Marta Tourais Nunes de Matos

COMPOSITE VENEERS: THE DIRECT-INDIRECT TECHNIQUE – CLINICAL CASE REPORT

Universidade Fernando Pessoa

Faculdade de Ciências da Saúde

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Trabalho apresentado à Universidade Fernando Pessoa
como parte dos requisitos para obtenção do
grau de Mestre em Medicina Dentária.
Atesto a originalidade do trabalho,

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(Marta Tourais Nunes de Matos**)**

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Abstract

Over the last few years, the aesthetic requirements of patients have increased significantly. Everyday dental problems such as: teeth size; shape; length; shade; asymmetries; discolorations; cracks; diastemas and agenesis are nowadays frequently improved or fixed not only due to aesthetic but also functional reasons. One of the currently widely used treatment options for these problems are veneers.

The aim of this dissertation is to present a clinical case demonstrating the protocol and results of a composite veneers technique: The Direct-Indirect Technique in the rehabilitation of two peg-shaped microdontic lateral incisors.

This technique was born with the objective of combining the advantages of both direct composite resin restorations and indirect restorations, allowing the practitioner to utilize the knowledge and skill of direct resin placement with the precision and convenience of indirect finishing and cementation. There is a range of procedures that may be successfully treated with The Direct-Indirect Technique.

Keywords: *"composite veneers", "The Direct-Indirect Technique", "direct restoration", "indirect restoration", "composite restoration", "direct restoration versus indirect restoration",* "microdontia".

Resumo

Ao longo dos últimos anos, as exigências estéticas dos pacientes aumentaram significativamente. Problemas dentários diários como: tamanho dos dentes; forma; comprimento; tonalidades; assimetrias; descolorações; fissuras; diastemas e agenesias são hoje em dia frequentemente melhorados ou corrigidos não só por razões estéticas, mas também funcionais. Uma das opções de tratamento bastante utilizadas atualmente para esses problemas são as facetas.

O objetivo desta dissertação é apresentar um caso clínico demonstrando o protocolo e os resultados de uma técnica de facetas em resina composta: a Técnica Direta-Indireta na reabilitação de dois dentes incisivos laterais conoides que apresentam microdontia.

Esta técnica nasceu com o objetivo de combinar as vantagens das restaurações diretas de resina composta e restaurações indiretas, permitindo ao operador utilizar o conhecimento e habilidade da colocação direta de resina com a precisão e conveniência do acabamento indireto e cimentação. Há uma série de procedimentos que podem ser tratados com sucesso com a Técnica Direta-Indireta.

Palavras-chave: *"Facetas em compósito", "Técnica Direta-Indireta", "Restauração direta", "Restauração indireta" "Restauração em resina composta", "Restauração direta versus restauração indireta", "Microdontia".*

Dedications

To my parents Maria João and Tomás, and grandmothers Marilú and Maria José. Thank you for all the opportunities, encouragement, affection, and values transmitted.

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I. INTRODUCTION

Nowadays, aesthetic requirements are increasing significantly in dentistry for both anterior and posterior teeth (Kallala *et al.,* 2011). Having the perfect smile is becoming an objective, as the image of stars and celebrities have been unquestionably improved through smile correction (Rehman *et al.,* 2011). This smile improvement involves particularly central and lateral incisors as they are the most influential teeth in smile attractiveness (Sriphadungporn *et al.,* 2017).

Dental abnormalities such as changes in shape, size, position, colour, or texture, may compromise smile harmony (Francisconi *et al.,* 2012). These anomalies can result from numerous genetic and environmental factors. In fact, events during the prenatal period have shown to have the most impact on these anomalies (Uslu *et al.,* 2009).

Microdontia is a type of dental abnormality in which teeth present a smaller size than usual. This anomaly can happen in permanent teeth and /or deciduous teeth. According to epidemiological studies, the prevalence of microdontia ranges from 1.5 to 2% and occurs more commonly in women than men (Guttal *et al.,* 2010). According to Boyle, (cit. in Bargale and Kiran, 2011) the teeth are smaller, the crowns shorter, and the normal contact areas between teeth are often lost.

The aim of this work is to present a clinical case demonstrative of the protocol and results of “The Direct-Indirect Technique", in the rehabilitation of two maxillary lateral incisors (12 and 22) that presented microdontia. The clinical case is supported by a bibliographic review of different authors, approaching microdontia to understand its aetiology, as well as address the possible treatment options, focusing specifically on conservative treatment options.

