

ADRIANA LEMOS MORI UBALDINI

***RESTAURAÇÕES EM RESINA COMPOSTA
COMO SOLUÇÃO ESTÉTICA DE UM CASO DE
DENTINOGENESE IMPERFEITA***

Monografia apresentada à Faculdade de
Odontologia de Piracicaba, da
Universidade Estadual de Campinas,
como requisito para obtenção de Título de
Especialista em Dentística

PIRACICABA
2014

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SUMÁRIO

TITLE PAGE	7
ABSTRACT	8
INTRODUCTION	9
DESCRIPTION OF MATERIALS AND TECHNIQUE	11
POTENTIAL PROBLEMS	15
BENEFITS	16
CONCLUSION	17
LEGENDS	18
REFERENCES	19
APPENDIX	22

TITLE PAGE

TITLE: Adhesive restorations as an esthetic solution for a case of Dentinogenesis Imperfecta

SHORT TITLE: Dentinogenesis Imperfecta transitory case report

CLINICAL RELEVANCE:

Dentinogenesis Imperfecta consists in a dentin anomaly that commits young patient dental esthetic and function. In these cases the use of direct restoration has shown to be a predictable conservative alternative to anterior and posterior reconstruction.

ABSTRACT

The tooth structure loss is the main sequel of Dentinogenesis Imperfecta (DI). Due to severe enamel attrition, patients committed by this anomaly often present esthetic, occlusion, endodontic and phonetics complications. Therefore, a multidisciplinary approach divided into clinical separate steps should be drawn in order to provide a complete dental rehabilitation. This report emphasizes the use of composite resin restorations during the transitory treatment step for vertical dimension increase, occlusion stabilization and anterior teeth esthetic reconstruction of a child patient with DI. Advances in bonding techniques allow satisfactory and durable restorations even at unfavorable substrates. At a near future, these direct restorations can become a definite treatment or may be replaced by dental prosthesis. However, its main purpose is to maintain dental function and esthetics until patient bone and dental developments permit orthodontic and orthognatic surgery treatments. Clinical success of DI treatment depends on an interdisciplinary treatment plan carried out in accordance with patients' peculiarities and limitations. Thus, composite resin restorations demonstrated to be an appropriate successful alternative for dental reconstruction during the transitory treatment step.

INTRODUCTION

Dentinogenesis Imperfecta (DI) is the most common type of hereditary dentin defect. This anomaly occurs in both sexes, primarily affecting Caucasians¹ and showing the incidence of 1:8000.^{2,3} Patients affected by DI present teeth with yellowish translucency and color alterations, which can vary from gray to brownish blue.^{2,4} The altered dentin has irregular tubules with larger areas of uncalcified matrix due to the failure in cellular differentiation of the odontoblasts, which are the responsible cells for this tissue production.⁵ Enamel parameters of hardness and elasticity are very much smaller than in normal teeth,⁶ so that, it tends to flake on the incisal surfaces of anterior teeth and occlusal surfaces of posterior teeth due to the poorly calcified nature on the dentin-enamel junction.⁷ Therefore, DI main sequel is the tooth structure loss because of enamel fracture and consequent dentin attrition, leading to a decrease of vertical dimension of occlusion (VDO) with significant esthetics and occlusion impairment.^{3,8}

The main goals of DI treatment are to prevent tooth attrition, restore occlusion, maintain patient's vertical dimension and improve dental esthetics.^{9,10} Several clinical alternatives have been reported to treat these patients, such as dental bleaching,¹¹ direct composite resin restoration,^{8,12-14} gold inlays,^{4,15} ceramic crowns,¹⁶⁻¹⁸ orthodontic management,^{20,21} implant-supported restorations,^{8,22} and total dentures.^{23,24} Whenever possible, an earlier preventive intervention should be done in order to decrease social and functional consequences of DI.^{5,9,25} Thus, according to the patient's age and dentition stage, the treatment plan should follow three different steps.^{26,27} (1) an initial stage with the purpose of carrying out primary teeth emergency treatments; (2) a transitory phase in which the provisional treatment of permanent dentition is realized and (3) a final step when the definite rehabilitative treatment is done in order to reestablish function and esthetics.

Adhesive dentistry is based on an infiltration process through which inorganic tooth material is exchanged by synthetic resin.²⁸ Therefore, the more mineralized the tooth tissue is, the better will be the results of this bonding technique. One of the concerns about using direct restorations as a DI treatment is that mineral content of these patients' dentin is decreased when compared to normal dentin.^{29,30} The main

component of its inorganic phase is poorly crystallized carbonated apatite and its crystallites are less numerous.^{1,31} In addition, dentin density, x-ray absorption and hardness are also reduced.^{12,32} However, adhesive technique can be successful when correctly indicated for DI patients, for both restorative treatment and orthodontic brackets bonding.^{8,12,14,34} Therefore, the aim of this case report was to describe the use of composite resin restorations for the esthetic and functional rehabilitation of a child patient with DI.

