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JCDD

Journal of Clinical & Digital Dentistry

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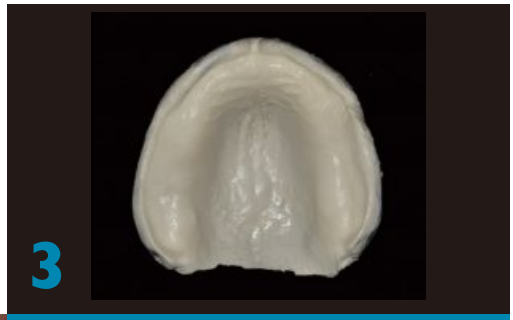

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About the Journal

The Journal of Clinical and Digital Dentistry are published four times (March, June, September, and December) annually since May 2019. The abbreviated title is "J Clin Digit Dent". In the journal, articles concerning any kind of clinical dentistry such as prosthodontics, orthodontics, periodontics, implant dentistry and digital dentistry are discussed and presented.

Aims and scope

This journal aims to convey scientific and clinical progress in the field of any kind of clinical and digital dentistry.

This journal publishes

- Original research data and high scientific merit in the field of clinical and digital dentistry.
- Review articles.
- Case reports in implant dentistry including GBR, digital dentistry, 3D printing, and prosthodontics.
- Short communications if they provide or document new technique and clinical tips.

About the Journal

Editorial Board

Editorial

Clinical judgment is the most important in dentistry

Recently, I gave a invited lecture at the annual meeting of the Bangladesh Academy of Aesthetic Dentistry(BAAD). The meeting was held 4 days including pre and post congress. Main sessions started at 9 AM, ended at 8 PM. I was surprised because an academic meeting usually ends at 5 PM in Korea. Through the appearance of dentists focusing untial the end, I could feel the passion of participant dentists.

As we know, Bangladesh is a developing country with a low national income. The development of dentistry is usually proportional to economic development, but the enthusiasm for dentistry is the same worldwide. Many lectures on the principles of dental care were available locally, and there were few lectures on digital dentistry using CAD-CAM. Still, I could feel the growing interest in digital dentistry.

My lecture title was 'face-driven functional occlusal harmony'. I explained the importance of treatment planning and the principles to be considered in establishing treatment plans. The dentist's treatment plan is the most critical factor in treatment procedures. Dentists' clinical judgments significantly impact clinical outcomes; their knowledge and treatment goals are more important than the materials and instruments.

In this issue of JCDD, It presents a complete denture treatment in patients with mental problems, the cutting edge of indirect resotration, and implant treatment in th esthetic zone. I hope all readers get a good knowledge of each field of interest and vabluable knowledge for clinical judgement for an excellent treatment.

Wongun Chang, DDS MS PhD

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Preparation for Posterior Bonded Ceramic Restoration

Wonjoong Kim, DDS

Introduction

With advances in adhesive dentistry, structurally compromised posterior tooth, which previously required veneer crowns, can now be restored with partial-bonded ceramic restorations. Various studies have reported the long-term clinical results of bonded ceramic restorations.[1]

Unlike crown restorations, which require extended tooth preparation of healthy tooth structure for an insertion path and mechanical retention of the restorations, bonded ceramic restorations do not require retention form as they are maintained by micro-mechanical and chemical methods based on adhesion.[2] This enables minimally invasive restoration that preserves the residual tooth structure as much as possible.
In addition, compared to crown restorations, bonded ceramic restorations can adjust the supragingival margin, which can reduce periodontal complication caused by restoration and allow easier maintenance (e.g., discovery of secondary caries).

Unlike non-bonded intracoronal restorations (amalgam, gold inlay, etc.), bonded ceramic restorations form bonds with the teeth, which provides benefits including stress dispersion and minimal tooth deformation.[3]

Excessive tooth reduction leads to a weakening of the tooth structure; increased risks of cracks, fracture, pulp irrtation, and root canal treatment; and lack of available tooth structure for reintervention.[4] Although bonded ceramic restorations have the advantage of minimal tooth preparation compared to traditional prosthetic restorations, the long-term success of restorations cannot be guaranteed with only minimal tooth preparation.

This article investigates the materials, tooth structure, treatment procedure, and occlusion in tooth preparation for bonded ceramic restorations with long-term stability.

Wonjoong Kim

Dr. Kim graduated from Pusan National University School of Dentistry in 2008.
He has been practicing Onyou dental office in Seoul since 2014.
He is a faculty member of Society of Korea Clinical Dentistry and currently taking educational activities of the society.

Preparation outline

Tooth preparation for ceramic restorations must be as simple as possible. Irregular surfaces, sharp edges, and isthmuses inside the cavity cause stress concentrations that lead to bond failure and restoration fracture. All parts of the cavity must be in smooth curves and do not require additional resistance or retention form.[5] Final preparation outline of cavity should be smooth and fluid curve. **(Fig. 1a-c)**

This appearance and shape help to avoid stress concentrations and induces dispersion of forces, thereby preventing bonding failure and restoration fracture. Additionally, it increases the adaptation of the restoration and facilitates the flow of cement for precise placement of the restoration.[2]

Fig 1a-c. (a). Final cavity shape before restoration bonding. All sides have formed smooth curves.
(b-c). Cavity shape before immediate dentin sealing (IDS). The cavity was formed before IDS to avoid dentin re-exposure.

Considerations for restoration space

1. Materials and bonding procedure

Lithium disilicate, an etchable ceramic material with stable long-term results, requires reductions of 1.5 mm on the occlusal surface and 1.0 mm on the axial surface, according to the manufacturer.[6] **(Fig. 2)** Although these reductions do not show significant differences in fracture resistance in the literature, the in vitro and clinical oral environments are different (teeth condition, masticatory environment, occlusal force, parafunction, error during the clinical process, etc.). Therefore, a occlusal reduction more than 1.5mm is reasonable.

In addition, an additional approximately 0.5 mm must be required for immediate dentin sealing (IDS) and resin coating to protect the exposed dentin and maximize dentin bonding.[8] Thus, a total of 1.5–2.0mm on the occlusal surface and 1.0–1.5 mm on the axial surface must be reduced **(Fig. 3a-b)**.

2. Occlusion

For long-term restoration stability, the occlusal force must be vertically applied to the restoration. This can be achieved by forming an occlusal surface with a cusp-to-fossa relationship and without eccentric contact.[9] In order to produce such an occlusal surface shape, a strategy for uniform occlusal surface preparation and minimization of the tooth reduction amount is required.

Tooth preparation for bonded restoration is conducted under rubber dam isolation to prevent tooth contamination by oral fluids and ensure stable bonding. In the case of teeth with normal occlusion, it is possible to secure space for appropriate restoration even under rubber dam. However, for teeth with malocclusion or abnormal antagonist, appropriate clearance for restoration cannot be secured under rubber dam isolation. In these cases, a diagnostic model can be obtained before the treatment and the shape of the final restoration can be reproduced through wax-up to generate a preparation guide for uniform tooth preparation.

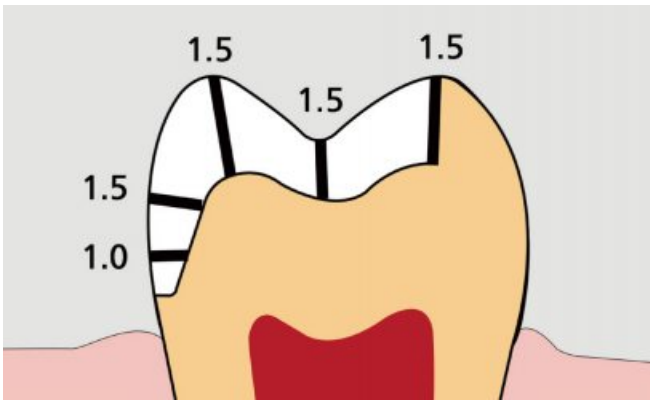


Fig 2. Amount of tooth reduction suggested by the manufacturer (IPS E-Max Clinical Guide, Ivoclar vivadent)

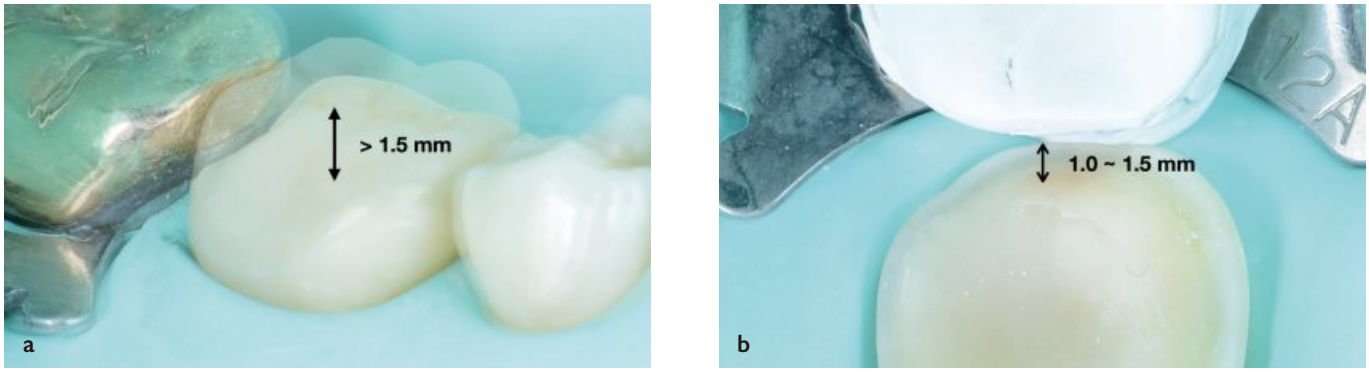


Fig 3a-b. (a) Amount of occlusal surface reduction for lithium disilicate restoration
(b) Amount of axial surface reduction for lithium disilicate restoration

Fig 4a-d. (a) A patient with a class 2 malocclusion
(b) After acquiring a diagnostic model for maxillary and mandibular overlay restoration, the final shape of the restoration was reproduced through wax-up.
(c) For transmission of vertical occlusal force, a cusp-to-fossa relationship was established on the lingual side.
(d) Putty preparation guide prepared through wax-up
(e) Uniform thickness of the restoration was acquired by using putty preparation guide
(f) Restoration with a uniform thickness formed after treatment

3. Photopolymerization

The use of dual-cured resin cement for extensive indirect bonded restoration may lead to a lack of time to place the restoration in the intended site. If the restoration is not properly placed, extensive occlusal adjustment is required, which can decrease the restoration strength. In addition, a large amount of cement remnant due to the lack of time can cause secondary caries and discoloration as well as potential damage to periodontal tissues.
To overcome these limitations, light-cured restoration resin is used for extensive indirect bonded restorations. These light-cured restoration resins have superior mechanical properties to resin cements, thereby offering long-term restoration stability. [10,11]

When a light-cured resin is used, the amount of light reaching the cement is reduced after passing the restoration (or tooth structure). If a thick restoration is used, a high-powered light-curing device may not be sufficient to deliver light for immediate cure. Therefore, the restoration should be <2 mm thick, and sufficient light must be irradiated for >60 seconds to all accessible surfaces. [2,12] **(Fig. 5)**

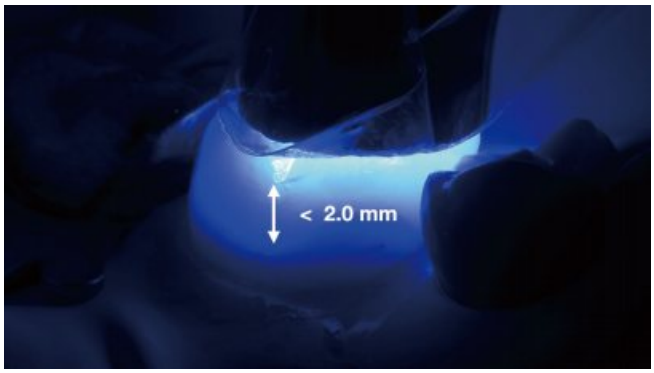


Fig 5. Thickness of the restoration for photopolymerization.