To carry out the bibliographic review that supports the reported clinical case, research for scientific articles was carried out through the search engines: PubMed and B-On. The following inclusion criteria were defined: articles published on the theme without time limitation, with full text available at no additional cost, with linguistic limitations in Portuguese and English. Articles which were not of interest to the topic, were excluded after reading the title and/or abstract. 45 articles were selected considering the inclusion and exclusion criteria and because they related to the objective of this review. The following keywords were used: *“composite veneers”, “The Direct-Indirect Technique”,*

"direct restoration", "indirect restoration", "composite restoration", "direct restoration versus indirect restoration", "microdontia".

The inclusion criteria to select the patient in which we will perform the clinical case, will be described later on. The research project for this study, was approved by the ethics committee, following the recommendations of the Declaration of Helsinki (Appendices).

II. CLINICAL CASE

1. Microdontia

i. Clinical Characteristics

Microdontia often manifests as 'peg-shaped' teeth, which are called 'conical teeth' (Guttal *et al.*, 2010). These, are usually seen affecting the maxillary lateral incisors. The prevalence reported varies from 0.8% to 8.4% of the population (Ezoddini *et al.*, 2007).

As Bargale, 2011, cited, Shafer, Hine, and Levy classify Microdontia into three categories: (1) Microdontia that involves only a single tooth, (2) Relative generalized microdontia, due to the presence of small teeth relative to large jaws and (3) True generalized microdontia, in which all teeth are smaller than normal.

Single tooth microdontia is frequently encountered, while true generalized microdontia is more uncommon and is normally found as a part of a specific syndrome, such as pituitary dwarfism, Williams's syndrome, among others (Bargale and Kiran, 2011).

Specific dental anomalies are often related in the same patient, as the same genetic defect can produce different manifestations, such as, the association between unilateral maxillary agenesis and microdontia of the contralateral incisor, this is, the same genetic defect that causes the agenesis is incompletely expressed on the opposite side of the arch, causing Microdontia (Garib *et al.*, 2010).

The clinical associations of the patterns of related dental anomalies are essential, as the premature finding of a particular dental anomaly (such as the development of a conoid maxillary lateral incisor or radiographic indication of tooth agenesis) can draw the attention of professionals to the possible development of other associated anomalies in the same patient or family members, allowing early intervention (Garib *et al.*, 2009).

ii. Aetiology

Mutations in the normal development of genes are known to cause many dental defects. However, both genetic and environmental features are involved in the multifaceted aetiology of microdontia (Bargale and Shital, 2011).

Studies in twins have confirmed that there is a solid genetic contribution to the discrepancy in the size and shape of human teeth. Roughly 56 to 92% of the phenotypic variation in definitive crown size could be attributed to genetic variation, while environmental effects ranged from 8 to 29%. (Townsend *et al.*, 2012).

Teeth development is mainly controlled by genetics, and several human genes arise in their morphogenesis. Currently, the genetic background for Microdontia and Hypodontia is considered identical. Various defects in individual genes have been found to be the cause of hypodontia. These genes include the following: MSX1, MSX 2, RIEG/PITX2 EDA and /ectodysplas-A and, in genetic terms, the PAX9 gene is also included (Alickovic and Redzic, 2011).

Moreover, some of the numerous external factors that influence the development of this mutation are the effect of cytotoxic drugs, trauma, radiation, or pulpal complications on teeth during their development. Radiation in the jaws during tooth development can also cause microdontia in the involved area (Koch and Poulsen, 2009).

iii. Clinical Approach of Microdontic Teeth

Ernest, 2014, mentions that the recognition of small teeth based on intraoral examination and panoramic radiograph, indicates the diagnosis. The number and distribution of microdontic teeth may also suggest consideration of syndromes (e.g., congenital heart disease, progeria).

When maxillary incisors are affected with microdontia, this can deteriorate the smile and may affect the patient psychologically because of the smaller shape and size in disharmony with the other teeth (Mittal and Mohandas, 2018). Hence, when present in the anterosuperior region, microdontia causes significant aesthetic problems, often making patients seek dentists for improvement. Throughout the treatment of a lateral incisor with such alteration, there are many aspects that must be taken into consideration, such as the patient's expectations and the dentist's experience. The type of treatment

should be selected based on both aesthetic and functional requirements (Izgi and Ayna, 2005).