DESCRIPTION OF MATERIALS AND TECHNIQUE

An 8-year-old boy in good general health sought dental care at the department of restorative dentistry at Piracicaba Dental School of State University of Campinas–UNICAMP. His mother had been treated for DI several years before, but when she searched for treatment; her tooth loss was so extensive that she had to have all her teeth extracted to subsequent prosthetic rehabilitation. As soon as the mother noticed the same tooth malformation in her son dentition, she searched for treatment with the desire to provide him a better prognosis.

Medical history has demonstrated a considerable prevalence of DI on patient parents (Figure 1), and has shown no evidence of osteogenesis imperfecta, once there has been no register of frequent long bone fractures, laxity of joints, or increased bleeding tendency.^{20,35} A detailed dental history was also obtained and indicated that dentin malformation severely reached dentin of all deciduous and permanent teeth; promoted masticatory, esthetics and phonetics deficiency, although it did not cause any painful symptom.

Clinical examination revealed mixed dentition (Figures 2a-2c). The deciduous teeth were worn shapeless yellow due to complete enamel loss (65, 63, 75, 83, 84, 85), while the permanent teeth were discolored with clinical crowns of reduced size due to enamel loss on incisal face of anterior teeth and occlusal face of posterior teeth (16, 14, 12, 11, 21, 22, 24, 26, 36, 34, 32, 31, 41, 42, 46). The tissue loss of tooth 11 was severe (Figure 2a) resulting in pulp contamination and consequent necrosis. In addition, the patient had bad oral hygiene habits and was identified with gingivitis, aggravated by tooth fracture at gingival level. Occlusion problems were other important clinical findings; he was diagnosed with class III malocclusion, anterior and posterior crossbite, anterior open bite and with vertical dimension decreased.

Patient panoramic radiograph (Figure 3) also showed DI characteristic features, since the roots were short, the crowns were bulbous³⁶ with marked cervical constriction,⁴ and the residual enamel was normal in density. As evidenced on this exam, due to pulp necrosis on tooth 11, the endodontic treatment should to be carried out. When the

periapical radiolucent area is generalized it can be considered as one DI characteristic.^{30,37} However, once it was localized and only noticed on tooth 11 it indicated the need for endodontic treatment. Contrary to some literature reports,^{2,15,22} the radiograph evidenced that pulp chambers were not yet obliterated,⁵ allowing the access for endodontic therapy of element 11.

The correlation of patient clinical and radiographic examination with his medical history led to the diagnosis of DI type II.^{3,5} Because of the extensive physiologic root reabsorption and absence of pain symptoms on deciduous teeth, there was no need for intervention at the initial stage of the treatment. Therefore, the treatment plan was divided into transitory and final steps. For the transitory phase, the procedures proposed were: endodontic therapy of teeth 11, vertical dimension increase, occlusion stabilization and anterior teeth esthetic reconstruction. Whereas the proposed plans for the final phase were: orthodontic treatment, orthognatic surgery, implants and prosthetic rehabilitation if necessary.

Due to the presence of an open apex, in order to stimulate regeneration of apical tissues and to induce apexogenesis, the treatment of choice for tooth 11 was the revascularization. Thus, in a first appointment the coronal pulp was accessed and profuse decontamination irrigation with sodium hypochlorite 1% (Solucao de Milton, Asfer, Sao Paulo Brazil) and chlorhexidine 2% (Clorhexidina, FGM Products, Santa Catarina, Brazil) was done without any root canal instrumentation. Then, a paste-based calcium hydroxide (Hidroxido de calico P.A., Biodinamica, Parana, Brazil) and 2% chlorhexidine (Clorhexidina, FGM Products, Santa Catarina, Brazil) was placed in pulp chamber and the tooth was sealed with ionomer cement (Vitremmer, 3M ESPE, Sao Paulo, Brazil). After two weeks, the interappointment dressing was removed; an intentionally induced bleeding was promoted into the canal to allow the formation of a clot, and a mineral trioxide aggregate (MTA, Angelus, Parana, Brazil) plug was placed in the cervical third of root canal. The tooth was restored with ionomer cement (Vitremmer, 3M ESPE, Sao Paulo, Brazil) and a 3-month follow-up visit was proposed to the patient.

Patient masticatory efficiency was affected by lack of posterior teeth contact. Therefore, as soon as the size of premolars and molars crowns increased (Figures. 4a-

4e), indirect resin restorations were done to stabilize the posterior occlusion. Composite resin overlays C3 (IPS Empress Direct, Ivoclar Vivadent, Sao Paulo, Brasil) were made through the use of diagnostic casts. They were done by incremental technique, polymerized with led light and cured with microwave thermal therapy (immersed in water and warmed at high potency during 3 min).