Extention of cavity

Marginal ridges are cross-bracing structures that greatly contribute to the fracture resistance of teeth. The MOD cavity, which includes both mesial and distal marginal ridges, greatly increases the deflection of residual tooth structure by external forces compared to MO or DO cavities. Long-term, this causes bonding failure and restoration and tooth structure fracture. [13,14] Therefore, in the treatment of bilateral proximal caries, the extension of the cavity to the marginal ridge must be carefully determined and the marginal ridge must be preserved as much as possible. **(Fig. 6a-g)**

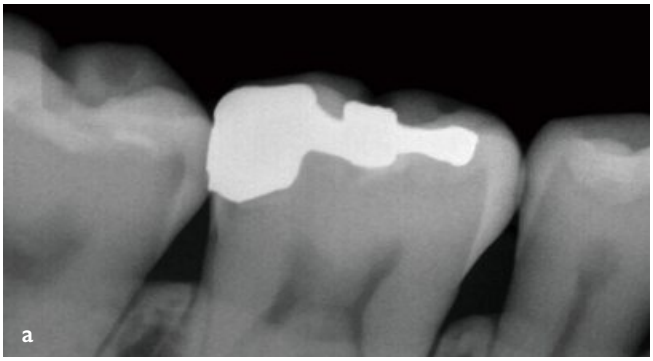
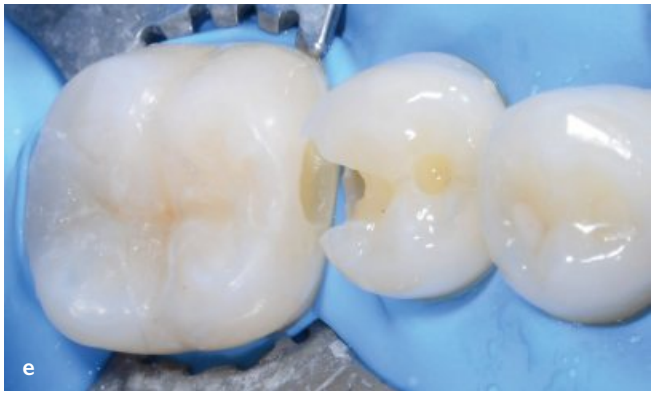


Fig 6a-d. (a) Radiographic finding of mesial and distal caries of first molar
(b) Pre-operative image. distal marginal ridge is already lost with pre-existing amalgam restoration. while, mesial marginal ridge remains intact.
(c) Prepared disto-occlusal cavity of first molar for ceramic restotration. mesial marginal ridge wasn't included.
(d) After cementation of lithium disilicate inlay

Considerations for cuspal coverage - Structural Analysis -



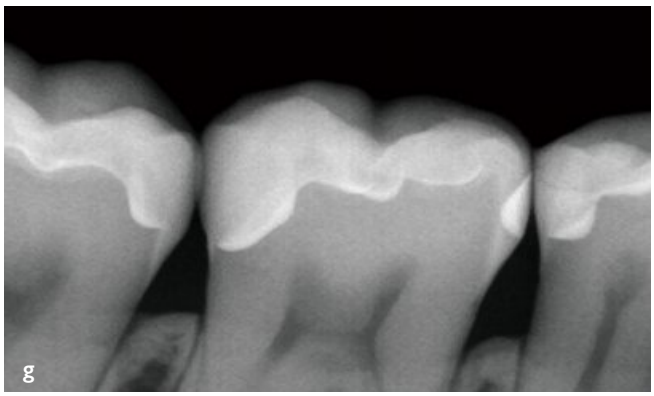


Fig 6e-g. (e) Mesial caries of 1st molar was directly accessed without removing mesial marsinal ridge, when treat disto-occlusal caries of second premolar,
(f) Mesial cavity of 1st molar was retored with direct composite resin. thus mesial marginal ridge could be preserved.
(g) Post-opearative radiograph.

1. Remaining cusp wall thickness

Thin residual tooth structures are deformed by external forces. Repeated deformation leads to the separation of the adhesive interface between the restoration and teeth, causing microleakage, fracture and discoloration of restoration or tooth cracking and fracture.
Therefore, after cavity preparation (removal of caries, old restoration and crack etc), cavity should be analyzed for decision of cuspal coverage. thin remaining cusp wall less than 2mm thickness should be considered for coverage. if it is decided to be covered, it is reduce more than 1.5mm occlusal clearance for the stabilty of resotration and tooth structure. [17] **(Fig. 7a-e)**

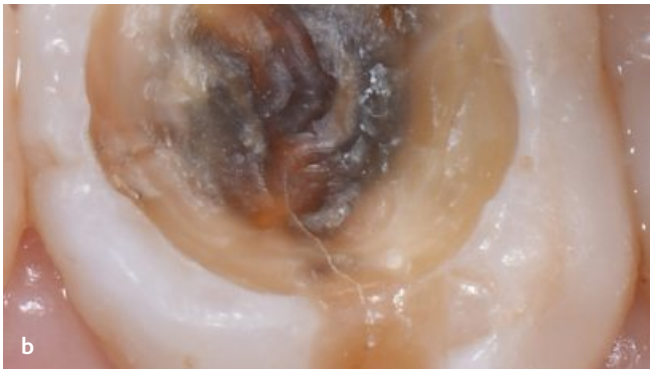


Fig 7a-e. (a) Fracture of the restoration and separation of bonding between the restoration and tooth. Remaining tooth strucuture less than 2mm thick and crack line on distopalatal cusp and mesial marginal ridge are observed
(b) Cracks extending from the mesial and palatal sides to the dentin caused by continuous deformation of thin tooth structure.
(c) Thin remaining tooth structure and disopalatal cusp with crack line are reduced for cuspal coverage
(d,e) Final overlay cavity preparation just before cementation

2. Depth of cavity

In addition to remaining cusp wall thickness, the depth of the cavity is another important factor affecting the fracture resistance of tooth. The effect on deflection of residual tooth structure are particularly noticeable in a MOD cavity with lost proximal and distal marginal ridges. When the remaing wall thickess is same, Increased cavity depth induces a longer cantilever arm that reaches the occlusal margin from the bottom of the cavity, resulting in greater tooth deformation due to external forces. In endodontically treated teeth, the cavity extends to the pulpal floor, which increases the risk of fracture of the residual tooth structure.[13,15] Therefore, with regard to MOD Cavity with endodontic access or cavity deeper than 5mm, cuspal coverage should be considered to reduce the length of cantilever arm. subsequently, cuspal coverage will prevent deflection of remaining tooth structure by occlusal forces. Subsequently, the cusp should be covered to prevent deformation of the residual tooth structure by external forces.[15,16] **(Fig. 8a-f)**

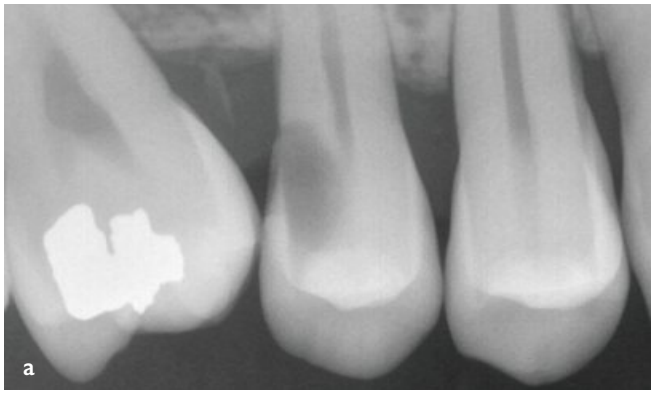


Fig 8a-d. (a) Extensive caries distal to the maxillary second premolar.
(b) Images during caries removal
(c) Pulp exposure during caries removal
(d) A deep MOD Cavity is formed due to endodontic treatment.
all cusps are reduced fot coverage

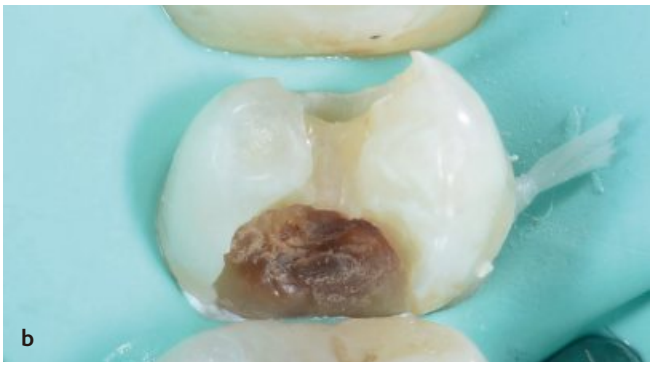


Fig 8e-f. Final cavity shape before bonding of the restoration overlay

3. Deep proximal cavities with limited access

For longevity of bonded restoration, complete removal of caries is mandatory. sometimes deep distal caries of mandibular and maxillary second molar cannot be easily approached with instruments. in this kind of situation, cusp can be reduced to facilitate access to cavity. at the same time, reduction of cusp reduces the length of the axial wall of deep cavity which can decrease deflection of remaining tooth structure by occlusal force.
by covering the reduced cusp with bonded restoration, fracture resistance can be restored. **(Fig. 9a-c)**

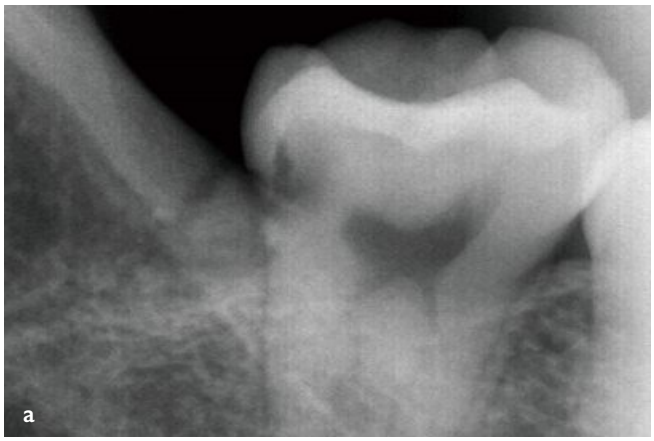


Fig 9a-c. (a) Deep distal subgingival caries in the mandibular second molar.
(b) Pre-operative image
(c) Final cavity preparation before cementation of ceramic onlay.
Distobuccal cusp (even it was thick enough) was reduced to facilitate deep distal cavity.

4. Cracks into dentin

Cracks extending to the dentin are characterized by brief & sharp pain during mastication and upon temperature changes. THE reasons for these symptoms are speculated to contraction and elongation of odontoblast processes, stimulation of pulp and periodontal ligament which is caused by
deflection of crack tooth by occlusal force and rapid movement of fluid inside the crack.[18,19]

Treatment plan for cracked tooth includes removal of crack and cuspal coverage.
first, crack into dentin should be removed as much as possible without exposing the pulp,
if it's vital. Then considering the direction of remaining cracks and cuspal deflection due to cracks,
cusp should be reduced and covered with bonded restoration.