A suitable conservative treatment option for microdontic peg laterals, could be the Direct–Indirect composite veneer technique, which was introduced in the 1990s. This technique combines many of the different advantages of both the direct and indirect methods. It is also called semi-direct technique by some authors (Spreafico *et al*., 2005).

Consequently, a direct-indirect restoration is performed by sculpting the composite resin directly on the tooth structure without previous adhesive preparation, then it is detached from the tooth, cured, heat tempered, finished, polished extra orally, and finally adhered indirectly in the mouth (Fahl and Ritter, 2020). The resulting restorations show enhanced mechanical properties, excellent aesthetics, as well as unique marginal adaptation and polishing. Furthermore, the direct-indirect technique has a varied range of applications (Fahl and Ritter, 2020).

2. Clinical Protocol

The steps of the clinical protocol will be described according to the authors Newton Fahl Jr and André V. Ritter, 2020:

1) Shade selection to establish the intended shade. Photograph registration.
2) Glycerine application on the teeth where the restoration will be performed, and Teflon tape on the surrounding teeth.
3) Application of composite resin: restoration sculpting and marginal imprint.
4) Intraoral light curing (initial polymerization) for 20 sec, each composite layer, using a light-curing unit with a wide spectrum (380-520nm) and keeping the guide tip as close to the resin surface as possible.
5) Restauration removal, to favour finishing ergonomics.
6) Supplemental extraoral light curing, to maximize light activation, avoiding pulp heating. This is another benefit of the direct-indirect technique, as all the energy can be supplied to the restoration without running the risk of causing deleterious pulp overheating by the heat emanating from the curing light.

7) Heat tempering, to optimize physical properties and biomechanics. The conversion from monomer to polymer is maximized both in quantity and quality of the polymers formed, and a volatilization of residual monomers occurs. It provides immediate benefits and there are several heat-tempering methods, but all employ dry heat (e.g., microwave oven, electric oven, heat-pressure polymerization unit and autoclave).
8) Extraoral and intraoral finishing to achieve anatomy and margins. This technique allows the visualization of micro and macro details through intra and extraoral evaluation.
9) Extraoral polishing to achieve marginal smoothness and gloss.
10) Shade try-in (try-in pastes) to modulate shade, which is the major advantage in the ability to perform minor chroma and value modulation.
11) Luting with a resin cement, integrating colour and form.

3. Clinical Case Report

For the choice of the clinical case, the following inclusion and exclusion criteria were identified:

Inclusion criteria: Patient with at least one tooth belonging to the 2nd sextant, and who presents one of the following changes: anomaly of size and/or shape (unitary microdontia or generalized diastemas) colour change not generalized.

Exclusion criteria: Teeth with periodontal problems, apical pathology, or extensive anterior restorations. Individuals who, due to general health problems, do not present physical and/or phycological condition to voluntarily give informed consent to participate in the study, as well as all those who refused to participate, even after clarification by the researcher.

Patient identification: (A.J.S.M.), male patient, 26 years old.

Medical history: No pathologies. No medication uses.

Dental history: Regular visits to the dentist, patient brushes teeth twice a day, but does not floss.

Psychosocial history: Patient has been a smoker since age 15, does not drink or use drugs.

Reason for consultation: Rehabilitation of lateral incisors: 12 and 22 which are microdontic and have a conical shape.

The present case report highlights the alteration of the shape and size of two maxillary lateral incisors, which affected the psychological well-being of a healthy 26-year-old male patient (A.J.S.M.). Consequently, the patient requested treatment to improve his dental aesthetics, as he was concerned about his small and peg shaped teeth in the anterior upper region.

Throughout the first appointment, the patient's anamnesis and clinical history were collected. Since the patient was already previously being followed in this clinic, recent X-rays and detailed information and history were also already provided.

Subsequently, the patient rinsed his mouth with hydrogen peroxide and the clinical examination was performed, using a dental mirror and a probe. The patient was informed of all the possible treatment options for his situation, and he ended up deciding to choose the direct indirect technique, due to its lower cost compared to ceramics and as it is a non-invasive procedure, compared to crowns or implants.

Previously, before initiating the first steps of this technique, the patient was asked to give his informed consent to authorize the collection of photographs and the future publications of this clinical case (Appendices).

Lastly, after agreeing on the treatment, impressions of both jaws were made with alginate (Hydrogum® - Zhermack), as well as a bite record with a PVS (Oclufast® - Zhermack) and a second appointment was scheduled to perform the direct-indirect technique. This is not a step within the technique; however it was decided to be done, in order to practice the technique and to do a try-in to show the patient the final result and to confirm his agreement on doing the procedure.