Extra interocclusal space was shared equally between the mandibular and maxillary arches, but VDO was not completely re-established since dental crowns were not fully erupted. Previous to resin overlays cementation, no tooth preparation was performed, but some provisory restorations were removed. Then, teeth were treated with a 3 step etch-&-rinse adhesive (Adper Scotchbond, 3M ESPE, Sao Paulo, Brazil), and cementation was done with a flowable composite resin A2 (Tetric N-Flow, Ivoclar Vivadent, Sao Paulo, Brazil) (Figures 5a-5c). After the creation of posterior occlusion at an increased VDO, occlusal adjustments were done to provide the greatest possible amount of tooth contact (Figure 6). As a consequence of VDO increase, the patient's anterior open bite was intensified (Figures 7a-b). However, before starting the anterior reconstruction, the new occlusion was confirmed to be well tolerated by the patient during the 2-month clinical test.

Dental esthetic planning included clinical examination, analysis of photographs and diagnostic models. Through the wax-up cast, parameters such as incisal edges, teeth axes, teeth shapes and sizes were reconstructed. However, the width proportion discrepancy and the gingival contours asymmetry between maxillary incisors (Figures 8a-b) turned the direct restorative approach into a challenging esthetic treatment.

Superior teeth preparation consisted on the removal of softened dental tissue and superficial reduction of remanescant vestibular enamel in order to mask teeth color alteration (Figure 9). Whereas for inferior teeth, the only procedure carried out was the regularization of unsupported enamel rods. Before resin reconstruction, the prepared surfaces were treated with a conventional 3-step etch-&-rinse adhesive (Adper Scotchbond, 3M ESPE, Sao Paulo, Brazil). Direct resin restorations were performed through incremental technique using more dentin than enamel resin (C3 - IPS Empress Direct, Ivoclar Vivadent, Sao Paulo, Brazil) to ensure that the darkened background is

opacified . A silicon index (Adsil, Vigodent, Sao Paulo, Brazil) of the palatal and incisal surfaces was obtained from the wax-up cast as reference for the direct resin composite restorations of anterior superior teeth (Figure 10). On the other hand, for inferior teeth incisal reconstruction and inclination correction the free-hand classical centrifugal technique was used (Figures 11a-f). After this restorative procedure, oral hygiene instructions were reinforced to the patient with the purpose of achieving better hygiene habits and gingival health.

As soon as occlusion stabilization and anterior teeth esthetic reconstruction were achieved, the treatment transitory stage was completed. Therefore, to start the treatment final phase the patient was referred for orthodontic treatment. Patient orthodontic evaluation identified that his bone growth was not yet ideal for fixed orthodontic treatment. Thus, during this waiting time (approximately 2 years), the use of an orthopedic device has been planned with the aim of improving patient lingual positioning. According to initial treatment plan, the objective of orthodontic treatment will be to prepare the patient teeth inclination to subsequent jaws position correction through orthognatic surgery. After the combined orthodontic–orthognatic surgical treatment, quality and quantity of both remaining dental tissue and resin restoration will be evaluated to indicate the need for prosthetic rehabilitation. In addition, periodontal and radicular conditions will be investigated and dental implants will be placed, if necessary.

POTENTIAL PROBLEMS

Literature shows that suggestive images of periapical lesion do not necessarily have a direct relationship with pulp exposure or necrosis.^{30,37} Nevertheless, the rapid and severe tooth attrition can provide a greater proximity of the oral environment with the pulp in a short time resulting in pulp contamination via dentinal tubules.^{5,24} When it happens over a prolonged period, it may result in pulp necrosis, as in the presented case. Although endodontic treatment can be indicated to treat teeth with no obliterated pulp chamber, this therapy has a poor prognosis because of irregular and poorly mineralized dentin. It needs to be frequently followed and generally results on tooth extraction^{5,8,32}

Excessive wear and loss of tooth structure also compromised occlusion and esthetics. Decreased of VDO promotes occlusal destabilization, changes in masticatory and muscular functions, and phonetic and facial esthetic problems.³⁸ Anterior teeth attrition and color alteration causes decrease of self-esteem, difficulty to smile and change of lip posture to hide the teeth (Figure 4a). Restorative prognosis of DI often does not seem to be favorable due to the low receptivity of affected dentin to restorative materials and because of the significant amount of tooth destruction.³⁹ Another challenge of the rehabilitation treatment is the difficulty to establish cooperation with infant patients since clinical procedure is often time consuming and extensive.

BENEFITS

Early and correct diagnosis of DI is fundamental for appropriate dental treatment.^{9,25} In addition, division of the treatment plan into three steps provides the clinical procedures organization on a scale of priorities and promotes the integration of different dental specialties according to patient needs and limitations.^{17,26,35} Although treatment final result depends on patient dental-bone growth and is obtained after a long period of time, the direct restorative approach in the transitory phase allowed him not only a masticatory comfort as well as an aesthetic satisfactory solution.³⁴ The transitional and temporary character of composite resin restorations is questionable, and will depend on the remaining tooth condition after the orthodontic-surgical treatment conclusion.