Thereby cantilever arm which is deflected by occlusal force is reduced, this can relieve clinical symptoms.
and cuspal coverage can reduce micromovent of remaining tooth structure during function and
restore fracture resistance.[20] **(Fig. 10a-e)**

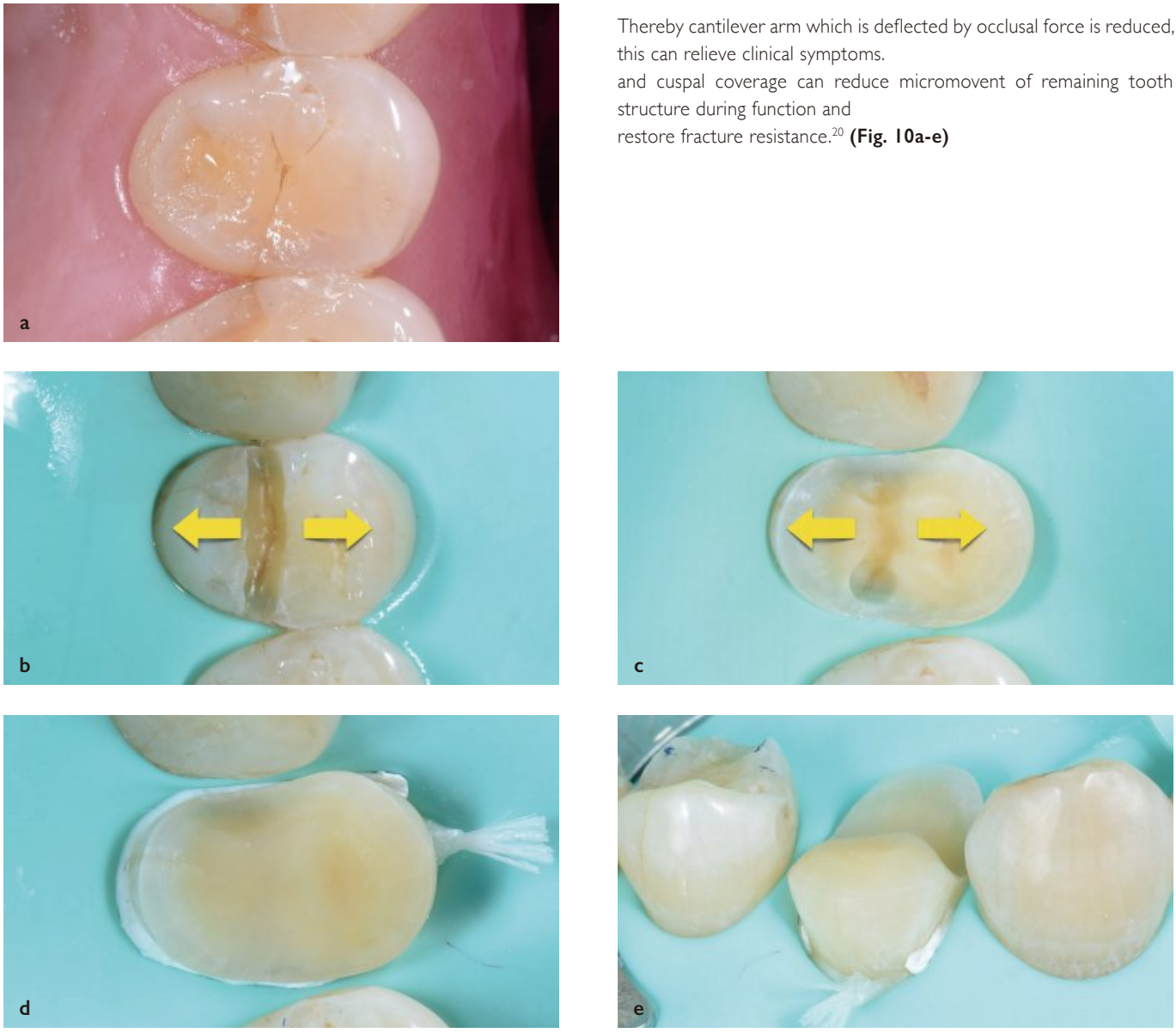


Fig 10a-e. (a) Final cavity preparation before cementation of ceramic overlay.
Sharp pain of the maxillary first premolar was observed during chewing and cold stimulation. A crack line extending from the central fossa to both marginal ridges was observed.
(b) After removal of the cracks on the enamel, cracks extending into the dentin were found.
Deformation in the buccolingual direction of the tooth due to the crack was expected.
(c) The crack was removed as much as possible without exposing the pulp.
As the cracks were still present, buccal and lingual cusps were reduced for coverage to prevent continous deflection
(d) Final cavity preparation before cemetntation of restoration.
all surfaces and angles are smoothened to prevent stress concentration during function.

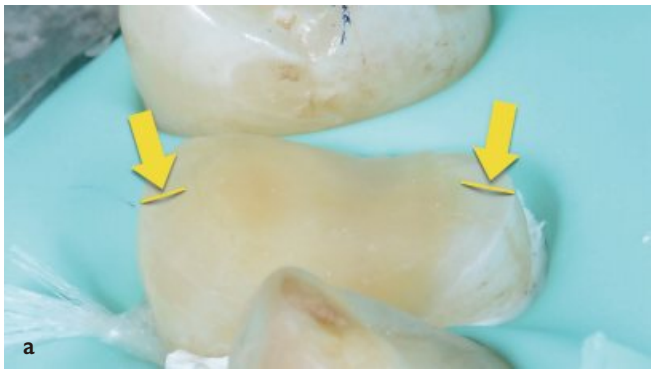
Finish lines

To form adequate finish lines for indirect bonded ceramic restorations, it is necessary to divide and form each part. For long-term stability of bonding, all margins need to be placed on the enamel as much as possible. When the margin needs to be placed on the dentin due to a deep subgingival defect, deep margin elevation (cervical margin relocation) can be performed under rubber dam isolation. this can maximize dentin bonding strength and facilitates subsequent clinical procedures (impresstion taking, cementation procedure).[10,21] If rubber dam isolation coundn't be performed for deep margin elevation.
surgical crown lengthening should be preceded before restorative procedure.

1. Buccal and lingual enamel margins

Beveled margin is formed at buccal and lingual surface for the following reasons

1) Enamel bonding stability : The tensile strength of the enamel is determined by orientation of enamel rods. Obliquely cut enamel has a greater tensile strength than horizontally cut enamel. A bevel induces an oblique section for the enamel of the finish lines. [22,23]
2) Change the direction of occlusal load toward the center of tooth. [2,20] **(Fig. 11a)**
3) Esthetics : natural shade blending of the restorations and residual teeth **(Fig. 11 b-c)**



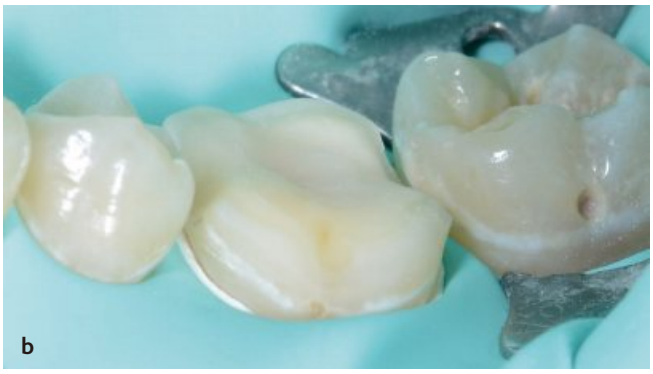
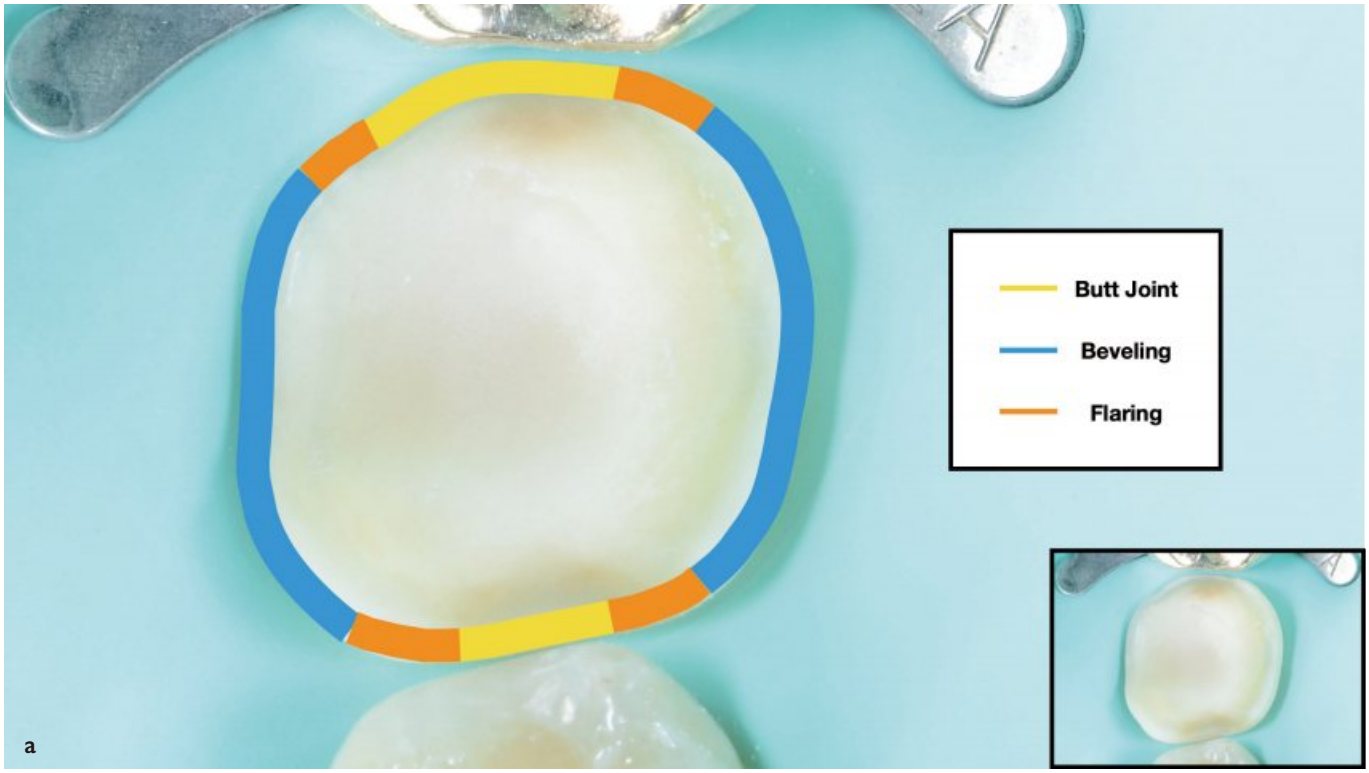