All figures of the clinical case can be found in the Appendices. Intraoral photographs of the initial state of these teeth were taken (Figures 8a and 8b - Appendices).

Right after this first appointment, at the laboratory, gypsum powder was combined with water and spatulated to create a mixture that was poured into the alginate dental impressions, to create a negative reproduction of the teeth and surrounding tissues. It was allowed to set, after which the gypsum and impressions were separated, resulting in the

positive reproduction of the patient's teeth, arch, and surrounding tissues (the models) (Fig.9 - Appendices).

Afterwards, the models were assembled in an articulator and diagnostic waxing was carried out, to predict the shape change and to make the silicon key guides to be used for the mock-up (Fig.10 - Appendices). Also, the Direct-Indirect Technique was simulated in one of the replicated models to practice all steps before executing it on the patient (Fig.11 - Appendices). This step is not usually necessary, but it was only made to be sure about the technique steps.

The second appointment was begun by trying the silicon key guides (Fig. 12 - Appendices) made previously on the models. A mirror was placed on the patient's lap, so he could keep up with every step and easily participate during choices, giving his preferences and opinions.

If the patient was not sure or felt indecisive about the final result, a mock-up with a bys-acrilic material (Structure – Voco ®) could have been done with the silicon key-guides made beforehand. However, the patient saw and tried the composite veneers that were previously made on the model, when simulating the technique (Fig. 13 - Appendices) and liked them. Therefore, in this case, no mock-up was necessary to assemble.

The shade selection was made using a Vita scale, establishing the intended shade (hue, chroma and value) (Fig.14 - Appendices). A retraction cord was placed on the first lateral incisor (12) to be treated and isolation was accomplished by means of a cheek and lip retractor and bilaterally placed cotton rolls. The neighbouring teeth were also isolated with Teflon and acetate matrix.

Glycerine, a water-soluble agent that allows the disinsertion of the composite veneer directly placed on the tooth was put on that same tooth, delivering a mechanical anti-adherent barrier where the restoration was performed (Fig. 15 - Appendices).

For this technique, ideally no preparation of the teeth is needed. However, depending on the type of anomaly, it might be required to do a chamfer finish line which should be within enamel whenever possible, to ensure an adequate seal of the veneer placed into the interproximal embrasures without breaking contact. This preparation is designed to protect the resin veneer, preventing it from fragmenting during mastication or excursive movements. Yet, in this patient's teeth that was not required.

Then, composite resin was placed on and around the tooth, with the aid of the silicon key guide, to build all the layers of the veneer. Correct restoration, sculpting and marginal imprint were carefully performed, and intraoral light curing was done between layers (initial polymerization).

After having built all layers of the veneer, the restauration was removed with a probe (Fig. 16 - Appendices) and supplemental extraoral light curing (ideally above 1200mW/cm2 with a light curing unit of between 380-520nm) was carried out to maximize light activation, avoiding pulpal heating.

To optimize physical properties and biomechanics, heat tempering was completed using a microwave oven selecting 450-500w power for 4 minutes (Fig. 17 - Appendices). Another option would be to use the autoclave with 121-134ºC for 15 minutes. The veneer seemed harder and more resistant after the heat tempering.

Extraoral finishing**,** and polishing were performed, to achieve ideal anatomy and margins as well as marginal smoothness and gloss. Shade try-in (try-in pastes) were tested to modulate shade.

Finally, luting was carried out, following an adhesive protocol cementation (adhesion to enamel). For this step, rubber dam isolation would be ideal, however after several failed attempts of placing the clamps (due to lack of space and dental crowding), relative isolation was the only possibility.

Air abrasive aluminium oxide (30µm) was sprayed for 10 seconds into the tooth (Fig. 18 - Appendices). Then, etching of the surface to be bonded was made with a 37% phosphoric acid for 30 seconds (Fig. 19 - Appendices). After that timing, the tooth was water rinsed and slightly dried.

A thin layer of an etch-and-rinse primer (Optibond FL- Kerr ®), was applied followed by the adhesive layer, and light cured for 20 seconds. The seating of the restoration was done using a luting agent (Variolink Esthetic LC ®), with a 2 seconds photopolymerization to stable it. The removal of excess was immediately cleaned with dental floss and a brush, and after having checked that everything was in place, the final light curing was ensured to the tooth (Fig. 20 - Appendices). There are other cementation protocols if another substrate is present, namely dentin or old composites.