The adhesive reconstruction preserves more tooth structure and is a predictable approach to establish anterior esthetics, to determine a new posterior support and to test the patient adaptation to the new VDO.^{8,38} Another advantage of these resin composite techniques is their potential for modification. For example, after full eruption of tooth crown or during orthodontic treatment it is still possible to adjust occlusion contacts and incisal edge position by removal or addition of composite resin. In addition, since there is little need for tooth preparation, direct restoration technique is considered a conservative alternative^{13,28,34} and does not hinder the subsequent performance of a prosthetic treatment whenever necessary.

CONCLUSION

A multidisciplinary approach should be considered for the successful treatment of patients with DI. This case report described an interdisciplinary treatment plan divided into distinct steps. During the transitory treatment phase, the use of direct resin composite restorations was satisfactory to VDO reestablishment and anterior dentition reconstruction. This direct rehabilitation significantly improved the patient smile esthetic and masticatory function, being therefore, crucial to the future subsequent final treatment step.

LEGENDS

Figure 1: Family pedigree. Solid symbols reveal multiple generations of DI affected family members, and the dashed symbol indicates the patient under treatment.

Figures 2: Mixed dentition. Primary dentition affected by DI shows yellow teeth with enamel absence due to attrition. Permanent dentition, also stricken by DI depicts yellow/brown teeth worn by enamel fractures. (a) Intraoral view in occlusion; (b) Intraoral view of the upper arch; (c) Intraoral view of the lower arch.

Figure 3: Panoramic radiograph demonstrating classic features of DI.

Figures 4: Pretreatment permanent dentition with brown-colored teeth and severe enamel attrition. (a) Extraoral view; (b) Intraoral view ; Lateral side views (c) right and (d) left illustrating the decrease of VDO caused by severe dental attrition.

Figures 5: Initial clinical procedure. (a) Posterior teeth previous to occlusal restoration; (b) Resin overlays after their cementation; (c) Postoperative immediate view of the posterior superior restorations.

Figure 6: Superior posterior restorations contact with no restored inferior teeth.

Figures 7: Clinical appearance of anterior teeth after the VDO increase. Patient anterior open bite was intensified temporally. (a) Extraoral view; (b) Intraoral view.

Figures 8: (a) Occlusal and (b) vestibular view of anterior superior teeth prior to restorative procedure.

Figure 9: Anterior teeth aspect after preparation for direct resin reconstruction.

Figure 10: Adaptation of silicone index. Matrix used to guide the resin composite insertion on incisal and palatal faces.

Figures 11: Posttreatment photographs. (a) Extraoral view; (b) Intraoral view; (c) Intraoral view of the upper arch; (d) Intraoral view of the lower arch; (e) Intraoral right side view; (f) Intraoral left side view.