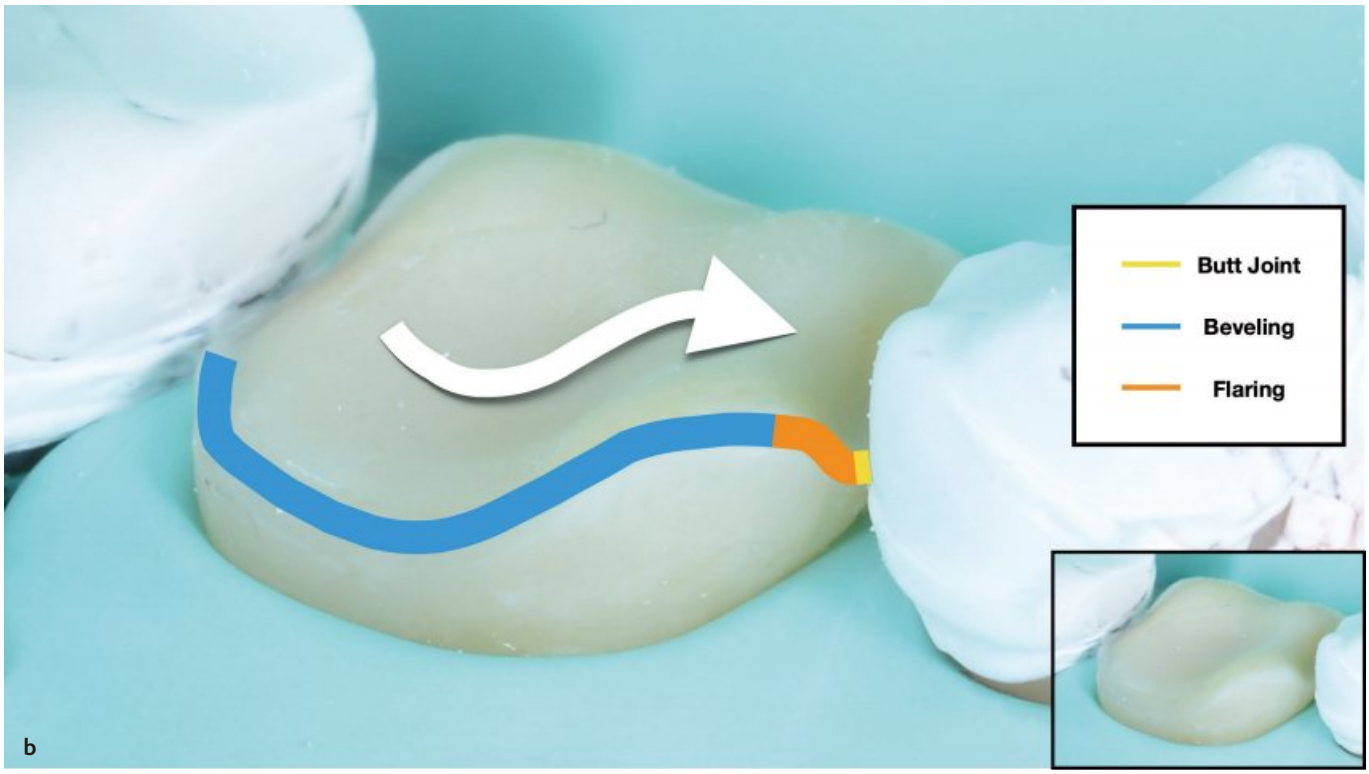
Fig 11a-c. (a) By forming beveled margin on buccal and lingual enamel, occlusal stress can be redirected toward the center of tooth.
(b-c) Images before and after overlay bonding. A natural-looking transition area is formed between the restoration and beveled buccal enamel margin.

2. Proximal margin

enamel is the most reliable bondable substrate of human teeth. most proximal margins of cavity are located gingival third , where thinner enamel exist compared to occlusal and middle third. in this location, an excessive effort to form beveled finish line result in lack of bondable enamel. for this reason, proximal margin is formed as a butt joint to preserve enamel in cervical region.[27] If the enamel of the proximal margin is sufficiently thick, a bevel can be formed.[24,25] **(Fig. 12a-b)**

Fig 12a-b. Formation of the finish lines for the overlay. A beveled finish lines are formed for buccal and lingual margin, and a butt joint is formed for the proximal margin. The transition area is flared in the direction of the opening the contact point while removing unsupported enamel. All transition areas of the margins are formed with smooth curves.





3. Cavosurface margin

As occlusal force has direct effects on the cavosurface margin, a butt joint is formed to secure sufficient thickness to the tooth structure and restoration.[26] **(Fig. 13a-b)**

4. Transition area

In the transition area of the buccolingual and proximal margins, flaring is performed in the buccolingual direction to remove unsupported enamel that is unfavorable for bonding. Opening the margin in the buccolingual direction allows finishing and polishing after restoration bonding and facilitates maintenance such as the discovery of secondary caries and discoloration.
Sharp line angles are removed and all margins form curves for smooth transition areas.

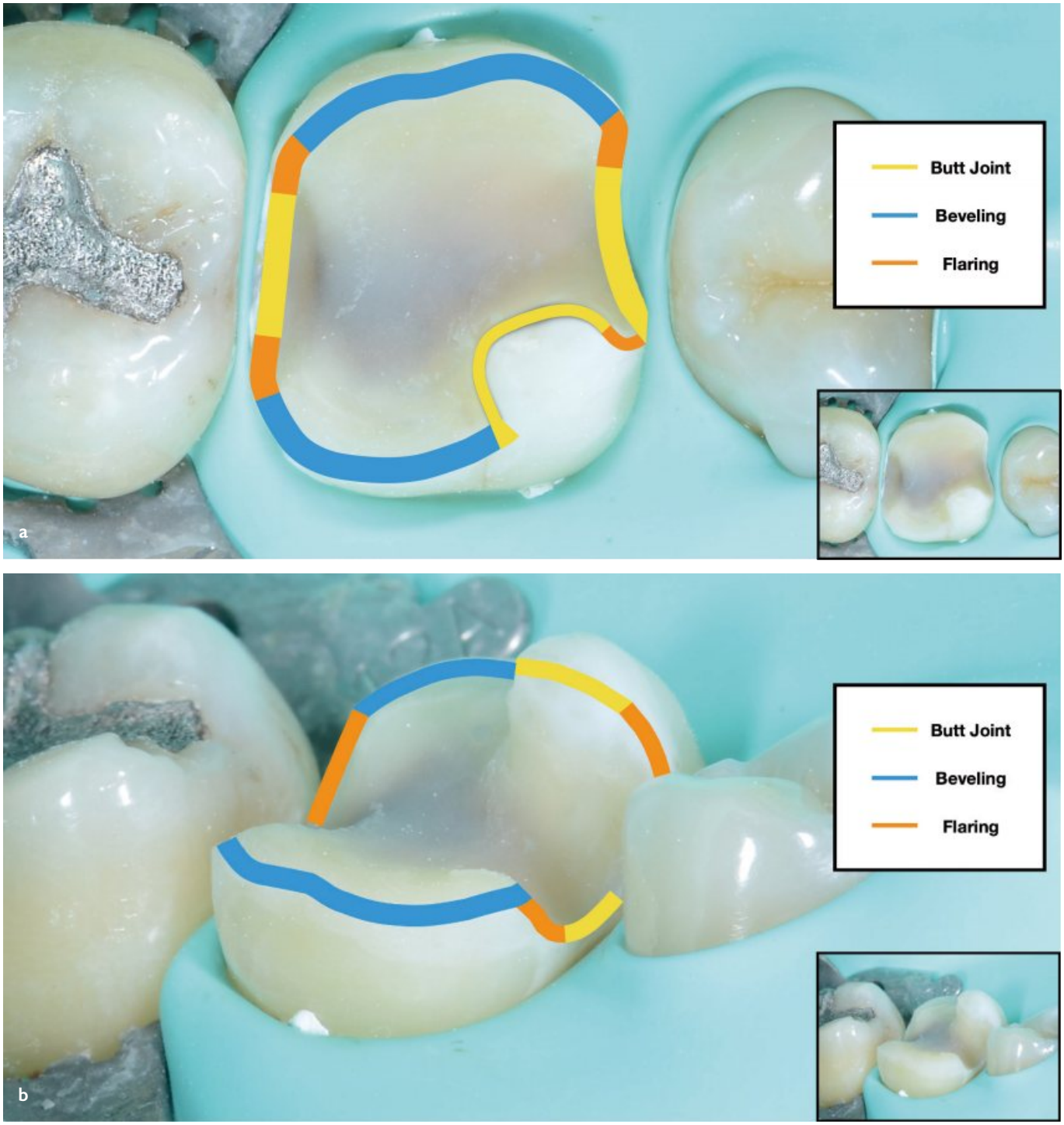


Fig 13a-b. Formation of the finish lines for the onlay. The basic principle is the same as that for overlay. The cavosurface margin is formed as a butt joint.

Conclusion

With advances in adhesive dentistry, minimally invasive approaches have been developed for the restorative treatment of severely structurally compromised posterior teeth. However, the long-term stability of such restoration cannot be guaranteed only with "minimal" tooth preparation. Tooth preparation should based on an understanding of tooth strucuture, material, clinical procedure and occlusion.

References

1. Daniel Edelhoff et al. Clinical performance of occlusal onlays made of lithium disilicate ceramic in patients with severe tooth wear up to 11 years. Dent. Mat. 2019
2. Gianfranco Politano et al. Nonretentive bonded ceramic partial crowns: concept and simplified protocol for long-lasting dental restorations. J. of Adhes. Dent. 2018
3. Paulo Vinicius Soares et al. Influence of restorative technique on the biomechanical behavior of endodontically treated maxillary premolars. Part I: Fracture resistance and fracture mode. J. of Prosthet. Dent. 2008
4. Daniel Edelhoff et al. Tooth structure removal associated with various preparation designs for posterior teeth. Int. J. of Perio. & Resto. Dent. 2002
5. Ana Beatriz Gomes de Carvalho et al. Mechanical behavior of different restorative materials and onlay preparation designs in endodontically treated molars. Materials 2021
6. IPS E-Max Clinical Guide, Ivoclar vivadent
7. Bodo Seydler et al. In vitro fracture load of monolithic lithium disilicate ceramic molar crowns with different wall thicknesses. Clin. Oral. Invest. 2013
8. Marco Aurélio de Carvalho et al. Significance of immediate dentin sealing and flowable resin coating reinforcement for unfilled/lightly filled adhesive systems. J. of Esthet. Resto. Dent. 2020
9. Pascal Magne, Urs C. Belser. Rationalization of shape and related stress distribution in posterior teeth: a finite element study using nonlinear contact analysis. Int. J. of Perio. & Resto. Dent. 2002
10. Didier Dietschi, Roberto Spreafico. Current clinical concepts for adhesive cementation of tooth-colored posterior restorations. Pract. Perio. Aesthet. Dent. 1998
11. Didier Dietschi, Roberto Spreafico. Evidence-based concepts and procedures for bonded inlays and onlays. Part III. A case series with long- term clinical results and follow-up. Int. J. of Esthet. Dent. 2019
12. André L. Faria-e-Silva et al. Effectiveness of high-power LEDs to polymerize resin cements through ceramics: An in vitro study. J. of Prosthet. Dent. 2017
13. Piyanee Panitvisai et al. Cuspal Deflection in molars in relation to endodontic and restorative procedures. J. of Endodontics 1995
14. Pascal Magne, Tevan Oganes. CT scan based finite-element analysis of premolar cuspal deflection following operative procedures. Int. J. of Perio. & Resto. Dent. 2009
15. Ashraf ElAyouti et al. Influence of cusp coverage on the fracture resistance of premolars with endodontic access cavities. Int. Endo. J. 2011
16. Andras Forster et al. In Vitro Fracture Resistance of Adhesively Restored Molar Teeth with Different MOD Cavity Dimensions. J.of Prostho. 2018
17. Stephanie Krifka et al. Ceramic inlays and partial ceramic crowns: influence of remaining cusp wall thickness on the marginal integrity and enamel crack formation in vitro. Oper. Dent. 2009
18. Werner Geurtsen et al. Diagnosis, therapy, and prevention of the cracked tooth syndrome. Quintessence Int. 2003
19. Martin Brannstrom. The hydrodynamic theory of dentinal pain-sensation in preparations, caries, and the dentinal crack syndrome. J. of Endodontics 1986
20. Graeme Milicich. The compression dome concept: the restorative implications. General Dent. 2017
21. Pascal Magne, Roberto Spreafico. Deep margin elevation: a paradigm shift. Am. J. of Esthet. Dent. 2012
22. Marcelo Giannini et al. Ultimate tensile strength of tooth structures. Dent. Mat. 2004
23. Ricardo M. Carvalho et al. Effects of prism orientation on tensile strength of enamel. J. of Adhes. Dent. 2000