The retraction cord was then removed, occlusion evaluation was checked and finishing and polishing with silicon burs and polishing pastes were the final step.

After completing all the mentioned steps for the tooth 12, everything was repeated (exactly the same way) for the tooth 22 to obtain the final result (Fig.21- Appendices).

The final aesthetic and functional results for both teeth were achieved and met the patient's expectations. A third appointment was scheduled after one month of the procedure.

In this final control appointment, control photographs were taken (Fig. 22 - Appendices), and occlusion evaluation was performed. The patient was extremely pleased with the before and after results, as shown below, mentioning self-esteem improvement.

Figure 1- Initial photograph (from first appointment)

Figure 2 - Final photograph (from the control appointment)

III. DISCUSSION

The type of treatment for microdontia, should be selected based on both functional and aesthetic requirements; the need for extractions; the position of the canines; and the possibility to synchronize restorative and orthodontic treatment. Treatment options can vary from: extraction of the microdontic tooth and orthodontic movement of the canine into the lateral incisor space with re-anatomization of the canine; extraction and placement of a single dental implant or a fixed partial denture or the direct or indirect restoration of conoid lateral incisors to reproduce normal tooth morphology. All these treatment approaches can produce acceptable results (Izgi and Ayna, 2005; Laverty and Thomas, 2016; Hwang *et al.,* 2012).

Regarding conical teeth, the most drastic option is extracting them. Yet, it may be the best option when there is insufficient root support or a malformed root, with subsequent replacement of that tooth with an implant, preparation of adjacent teeth for a fixed partial denture, and/or orthodontic traction of the canines into the edentulous space. When sufficient root support exists, many more treatment options for conoid lateral incisors are available, (Ittipuriphat and Leevailoj, 2013) ranging from conservative techniques such as direct restorations to more invasive techniques such as indirect restorations (Dietschi, 2008).

For peg-shaped lateral incisors, numerous treatment techniques could be indicated, such as: ceramic veneers, crowns, and direct or indirect composite resins (Mittal and Mohandas, 2018).

Restorations with ceramic veneers, or crowns are considered to be more aesthetic than composite restorations. The optical proprieties of vitroceramic optimize aesthetic outcomes, especially in cases where teeth are found discoloured. Also, ceramic is characterized by the colour stability and improved resistance to abrasion compared to resins (Saatwika *et al.,* 2019; Nakamura *et al.,* 2001).

Despite that, their realization requires more appointments and the involvement of a dental technician, which makes its costs much higher. It is also a more invasive and irreversible technique, as some tooth milling is required. In cases of malpositions, ceramic veneers may not be indicated because of the excessive preparation required in order to have an insertion axis, which can expose the dentin tissue (Kallala *et al.,* 2021). In addition, it

presents a greater risk of fracture, as it is a harder material and if replacement is necessary for some reason, it will increase the treatment costs.

Direct restorations of anterior teeth are a viable option in the treatment of conoid lateral incisors, as it is a more conservative, reversible procedure that does not require tooth milling. It is worth mentioning the fact that there are already several composites available on the market with optical and mechanical characteristics very similar to the dental structure and aesthetically unnoticeable. It is a simple and quick procedure, which makes it economical, and in case the patient needs some adjustment or correction of the restorations, they are easily recoverable in the dental office, without great additional costs, giving the patient back the aesthetics and smile harmony (Fahl and Ritter, 2020).
Indirect composite restorations present advantageous physical properties, aesthetic quality, and marginal integrity, which make the composite resin a reliable material for these situations (Saatwika *et al.,* 2019).

In fact, composites used in the realization of indirect restorations are similar in composition to those used in the conventional direct intraoral techniques, as they both have a constituent base with organic matrix, bonding agent, and filler particles (Baratieri and Junior, 2015).

When choosing a direct or indirect treatment approach, the time necessary to complete the technique is an aspect measured by clinicians. It is usual to state that indirect procedures are more valuable than direct procedures, from the point of view of predictability, clinical productivity, and financial gain, as they require less clinical chair time in their execution. However, this statement must be considered only partly correct because it also varies on the type as well as number of restorations that will be fabricated, not to mention the technician. It should be noted that orthodontic treatment often plays a significant role in multidisciplinary aesthetic treatments to correct the position of the teeth and the relationship between the arches, knowledge, and training that the operator must have to perform such procedures (Meijering *et al.*, 1997).