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APPENDIX

Figure 1

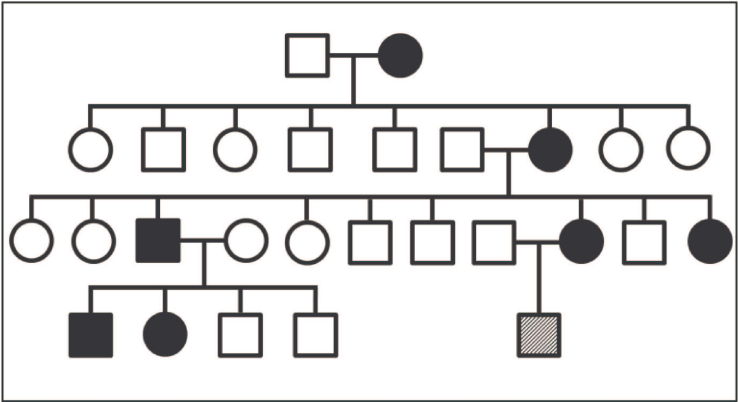


Figure 2a



Figure 2b



Figure 2c

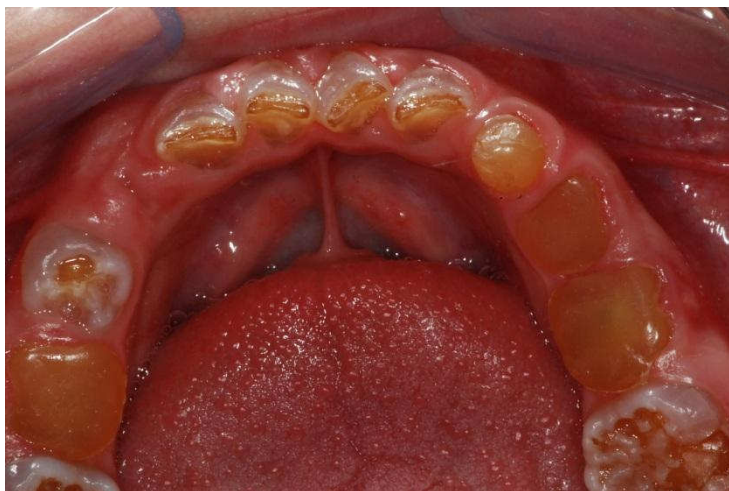


Figure 3



Figure 4a

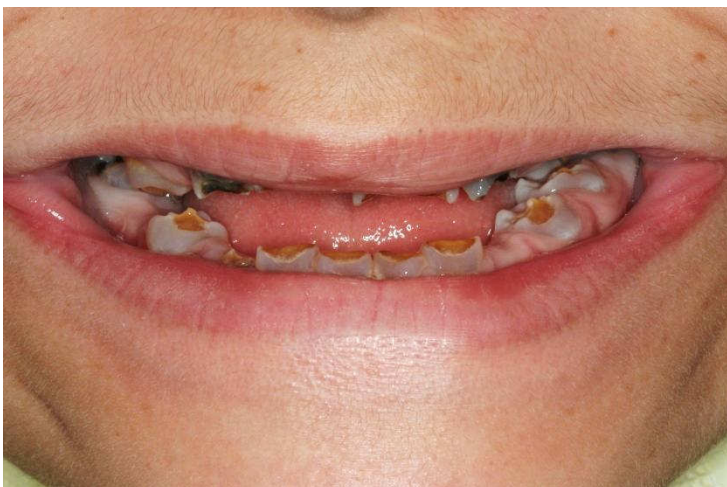


Figure 4b

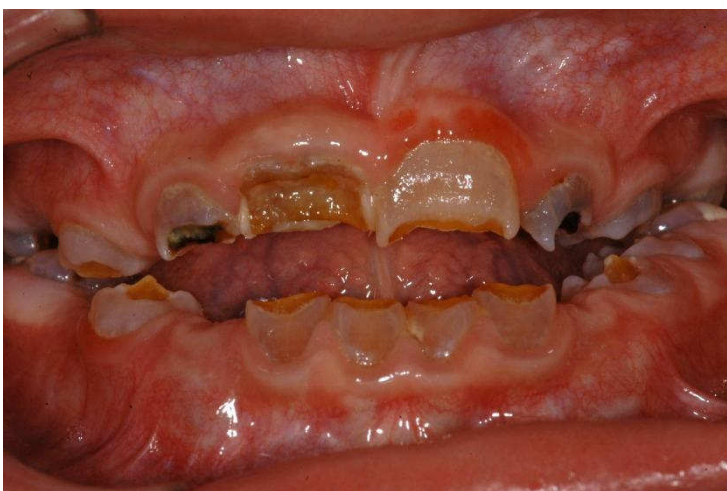


Figure 4c



Figure 4d



Figure 5a



Figure 5b



Figure 5c

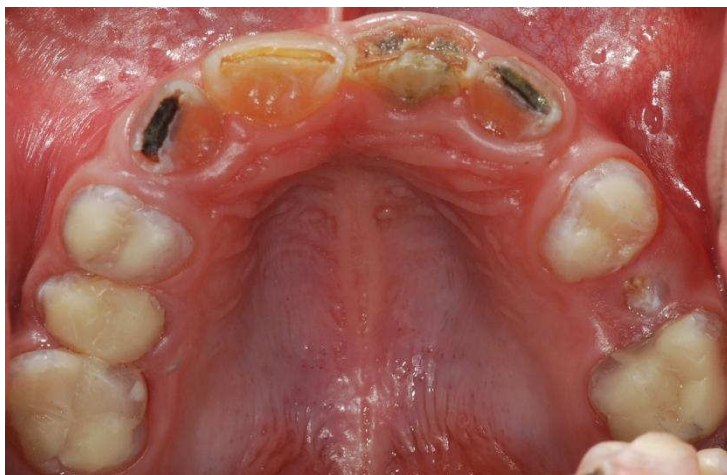


Figure 6

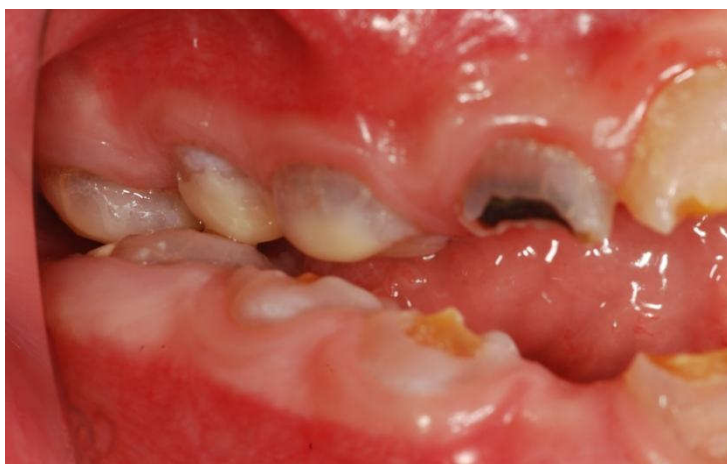


Figure 7a



Figure 7b



Figure 8a

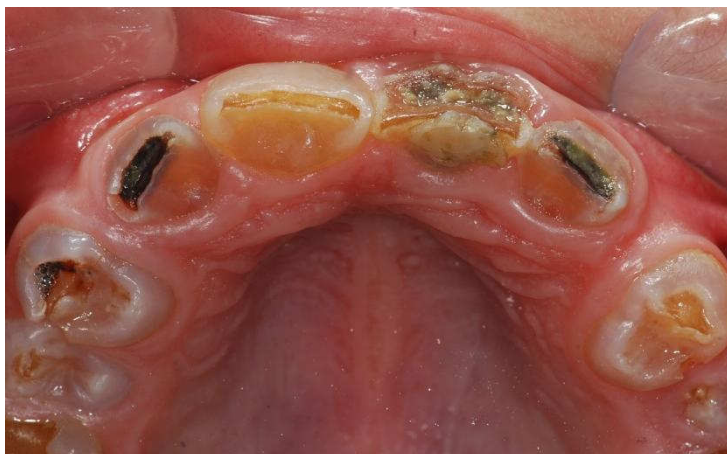


Figure 9



Figure 10



Figure 11a

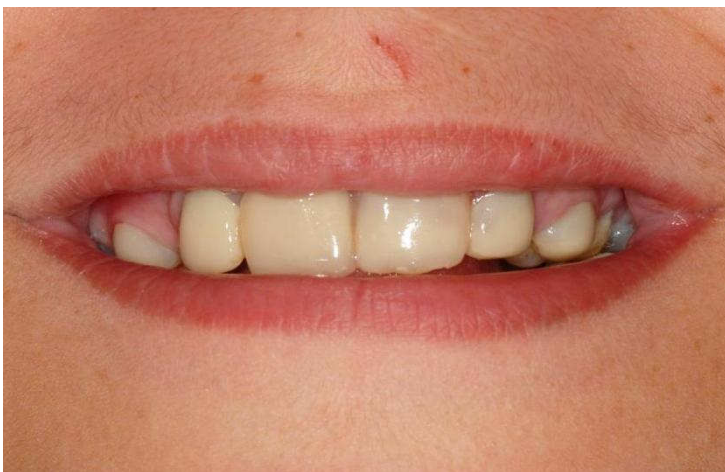


Figure 11b



Figure 11c

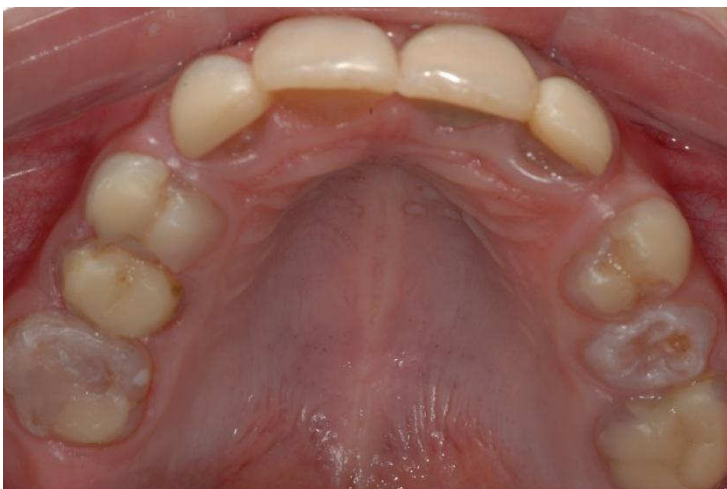


Figure 11d



Figure 11e



Figure 11f



INSTRUCTIONS TO AUTHORS

Updated 17 July 2013 – updates in green

Dear Authors,

We are so grateful to each of you for continuing to provide Operative Dentistry with such outstanding manuscripts to consider. We have seen a steady increase each year in the number of manuscripts that are sent to us for publication consideration. Over the years we have been charged for each manuscript that is submitted to Operative Dentistry. Due to increased submission costs the time has come that we need to pass a small portion of these costs on to our submitting authors. *Beginning in 2013 with the first manuscript submission, 25.00USD will be charged to our authors to submit a manuscript*; it is a one-time cost per manuscript. If you are asked to submit revisions of your paper, only the original submission will be charged. This fee will be required for a manuscript to be considered in any way. Please understand that this fee is charged to us by our vendor, and is non-refundable. Paying the submission fee will have no bearing on whether or not your manuscript will be accepted either for review, or for publication. Should you have any questions about this new policy, please contact our offices at editor@jopdent.org.

Paypal has been chosen to help with this fee collection. We understand that not all countries participate with Paypal. If you are unable to submit the fee via Paypal, contact our offices at editor@jopdent.org for other options. We thank you for understanding the necessity of this step. Should you have any questions about this new policy, please contact our offices at editor@jopdent.org.