24. Federico Ferraris et al. Comparison of posterior indirect adhesive restorations (PIAR) with different preparation designs according to the adhesthetics classification. Part 1: Effects on the fracture resistance. Int. J. of Esthet. Dent. 2021

25. Federico Ferraris. Posterior indirect adhesive restorations (PIAR): preparation designs and adhesthetics clinical protocol. Int. J. of Esthet. Dent. 2017

26. M. O. Ahlers et al. Guidelines on the preparation for all-ceramic inlays and partial crowns - With special regard to CAD/CAM-technology. Int. J. of Computerized Dent. 2009

27. Marco Veneziani. Posterior indirect adhesive restorations: updated indications and the Morphology Driven Preparation Technique. Int. J. of Esthet. Dent. 2017

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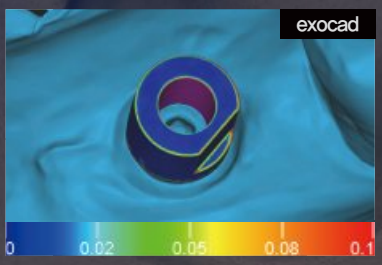

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A case report : single maxillary anterior tooth implant restoration with socket shield technique

Hyunggu Im, DDS, CAGS, MSD

Abstract

The anterior maxillary area is the most esthetically demanding site that thorough treatment planning and clinical execution is required to achieve an optimal result. Restoring anterior teeth with dental implants is even more of a challenge due to the inevitable resorption of the alveolar ridge after extraction. Preserving the remaining alveolar bone volume is crucial in restoring anterior maxillary teeth with dental implants.

Immediate implant placement with socket grafting after the extraction seems to better preserve the bony structure with minimal post-operative complications than delayed implant placement. Also, the "socket shield technique" is reported to minimize the resorption of the alveolar bone volume on the buccal aspect with minimal surgical trauma to the patient.

In this case report, a clinical case of restoring a single maxillary central incisor with a dental implant using the "socket shield technique" will be discussed.

Hyunggu Im

D.D.S., 2005 Seoul National University School of Dentistry
Certificate of Advanced Graduate study in Prosthodontics, 2011-2014, Boston University
M.S.D.,2014, Master of Science in Dentistry in Prosthodontics, Boston University
Virginia State licensed 2015 – present
Private practice - BOIM dental clinic 2015- present
Faculty member of the Korean Academy of Oral & Maxillofacial Implantology, Global Academy of Osseointegration, Korean Academy of Esthetic Dentistry, Global academy of Osseointegration
Clinical faculty at Yonsei University College of Dentistry
Private practice - BOIM dental clinic
Founder, CEO of GAMON medical wear 2020 - present

Introduction

Restoring anterior teeth with dental implants is a challenge due to the inevitable resorption of the alveolar ridge after extraction. More alveolar bone loss is observed at the buccal aspect from 2.3 to 3.1 mm (Araújo MG et al. 2005, Caneva M et al. 2010).[1,2]
Typically after extraction, horizontal bone loss of 3.79 mm and vertical reduction of 1.24 mm without grafting has been reported (Tan WL et al. 2012)[3].

Immediate implant placement with socket grafting after the extraction seems to better preserve the bony structure with minimal post-operative complications compared to delayed implant placement, although there is a controversy that immediate implant placement does not prevent the resorption of the buccal bone crest after extraction (Vina-Almunia J et al. 2013, Clementini M et al. 2015).[4,5]

Araujo MG et al. reported that grafting Bio-oss collagen in the gap between the implant and buccal wall of extraction sockets resulted in a thicker buccal plate and improved marginal bone-to-implant contact. Therefore, socket grafting is recommended to maintain the osseous crest level for most cases (Spray JR et al. 2000, Kazor CE et al. 2004, Juodzbalys G et al. 2007).[6,7,8]

In an attempt to minimize buccal alveolar bone loss after tooth extraction, several techniques have been developed. "Socket shield technique" is one of the techniques that was introduced in the 2010s. Hürzeler et al. first described this technique in 2010[9], where they retained the buccal aspect of the root during the implant placement. They found out that the remaining root did not appear to interfere with osseointegration, which may be beneficial in preserving the buccal bone plate. Bäumer et al. in 2017[10] published a clinical case series of 10 patients with 1st premolar cases with a 5-year follow-up. They reported that all implants healed without adverse events, and the volumetric changes of the buccal bone were low. Gluckman et al. in 2017[11] reported a 96.1% survival rate of 128 implant cases with 1–4 years follow-up using the socket shield technique. They discussed that the technique required clinical experience to be executed properly.

Methods

In this case report, a single implant case in the maxillary central incisors is presented. The technique followed the methods described by Gluckman and Salama in 2018.[11]

Initially, a horizontal coronectomy was performed. Subsequently, the remaining root was sectioned vertically using a surgical bur through the root canal. The palatal half of the root was removed using a periotome. The palatal side of the remaining root at the buccal aspect was prepared to leave 2 mm of thickness. The coronal portion of the root was prepared apically 2–3 mm to allow more space on the buccal aspect. Osteotomy was made towards the palatal side of the alveolar socket to secure the implant position that will allow the screw access hole to be located at the cingulum area. The implant was in place, and the gap between the implant and the remaining root was filled with xenograft bone material. The healing abutment was engaged, and the gap between the healing abutment and the free gingival margin was covered with flowable composite resin.

Case Report

A 26-year-old female patient came in with a chief complaint that a fistula was present at the apical area of the maxillary central incisors **(Fig. 1)**. The panoramic radio graph showed apical radiolucency on teeth #12 and #22 **(Fig. 2)**.

Teeth #22 went through endodontic treatment along with post and core restoration, which made the prognosis of teeth #22 retreatment questionable. After discussing with the patient, the treatment was planned to retreat teeth #11 and #12 and implant on teeth #21.

A pre-op computed tomography (CT) image showed discontinuous buccal bone on tooth #21 at the apical area **(Fig. 3)**, which might have been causing the sinus tract. Also, the buccal bone seemed less than 0.5 mm thick, which could have caused tremendous bone loss after an extraction. In this case, understanding the risk of having a post-operative infection, the "socket shield technique" was still applied to minimize the buccal bone loss and the necessity of more advanced surgery.

After removing the existing crowns, endodontic retreatment was performed on teeth #11 and #12 **(Fig. 4)**, followed by post and core restoration **(Fig. 5)**.

Fig 1

Fig 2

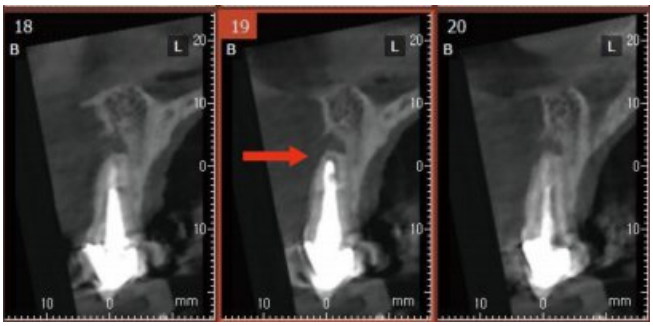

Fig 3

Fig 4

Fig 5

The socket shield technique was applied on teeth #21 **(Fig. 6)**.
To minimize the risk of post-operative infection, thorough curettage and irrigation were executed at the apex of teeth #21. Also, the apical 1/3 of the root was removed with caution by using a surgical bur.

The implant was in place towards the palatal aspect of the socket to ensure the location of the screw access hole of the implant crown was positioned at the cingulum area. The gap between the implant and the remaining root was filled with xeno-graft particulate bone material**(Fig. 7)**. A healing abutment was engaged, and the remaining space was sealed with flowable composite resin.

Fig 6

Fig 7

3-unit cantilever provisional FPD was delivered to avoid loading #21. Post-op 3 months showed uneventful healing, and the implant-supported fixed provisional crown was fabricated to mold the soft tissue contour **(Fig. 8)**. The provisional crown was fabricated with a temporary abutment, PMMA shell, and flowable composite resin. As there is no chemical bond between the PMMA and composite resin, several holes were prepared on the intaglio surface of the PMMA before relining to create some mechanical retention. The crown was contoured to generate an optimal emergence profile **(Fig. 9)**.

An emergence profile was created with the provisional restoration **(Fig. 10)**. Notice that the alveolar bone was well-preserved even though there was a small setback of the free gingival margin towards the palatal side.

Fig 8

Fig 9

Fig 10

Definitive restorations were delivered using zirconia layered with porcelain **(Fig. 11)**.

Post-op peri apical radio graph shows no signs of infection around the implant **(Fig. 12a)**. CT image shows intact bone on the buccal aspect of the implant **(Fig. 12b)**.