The clinical durability of composite resins seems to be a significant aspect in the choice of the restorative material for both clinicians and patients, when compared with ceramic restorations (Table 1).

	Direct (composite resin)	**Direct-indirect (composite resin)**	**Indirect (ceramics)**
Level of difficulty	Low to intermediate	Intermediate to high	Intermediate to high
Treatment time	Long	Intermediate	Long
Number of appointments	1-2	1-2	2-3
Quality of margins	Moderate	Excellent	Good to excellent
Alteration of form	Yes	Yes	No
Modulation of colour	No	Yes	Yes
Final aesthetics	Excellent	Excellent	Excellent
Longevity	Intermediate to high	Intermediate to high	High
Patient comfort	Intermediate	High	Intermediate to high
Cost to dentist	$	$	$$$
Cost to patient	$	$$	$$$

Table 1. Comparison of direct, direct-indirect, and indirect restorations (Fahl and Ritter, 2020)

Although there are intersections in their clinical indications, it is necessary to contemplate that composite resins and ceramics are distinct materials and their physical and mechanical properties must consequently be evaluated distinctly comparative to the benefits they offer. If the relative longevity of ceramic veneers is compared to that of composite resins, the observed results can differ meaningfully (Peumans *et al.*, 2004).

In this clinical case, ceramic full crowns could be indicated. Yet, as the patient was young, it would be invasive and more expensive compared to composite treatments. Tooth vitality, colour, position, and occlusion must all be well considered in order to opt for the most appropriate therapeutic option (Kallala *et al.*, 2021).

Since the patient presented microdontia and the situation could be improved without any type of dental preparation, it met all the requirements for applying veneers without any tooth reduction by milling (Lowe 2010; Parisini *et al.* 2017).

Otherwise, because of the patients' requirements, which were to improve his aesthetic and self-esteem without expensive or invasive treatments, and due to his clinical characteristics, small conoid teeth (which did not need preparation), the direct-indirect composite veers technique was a minimally invasive solution which allowed the tooth shape correction while respecting the pulp vitality (Fahl and Ritter, 2020).

The direct-indirect restorative technique combines many of the advantages present individually in both the direct and the indirect techniques. Firstly, a direct-indirect restoration is one in which the composite resin is sculpted DIRECTLY on the tooth structure without prior adhesive preparation. Then, after being light activated, it is removed from the tooth, heat tempered, finished, and polished extra orally. Finally, after that, it is adhered INDIRECTLY in the mouth in a single appointment. Also named semidirect, this technique has clinical applications in both anterior and posterior teeth, and its advantages are widely discussed in the literature (Fahl and Ritter, 2020).

As in this technique the restoration is sculpted directly on the tooth surface and removed after its light activation, it can be thermally treated, finished, and polished previously to handling adhesion and luting. Therefore, the subsequent restoration presents enhanced mechanical properties, outstanding aesthetics, as well as unrivalled marginal adaptation and polishing. Moreover, the absence of a laboratory phase eliminates costs arising from this step. Another of the most significant benefits of this technique, is the possibility of modulating the final colour of the restoration with the luting agents, allowing for slight

alterations in the restoration hue, chroma, and value. The direct-indirect technique has a wide range of applications, including prep-less contact lenses and veneers, veneers with preparation (discoloured teeth), fragments, diastema closure, and non-carious cervical lesions, among others (Fahl and Ritter, 2020).

In some circumstances, the correct shape of teeth affected with microdontia or lingually inclined teeth can be reproduced through a thin contact lens-type veneer with only one or two shades. Other times, numerous layers of resins of different shades and opacities are necessary to correct tooth discoloration and accomplish a natural impression (Fahl and Ritter, 2020).

As a final point, according to the authors Fahl and Ritter, 2020: clinical errors are undesirable and unpleasant for both the clinician and the patient, however, this technique gives the possibility to perform corrections more rapidly in the same defective restoration or discard it altogether and perform a totally new one, already contemplating the necessary changes (Fahl and Ritter, 2020).

IV. CONCLUSION

The direct-indirect technique allows the clinician to aesthetically treat compromised microdontic dentition in a creative way, by using composite material, that can be fabricated intraorally, heat-treated to enhance its physical properties, and bonded with resin cements that provide improved shade matching properties. This technique certainly presents solutions for the management of particular clinical situations, however several important requirements for each of the steps must be considered and slight variations depending on the clinical procedure may be presented.