*We operate with very strict guidelines regarding human subjects. If the manuscript uses human subjects (including survey forms) or specimens of any kind (including teeth, saliva, tissues), evidence of IRB or local oversight committee approval that was obtained prior to beginning the study must be provided **WITH** the submission.*

*If the manuscript is a randomized, controlled clinical trial, a link to the public registry in which the trial was registered must be provided **WITH** the submission.*

Sincerely,

Operative Dentistry Office Staff

All submitted manuscripts will be subject to the possibility of e-publication only. We now have the option of assigning 3-5 articles to each issue that will be published exclusively at our online journal www.jopdentonline.org. These e-pub articles will be paginated with an "e" prefix and will carry a fully citable DOI number. If you are not interested in the possibility of having your paper published only electronically, please do not submit your manuscript to us. Your authorization to allow us to e-publish will help us to publish manuscripts even faster than we have in the past. Our goal is to have a manuscript through the review process (submission to acceptance) in 2 months and from

acceptance to publication within 2 months. Please feel free to send any questions about this policy to editor@jopdent.org.

Operative Dentistry requires electronic submission of all manuscripts. All submissions must be sent to Operative Dentistry using the [Allen Track upload site](#). Your manuscript will only be considered officially submitted after it has been approved through our initial quality control check, and any problems have been fixed. You will have 6 days from when you start the process to submit and approve the manuscript. After the 6 day limit, if you have not finished the submission, your submission will be removed from the server. You are still able to submit the manuscript, but you must start from the beginning. Be prepared to submit the following manuscript files in your upload:

- A Laboratory or Clinical Research Manuscript file must include:
 - a title
 - a running (short) title
 - a clinical relevance statement
 - a concise summary (abstract)
 - introduction, methods & materials, results, discussion and conclusion
 - references (see Below)
 - The manuscript **MUST NOT** include any:
 - identifying information such as:
 - Authors
 - Acknowledgements
 - Correspondence information
 - Figures
 - Graphs
 - Tables
- An acknowledgement, disclaimer and/or recognition of support (if applicable) must in a separate file and uploaded as supplemental material.
- All figures, illustrations, graphs and tables must also be provided as individual files. These should be high resolution images, which are used by the editor in the actual typesetting of your manuscript. Please refer to the instructions below for acceptable formats.
- All other manuscript types use this template, with the appropriate changes as listed below.

Complete the online form which includes complete author information and select the files you would like to send to Operative Dentistry. Manuscripts that do not meet our formatting and data requirements listed below will be sent back to the corresponding author for correction.

GENERAL INFORMATION

- All materials submitted for publication must be submitted exclusively to Operative Dentistry.
- The editor reserves the right to make literary corrections.

- Currently, color will be provided at no cost to the author if the editor deems it essential to the manuscript. However, we reserve the right to convert to gray scale if color does not contribute significantly to the quality and/or information content of the paper.
- The author(s) retain(s) the right to formally withdraw the paper from consideration and/or publication if they disagree with editorial decisions.
- International authors whose native language is not English must have their work reviewed by a native English speaker prior to submission.
- Spelling must conform to the American Heritage Dictionary of the English Language, and SI units for scientific measurement are preferred.
- While we do not currently have limitations on the length of manuscripts, we expect papers to be concise; Authors are also encouraged to be selective in their use of figures and tables, using only those that contribute significantly to the understanding of the research.
- Acknowledgement of receipt is sent automatically. If you do not receive such an acknowledgement, please contact us at editor@jopdent.org rather than resending your paper.
- **IMPORTANT:** Please add our e-mail address to your address book on your server to prevent transmission problems from spam and other filters. Also make sure that your server will accept larger file sizes. This is particularly important since we send page-proofs for review and correction as .pdf files.

REQUIREMENTS

• FOR ALL MANUSCRIPTS

1. **CORRESPONDING AUTHOR** must provide a WORKING / VALID e-mail address which will be used for all communication with the journal.
NOTE: Corresponding authors **MUST** update their profile if their e-mail or postal address changes. If we cannot contact authors within seven days, their manuscript will be removed from our publication queue.
2. **AUTHOR INFORMATION** must include:
 - full name of all authors
 - complete mailing address **for each author**
 - degrees (e.g. DDS, DMD, PhD)
 - affiliation (e.g. Department of Dental Materials, School of Dentistry, University of Michigan)
3. **MENTION OF COMMERCIAL PRODUCTS/EQUIPMENT** must include:
 - full name of product
 - full name of manufacturer
 - city, state and/or country of manufacturer
4. **MANUSCRIPTS AND TABLES** must be provided as Word files. Please limit size of tables to no more than one US letter sized page. (8 ½ " x 11")

5. ILLUSTRATIONS, GRAPHS AND FIGURES

Photographs submitted to Operative dentistry must be unretouched.

They may be cropped, annotated and/or aggregated with other photos, but each photo must remain unretouched.

*Illustrations, graphs and figures must be provided as **TIFF** or **JPEG** files with the following parameters:*

- line art (and tables that are submitted as a graphic) must be sized with the short edge being no shorter than 5 inches. It should have a minimum resolution of 600 dpi and a maximum resolution of 1200 dpi. This means the shortest side should be no smaller than 3000 pixels.
- gray scale/black & white figures must be sized with the short edge being no shorter than 5 inches. It should have a minimum resolution of 300 dpi and a maximum of 400 dpi. This means the shortest side should be no smaller than 1500 pixels.
- color figures must be sized with the short edge being no shorter than 3.5 inches. It should have a minimum resolution of 300 dpi and a maximum of 400 dpi. This means that the shortest side should be no smaller than 1050 pixels.
- color photographs must be sized with the short edge being no shorter than 3.5 inches. It should have a minimum resolution of 300 dpi and a maximum of 400 dpi. This means that the shortest side should be no smaller than 1050 pixels.