Fig 11

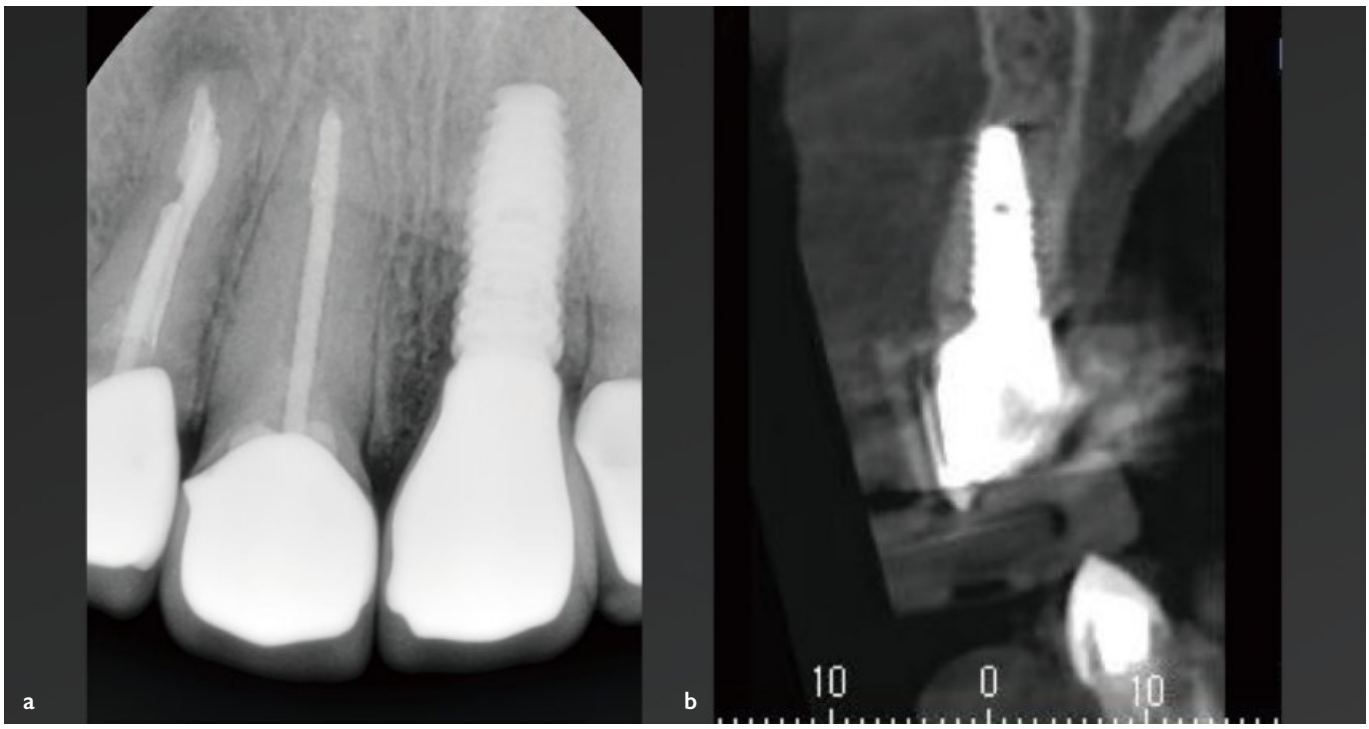

Fig 12a-b

Post-op 3-year panoramic radiograph shows well-maintained peri-implant bone structure **(Fig. 13)**.

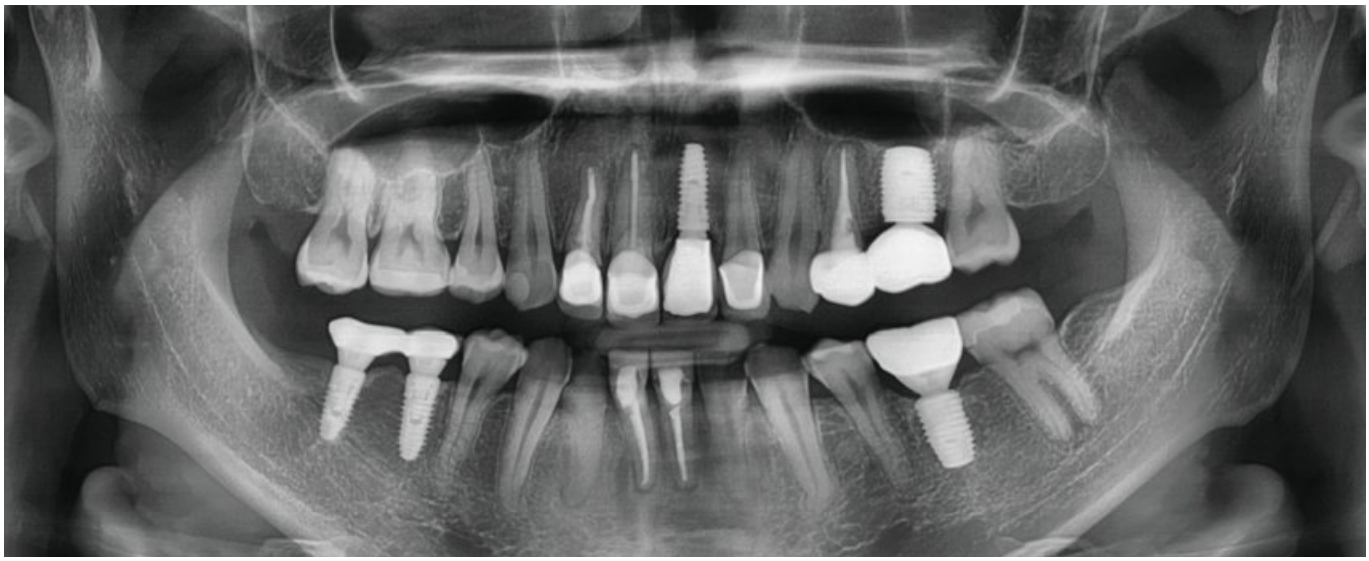

Fig 13

Discussion

Submerging the root portion of the tooth is not a new concept. Malmgren et al. introduced the ridge preservation concept in the 1980s(12). Casey and Lauciello(13) sectioned the root horizontally below the osseous crest level to submerge it to preserve the alveolar bone. In the case of the socket shield technique, the purpose of retaining the buccal portion of the root is to maintain the periodontal attachment of the root to the facial bundle bone, which is prone to resorption after the extraction. The partial extraction therapy requires complete elimination of the infection. Gluckman's study reported that the socket-shield technique's survival rate was consistent with conventional implant placement (97%). (11)

In this case report, the infectious apical 1/3 portion of the root was removed, followed by a thorough debridement of the granulation tissue. Even though the apical part of the buccal bone was not intact, bone grafting was performed, and the post-op CT scan showed the missing buccal bone was regenerated. The periodontal ligament of the remaining root did not stand out on the CT image, which might be due to the low resolution of the image or the possibility of root ankylosis with the buccal bundle bone. Either way, 3 years follow-up showed stable condition without any history of infection or exposure to the shield.
Even though there seemed to be a slight recession of the free gingival margin towards the palatal, it did not affect the treatment outcome. More importantly, the soft tissue contour around the implant was well maintained to be in harmony with the contra-lateral side.

Conclusion

Within the limitations of this case report, the socket shield technique seems to well-preserve the alveolar bone volume after implant placement when the protocol is strictly followed. Patient went through minimal post-operative discomfort, which is another benefit of this technique. A 3-year follow-up did not show any complications, yet regular check-up is required for long-term success.

References

1. Araújo MG, Lindhe J. Dimensional ridge alterations following tooth extraction. An experimental study in the dog. J Clin Periodontol. 2005 Feb;32(2):212-8.

2. Caneva M, Botticelli D et al. Flap vs. "flapless" surgical approach at immediate implants: a histomorphometric study in dogs. Clin Oral Implants Res. 2010 Dec;21(12):1314-9

3. Tan WL, Wong TL et al. A systematic review of post-extractional alveolar hard and soft tissue dimensional changes in humans. Clin Oral Implants Res. 2012 Feb;23 Suppl 5:1-21.

4. Viña-Almunia J, Maria E Candel-Martí et al. Buccal bone crest dynamics after immediate implant placement and ridge preservation techniques: review of morphometric studies in animals. Implant Dent. 2013 Apr;22(2):155-60.

5. De Risi V, Clementini M et al. Alveolar ridge preservation techniques: a systematic review and meta-analysis of histological and histomorphometrical data. Clin Oral Implants Res. 2015 Jan;26(1):50-68.

6. Spray JR, Black CG et al. The influence of bone thickness on facial marginal bone response: stage 1 placement through stage 2 uncovering. Ann Periodontol. 2000 Dec;5(1):119-28.

7. Christopher E Kazor 1, Khalaf Al-Shammar et al. Implant plastic surgery: a review and rationale. J Oral Implantol 2004;30(4):240-54.

8. Juodzbalys G, Wang HL et al. Soft and hard tissue assessment of immediate implant placement: a case series. Clin Oral Implants Res. 2007 Apr;18(2):237-43.

9. Hürzeler MB, Zuhr O et al. The socket-shield technique: a proof-of-principle report. J Clin Periodontol. 2010 Sep;37(9):855-62.

10. Bäumer D, Zuhr O et al. Socket Shield Technique for immediate implant placement - clinical, radiographic and volumetric data after 5 years. Clin Oral Implants Res. 2017 Nov;28(11):1450-1458.

11. Gluckman H, Salama M et al. A retrospective evaluation of 128 socket-shield cases in the esthetic zone and posterior sites: Partial extraction therapy with up to 4 years follow-up. J.Clin Implant Dent Relat Res. 2018 Apr;20(2):122-129

12. Malmgren B. Ridge preservation/decoronation. J Endod. 2013 Mar;39(3 Suppl):S67-72

13. Casey DM, Lauciello FR A review of the submerged-root concept. J Prosthet Dent. 1980 Feb;43(2):128-32

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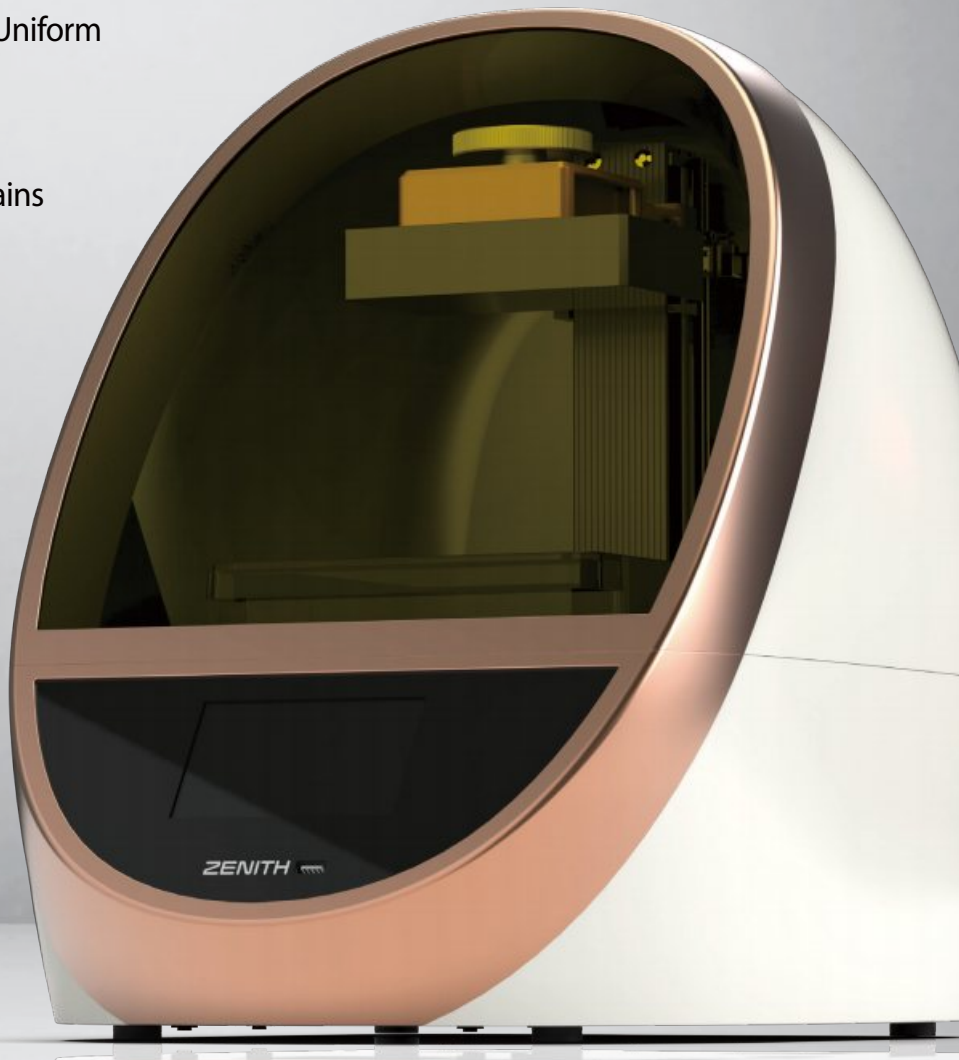

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Denture treatment for patients with mental disorders

Cheolyeon Kim, DDS

Introduction

This article aims to inform dental clinicians about the guidelines for denture treatment for people with mental disorders. Patients with psychiatric disorders have poor oral health and are subject to a high risk of dental caries and periodontal disease. The management of edentulous patients with mental disorders has not been addressed among dental professionals.