As well as any other developing clinical technique, more research is required to define optimum adhesive protocols for the direct–indirect composite technique, as well as to relate its marginal adaptations and clinical performance more accurately with the more traditional direct composite technique. Regarding the present dissertation, the range of information and cases on the direct-indirect technique, are limited. Thus, there is a great need to carry out more studies with long-term follow-up, to build more concrete evidence for this technique.

As a final point, the aesthetic treatment of anterior teeth involves the knowledge of a wide variety of techniques, materials, anatomical and chromatic characteristics of the teeth. The colour selection is vital to give a natural appearance to the restoration, due to the polychromatism found in natural teeth of the remaining dentition. It is recommended that the dentist is aware of the early diagnosis of dental anomalies, to intervene and recover, through the various treatment options, the function and aesthetics that are often compromised in these patients, thus contributing to improve their quality of life.

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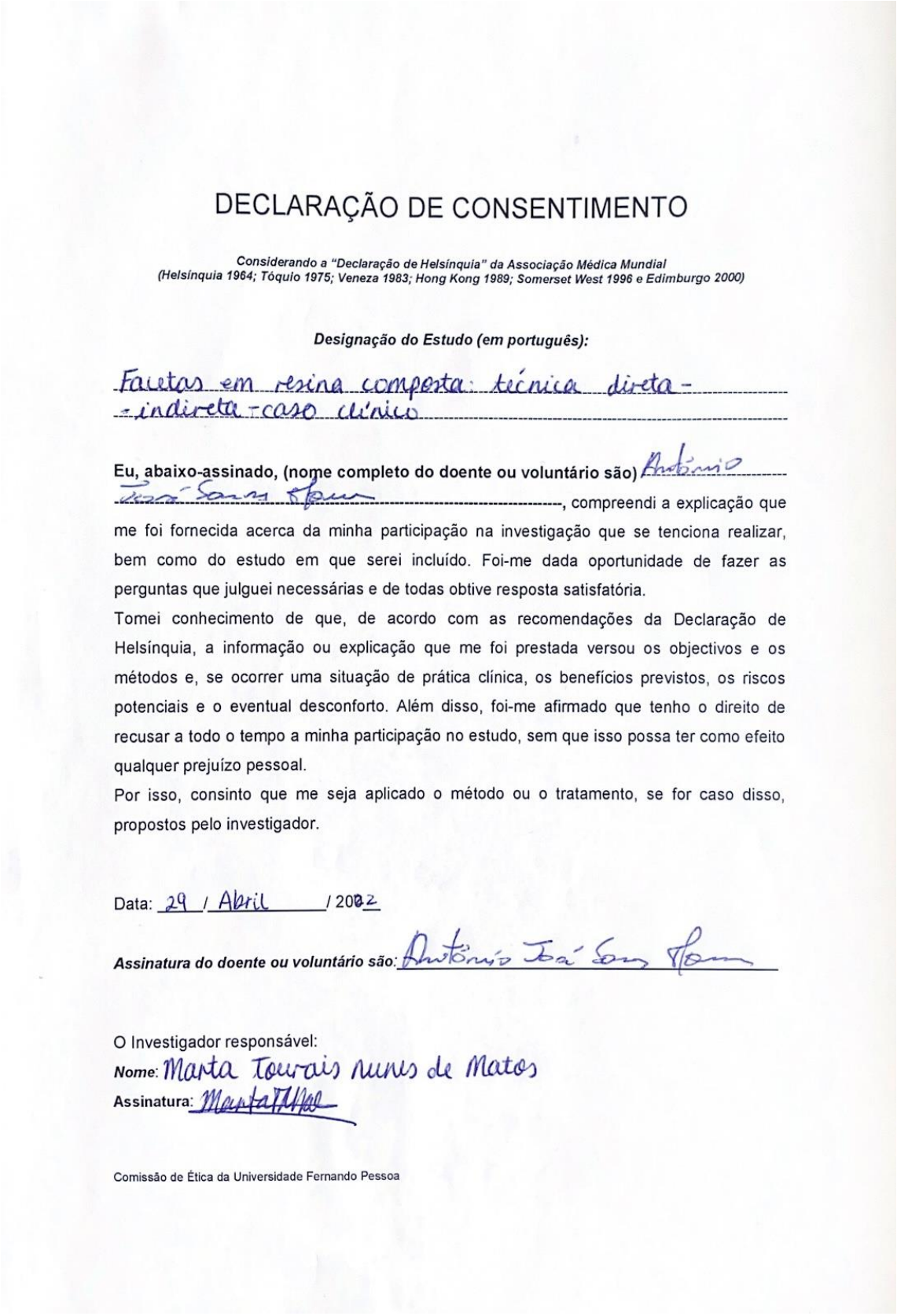
VI. APPENDICES