• OTHER MANUSCRIPT TYPES

1. CLINICAL TECHNIQUE/CASE STUDY MANUSCRIPTS must include:

- a running (short) title
- purpose
- description of technique
- list of materials used
- potential problems
- summary of advantages and disadvantages
- references (see below)

2. LITERATURE AND BOOK REVIEW MANUSCRIPTS must include:

- a running (short) title
- a clinical relevance statement based on the conclusions of the review
- conclusions based on the literature review...without this, the review is just an exercise
- references (see below)

• FOR REFERENCES

REFERENCES must be numbered (superscripted numbers) consecutively as they appear in the text and, where applicable, they should appear after punctuation.

The reference list should be arranged in numeric sequence at the end of the manuscript and should include:

1. Author(s) last name(s) and initial (ALL AUTHORS must be listed) followed by the date of publication in parentheses.
2. Full article title.
3. Full journal name in italics (no abbreviations), volume and issue numbers and first and last page numbers complete (i.e. 163-168 NOT attenuated 163-68).
4. Abstracts should be avoided when possible but, if used, must include the above plus the abstract number and page number.
5. Book chapters must include chapter title, book title in italics, editors' names (if appropriate), name of publisher and publishing address.
6. Websites may be used as references, but must include the date (day, month and year) accessed for the information.
7. Papers in the course of publication should only be entered in the references if they have been accepted for publication by a journal and then given in the standard manner with "In press" following the journal name.
8. **DO NOT** include unpublished data or personal communications in the reference list. Cite such references parenthetically in the text and include a date.

9. References that contain Crossref.org's DOIs (Digital Object Identifiers) should always be displayed at the end of the reference as permanent URLs. the prefix <http://dx.doi.org/> can be appended to the listed DOI to create this URL.

IE <http://dx.doi.org/10.1006/jmbi.1995.0238>

EXAMPLES OF REFERENCE STYLE

- Journal article: two authors
Evans DB & Neme AM (1999) Shear bond strength of composite resin and amalgam adhesive systems to dentin *American Journal of Dentistry* **12(1)** 19-25.
- Journal article: multiple authors
Eick JD, Gwinnett AJ, Pashley DH & Robinson SJ (1997) Current concepts on adhesion to dentin *Critical Review of Oral and Biological Medicine* **8(3)** 306-335.
- Journal article: special issue/supplement
Van Meerbeek B, Vargas M, Inoue S, Yoshida Y, Peumans M, Lambrechts P & Vanherle G (2001) Adhesives and cements to promote preservation dentistry *Operative Dentistry* (**Supplement 6**) 119-144.

- Abstract:
Yoshida Y, Van Meerbeek B, Okazaki M, Shintani H & Suzuki K (2003)
Comparative study on adhesive performance of functional monomers *Journal of Dental Research* **82(Special Issue B)** Abstract #0051 p B-19.
- Corporate publication:
ISO-Standards (1997) ISO 4287 Geometrical Product Specifications Surface texture: Profile method – Terms, definitions and surface texture parameters *Geneve: International Organization for Standardization* **1st edition** 1-25.
- Book: single author
Mount GJ (1990) *An Atlas of Glass-ionomer Cements* Martin Duntz Ltd, London.
- Book: two authors
Nakabayashi N & Pashley DH (1998) *Hybridization of Dental Hard Tissues* Quintessence Publishing, Tokyo.
- Book: chapter
Hilton TJ (1996) Direct posterior composite restorations In: Schwartz RS, Summitt JB, Robbins JW (eds) *Fundamentals of Operative Dentistry* Quintessence, Chicago 207-228.
- Website: single author
Carlson L (2003) Web site evolution; Retrieved online July 23, 2003
from: <http://www.d.umn.edu/~lcarlson/cms/evolution.html>
- Website: corporate publication
National Association of Social Workers (2000) NASW Practice research survey 2000. NASW Practice Research Network, 1. 3. Retrieved online September 8, 2003 from: <http://www.socialworkers.org/naswprn/default>
- Website: Online Early/Pre-published/Epub ahead of print/p>p*

Smith, JR, Brown, AB. 15 Year follow-up on At-home Tray Bleaching, A Case Study. *Journal of Oral Traditions*. Prepublished Sep 20, 2010. doi: 10.1177/01234-67891-3456
*these references must have some form of permanent reference such as a doi in order to be used in this form - otherwise, please reference as listed under "Website: single Author"
- Journal Article with DOI: SA Feierabend, J Matt & B Klaiber (2011) A Comparison of Conventional and New Rubber Dam Systems in Dental Practice. *Operative Dentistry* **36(3)** 243-250, <http://dx.doi.org/10.2341/09-283-C>