Pharmacotherapy for mental disorders can result in adverse drug reactions such as xerostomia and affect oral hygiene.

Cheolyeon Kim

Dr. Kim graduated from Pusan National University College of Dentistry in 2006.
He majored in Post Graduate Prothodontics for 3 years at New York University College of Dentistry in USA.
He is a board certified Prosthodontist and a full time practitioner at New York Digital Dental Clinic in Seoul, Republic of Korea.
He is a member of The Korean Academy of Prosthodontics and Korean Academy of Esthetic Dentistry.

Case Reports

Case 1

A 40-year-old Caucasian male fully edentulous patient presented to the clinic. The patient and his sister provided his medical and dental history. The patient had been diagnosed with bipolar disorder and schizophrenia approximately 20 years ago and he had been taking Zyprexa* and Depakote* every day for its management.

His sister explained that he had lost multiple teeth because of severe tooth decay. The patient's existing dentures were examined. Complete dentures were fabricated for maxillary and mandibular arches following routine protocols.

A few dentists would visit the clinic to observe the procedural steps and learn the methods of complete denture fabrication. In the present case, the patient stood up from the dental chair and shouted at the dentists. All the dentists were shocked and dismissed.

*Zyprexa: is used to treat certain mental conditions (such as schizophrenia, bipolar disorder)
*Depakote: to treat manic episodes associated with bipolar disorder

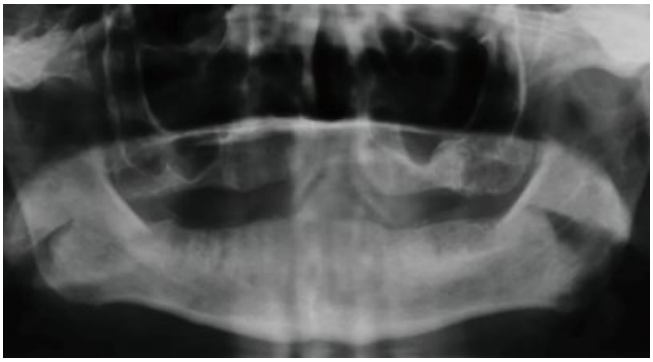

Fig 1. Panoramic view.
The patient may not have enough room for teeth arrangement for complete denture because of the supraeruption of pre-existing teeth.

Fig 2.

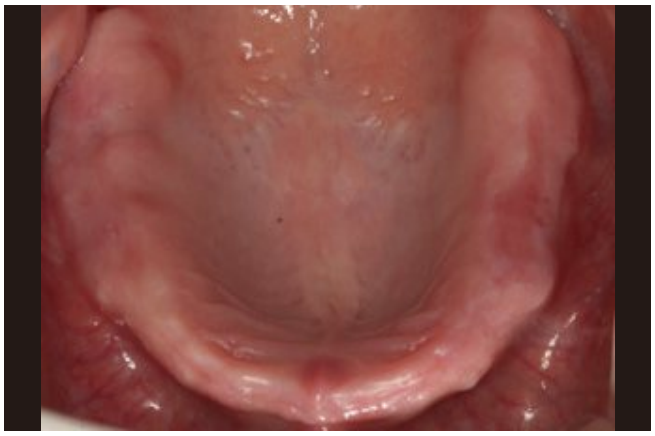

Fig 3. Edentulous maxillary arch

Fig 4. Edentulous mandibular arch

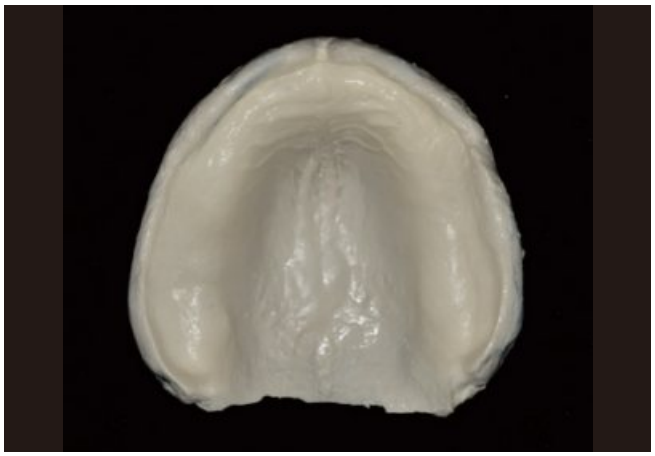

Fig 5. Final impression of the maxilla

Fig 6. Final impression of the mandible

Fig 7. Record base

Fig 8. Teeth arrangement

Fig 9. Teeth arrangement on the maxillary arch.
Both upper and lower second premolars were excluded because of limited space on the arch.

Fig 10. Teeth arrangement on the mandibular arch

Fig 11. Lateral view of the right side

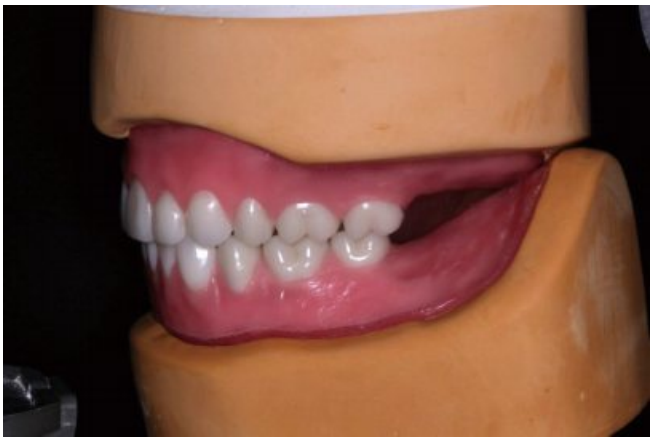

Fig 12. Lateral view of the left side

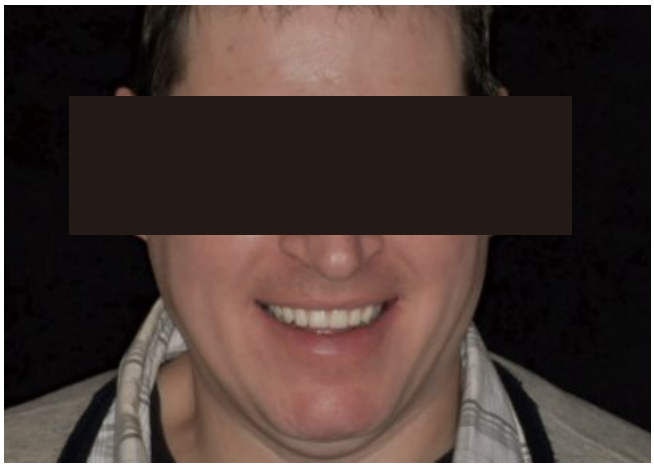

Fig 13. Delivery of the complete dentures

The treatment was completed successfully, and the patient was satisfied, with no significant complaints. But the patient was known to have deceived that he could eat well with complete dentures.
While in fact the patient took his dentures out and placing on the table while having dinner with his family (his sister informed the clinician).
The patient informed the clinician during the follow-up visit that the complete dentures were functioning adequately.

Case 2

A 68-year-old partial edentulous Asian male patient presented to the clinic. The patient was diagnosed with depression, but the clinician was unaware at first because the patient did not inform the dentist about this fact.

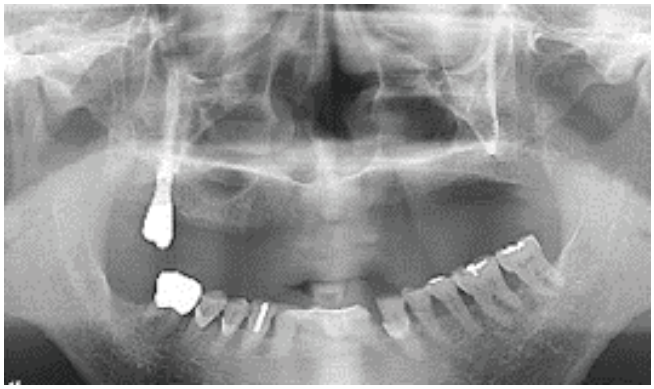

Fig 14. Panoramic view at the initial visit.

The patient presented to the clinic with four sets of maxillary dentures and documentation of previous treatments on his cell phone.
The patient had undergone several clinical procedures and was dissatisfied with the results. The patient had created treatment plans and requested that the dentists adhere to them, but these were not accepted.
The patient informed us that he had asked the previous dentist to fabricate an open palate complete denture, retained by a single implant over the maxillary second molar region on the right side.

Fig 15. Previous dentures used by the patient.

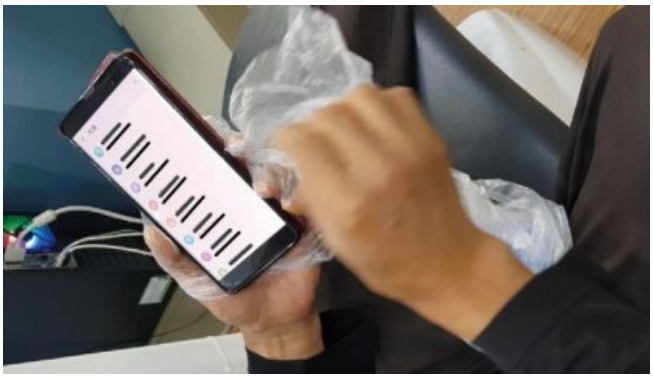

Fig 16. Patient has phone numbers of many dental clinics.

We explained the concept of removable complete denture prosthesis and the patient agreed to go forward with our treatment plan.

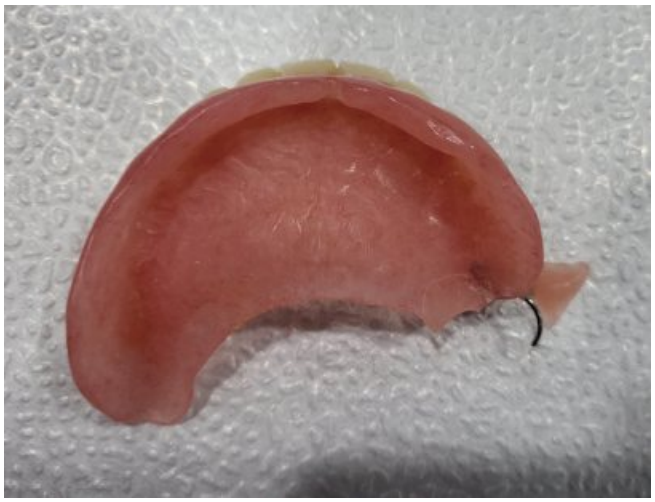

Fig 17. Patient explained to the clinician about one of the existing dentures

A complete denture was fabricated on the maxillary arch after removal of the single implant crown and it was replaced with a healing abutment at the tissue level.
The maxillary complete denture was provided with good retention
A few days later, the patient came back to the clinic and said that he would like to have open palate. However, he suddenly burst into screaming and crying.

