dent. 2003;89:223-224.
4. Alfawaz Y. Zirconia Crown as Single Unit Tooth Restoration: A Literature Review. J Contemp Dent Pract. 2016;17(5):418-422.
5. Dionysopoulos D. Accidental ingestion and aspiration of foreign objects during dental practice. Stomatological Dis Sci. 2017; 1:87-89.
6. Nakajima M, Sato Y. A method for preventing aspiration or ingestion of fixed restorations. J Prosthet Dent. 2004; 92:303.
7. Lee Ju-Hyoung. Design concept for preventing aspiration or ingestion of CAD-CAM crowns: A dental technique. J Prosthet Dent. 2020;123(2):220-222

Corresponding Author: Vidyashree V Nandini, Professor & Head, SRM Kattankulathur Dental College & Hospital, Kattankulathur,
E-mail: vidyashv@srmist.edu.in Ph.No.: 9444901719

Copyright by the Editorial board for The Journal of Clinical Prosthodontics and Implantology