Fig 18. Maxillary complete denture was fabricated.

Discussion

Mental disorders have a prevalence of 0.1%-25% including patients with predisposition for nicotine addiction and alcohol abuse.
Bipolar disorder is characterized by manic and depressive episodes (extreme highs and lows in mood), and the cycle is often unpredictable and variable. It is a psychiatric disorder affecting 1-2% of the global population.

The term "schizophrenia" originates from the word schizo, which is Greek for 'split' and phrenia refers to "mind." It is characterized by three types of symptoms: positive, negative, and cognitive symptoms.
Previous literature estimates the international lifetime prevalence of schizophrenia to be 0.3% to 0.7%. Schizophrenia is incurable and the treatment approach involves minimizing the side effects and improving the symptoms and quality of life. People diagnosed with schizophrenia die 10-20 years earlier than do normal people.
Depression is one of the most prevalent psychiatric disorders.

One out of ten adults in the United States suffers from depression, with approximately two-thirds of them having conditions that are serious. Up to 20% of the global population suffer from depression in their lifetime. In a major depressive event (MDD*), the patient experiences at least one or more symptoms such as loss of interest in activities, insomnia or hypersomnia, fatigue, being depressed most of the day, or experiencing a feeling of worthlessness for a period of approximately two weeks. For a milder form, the depressed mood lasts for most of the day for at least two years (PDD*)

*MDD: Major depressive disorder
*PDD: Persistent depressive disorder

Conclusion

Dental practitioners routinely come across several patients with mental disorders and provide dental care to severe psychiatric patients in their practice.
Consultation with the patient's psychiatrist or physician is mandatory, and written consent must be taken prior to the dental treatment.
Lack of communication between the medical and dental professionals impacts the quality of dental treatment, especially in severe forms of disease.
The medications that the patient is currently taking should be completely screened (amount of drug given, duration of drug, etc.) to prevent undesirable clinical situations during dental procedure.

Patients with severe mental disorders generally have poor oral hygiene, and several patients end up with an edentulous dental arch owing to loss of multiple teeth.

To be prepared to treat edentulous patients with mental disorders at a dental setup, it is important that there is complete medical screening that includes diagnosis of the disease, date of the medical diagnosis, treatment progress, medications, and severity of the disease.
Consultation with patient's family is essential for patients who have severe mental illness such as major depression, schizophrenia, etc.
Favorable appointment scheduling in accordance with patient preferences may be beneficial in dental treatment for patients with mental disorders. Appointments should not be given when the clinic is fully scheduled.

In case 1, the patient preferred afternoon hours for his appointment.
Patients with mental illnesses seeking denture treatment usually have a history of multiple dental visits; hence, reviewing previous dental history is essential. The primary objective of collecting and analyzing previous dental history is to avoid unfavorable outcomes of denture fabrication.
If the patient already has existing sets of dentures, a written consent is essential prior to dental procedures. Though a written consent is not mandatory legally, it may be of help in case of any unforeseen clinical outcome. Taking pre-operative photographs is strongly recommended for record-keeping and documentation for the same reason.

The etiology of tooth loss aids the clinician in determining the vertical dimension of occlusion, space for prosthodontic rehabilitation, prognosis,
and contributes to the treatment planning for prosthodontic success.
In case the patient does not agree with the treatment planning during the denture fabrication stage, a general dental practitioner must not heed the patient's treatment plan.

The overall goal should be incorporation of both the clinician's discretion and patient's need in the treatment planning for optimum results.
Denture treatment guidelines for patients with mental disorders are presented below:

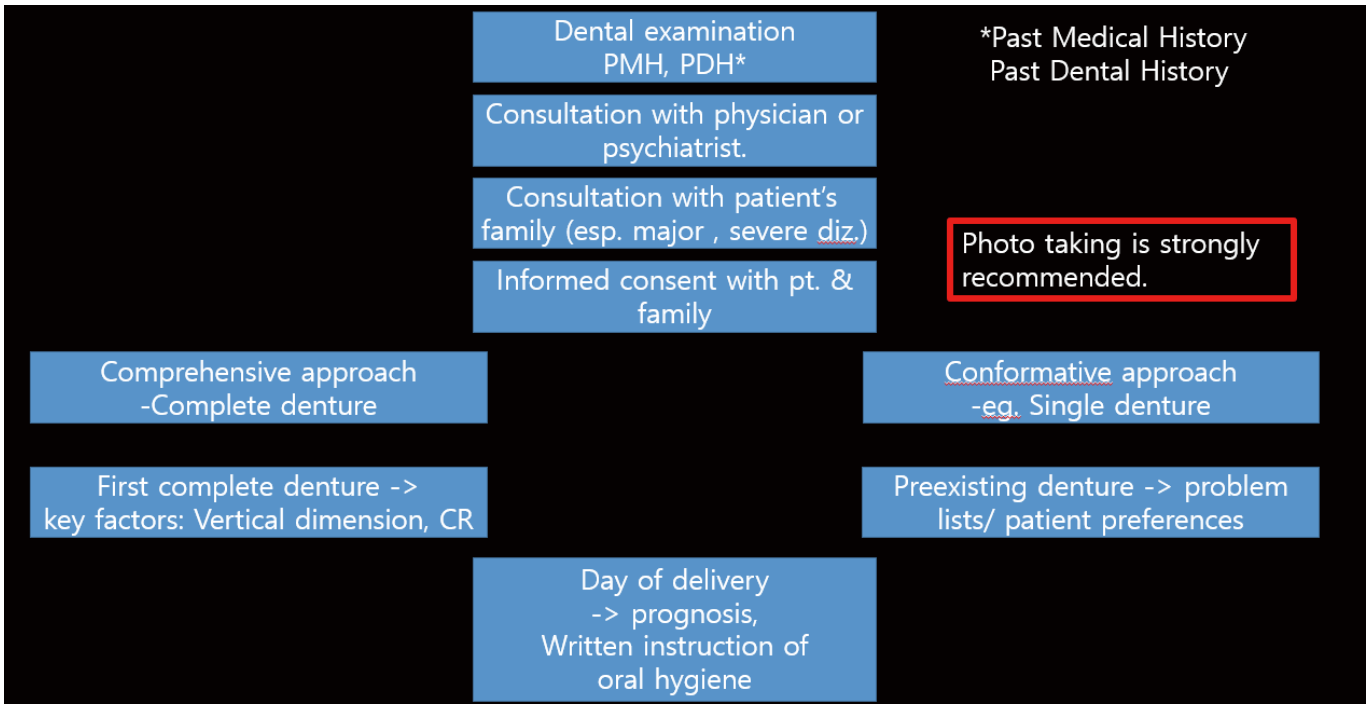

Fig 19. Guidelines for management of denture patients with mental disorders

Conclusion

Management of edentulous patients with mental disorders is complicated. There may be unexpected outcomes after fabrication of complete dentures for these patients.

In order to prevent unfavorable outcomes, general dental practitioners should follow the guidelines below:

1. Consultation with psychiatrist or physician
2. The probable side-effects of medication should be examined (Xerostomia, drowsiness, etc.)
3. Consultation with the patient's family
4. Thorough evaluation of previous medical and dental history
5. Written informed consent must be taken for dental treatment
6. Patient-centric appointment scheduling is important
7. Extensive instructions in oral hygiene should be given to the patient and patient's family after the dental treatment.

References

1. Torales J, Barrios I, González I. Oral and dental health issues in people with mental disorders.
Medwave. 2017 Sep 21;17(8):e7045.

2. David B Clark Mental Health Issues and Special Care Patients
Dent Clin North Am. 2016 Jul;60(3):551-66.

3. 3. Friedlander AH, Friedlander IK, Marder SR.
Bipolar I disorder: psychopathology, medical management and dental implications
J Am Dent Assoc. 2002 Sep;133(9):1209-17.

4. Steve Kisely, Lake-Hui Quek, Joanne Pais, Ratilal Lalloo, Newell W Johnson, David Lawrence
Advanced dental disease in people with severe mental illness: systematic review and meta-analysis. Br J Psychiatry. 2011 Sep;199(3):187-93.

5. Kyung Hee Choi , Sangyoon Shin , Euni Lee , Seok-Woo Lee
Access to Dental Care and Depressive Illness: Results from the Korea National Health Nutrition Examination Survey
Medicina (Kaunas). 2020 Apr 19;56(4):189

6. David B. Clark
Dental care for the patient with bipolar disorder
J Can Dent Assoc. 2003 Jan;69(1):20-4.

7. David B. Clark
Dental care for the psychiatric patient: chronic schizophrenia.
J Can Dent Assoc. 1992 Nov;58(11):912-6, 919-20.

8. H Häfner , W an der Heiden.
Epidemiology of schizophrenia
Can J Psychiatry 1997 Mar;42(2):139-51.

9. Mang Chek Wey , SiewYim Loh, Jennifer Geraldine Doss , Abdul Kadir Abu Bakar , Steve Kisely
The oral health of people with chronic schizophrenia: A neglected public health burden
Aust N Z J Psychiatry 2016 Jul;50(7):685-94.

10. Piotr Stępnicki , Magda Kondej , Agnieszka A Kaczor
Current Concepts and Treatments of Schizophrenia
Molecules . 2018 Aug 20;23(8):2087.

11. André Cavalcante da Silva Barbosa , Roberto Carlos Mourão Pinho , Márcia Maria Vendiciano Barbosa Vasconcelos , Bruno Gama Magalhães , Maria Teresa Botti Rodrigues Dos Santos , Arnaldo de França Caldas Júnior
Association between symptoms of depression and oral health conditions
Spec Care Dentist. 2018 Mar;38(2):65-72.

12. Skośkiewicz-Malinowska K, Malicka B, Ziętek M, Kaczmarek
Oral health condition and occurrence of depression in the elderly
Medicine (Baltimore). 2018 Oct;97(41):e12490.

13. Scott M Monroe, Kate L Harkness
Major Depression and Its Recurrences: Life Course Matters
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장 소 그랜드하얏트서울 남산룸III
(서울 용산구 소월로 322)

1st CLIP CONFERENCE

이유(EVIDENCE)있는 임플란트 치료의 변화(PARADIGM SHIFT)

CURRICULUM

KEYNOTE 16:30 — 16:40

학술위원장
권긍록 교수 경희대치과병원 보철과

SESSION 1 16:40 — 17:40

이유있는(Evidence-based) 불편한 진실을 마주하다 :
BRONJ, DRONJ

좌장
권용대 교수 경희대치과병원 구강악안면외과

연자
권대근 교수 경북대치과병원 구강악안면외과

DINNER 17:40 — 19:00

SESSION 2 19:00 — 20:00

이유있는 골재생 치료의 성공 :
절개법과 봉합법의 재해석

좌장
정의원 교수 연세대치과병원 치주과

연자
이중석 교수 연세대치과병원 치주과

SESSION 3 20:00 — 21:00

임상에서 당장 활용 가능한
구강 스캐너의 한계는 어디까지인가?

좌장
이규복 교수 경북대치과병원 보철과

연자
박지만 교수 서울대치과병원 보철과

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