DECLARAÇÃO DE CONSENTIMENTO

Considerando a "Declaração de Helsínquia" da Associação Médica Mundial
(Helsínquia 1964; Tóquio 1975; Veneza 1983; Hong Kong 1989; Somerset West 1996 e Edimburgo 2000)

Designação do Estudo (em português):

Facetas em resina composta: técnica direta-
-indireta - caso clínico

Eu, abaixo-assinado, (nome completo do doente ou voluntário são) António José Sousa Ramos, compreendi a explicação que me foi fornecida acerca da minha participação na investigação que se tenciona realizar, bem como do estudo em que serei incluído. Foi-me dada oportunidade de fazer as perguntas que julguei necessárias e de todas obtive resposta satisfatória.

Tomei conhecimento de que, de acordo com as recomendações da Declaração de Helsínquia, a informação ou explicação que me foi prestada versou os objectivos e os métodos e, se ocorrer uma situação de prática clínica, os benefícios previstos, os riscos potenciais e o eventual desconforto. Além disso, foi-me afirmado que tenho o direito de recusar a todo o tempo a minha participação no estudo, sem que isso possa ter como efeito qualquer prejuízo pessoal.

Por isso, consinto que me seja aplicado o método ou o tratamento, se for caso disso, propostos pelo investigador.

Data: 29 / Abril / 2022

Assinatura do doente ou voluntário são: António José Sousa Ramos

O Investigador responsável:

Nome: Marta Tourais Nunes de Matos

Assinatura: Marta Matos

Comissão de Ética da Universidade Fernando Pessoa

Figure 3 - Consignment form

Objetivos do estudo:
Este estudo tem como objetivo demonstrar a técnica "directa-indirecta" de aplicação de facetas em resina composta, usadas para modificar a cor e/ou alterar a forma ou posição dos dentes anteriores.

Riscos do estudo:
Trata-se de um procedimento maioritariamente aditivo, pelo acréscimo de resina composta aos dentes naturais, tornando-o uma técnica pouco invasiva e reversível. Em algumas situações pode ter que se proceder a alguns desgastes dentários, nomeadamente na correção de certas posições dentárias, o que poderá trazer alguma sensibilidade transitória ao paciente.

Benefícios da técnica:
A reabilitação de dentes anteriores com facetas através desta técnica, tem alguns benefícios, nomeadamente: Menor custo comparativamente com técnica indireta com cerâmicas; Estética final de grande qualidade; Alteração de cor, forma e posição de dentes em apenas 2 consultas; Boa qualidade de acabamento das margens restauradoras; Conforto do paciente.

Porto, 29 de Abril de 2022

Assinatura do paciente: António José Sousa Flores

Assinatura da Investigadora principal (aluna):

Assinatura da orientadora:

Figure 4 - Clinical case objectives, risks and benefits

AUTORIZAÇAO PARA USO DE IMAGEM

Eu António José Sousa Ramos com CC nº 14537457, autorizo a aluna Marta Tourais Nunes de Matos, e a sua orientadora Prof Doutora Liliana Teixeira , a utilizar as minhas fotografias intra-orais e extra-orais com o propósito exclusivamente científico e educativo, nomeadamente para exposição no projecto de pós-graduação, em publicações de artigos científicos ou exposição em congressos científicos. Esta autorização não me permite obter qualquer direito e/ou remuneração, ao longo do tempo.

Porto, 29 de Abril de 2022

Assinatura do paciente: António José Sousa Ramos

Assinatura da Investigadora principal (aluna): Marta Nunes de Matos

Assinatura da orientadora: Liliana Teixeira

Figure 5 - Image authorization

Universidade Fernando Pessoa

Exma. Senhora
Prof. Doutora Sandra Gavinha
Diretora da FCS

Nº	Data
FCS/MED – 232/21-2	7 de Fevereiro de 2022

Exma. Senhora Professor Doutora,

A Comissão de Ética analisou a ressubmissão do projeto de investigação apresentado por Marta Tourais Nunes de Matos, intitulado "Composite veneers: The direct-indiret technique - Clinical case report" a realizar no âmbito do Mestrado Integrado em Medicina Dentária.

Este estudo tem como finalidade apresentar um caso clínico demonstrativo da técnica de restauração directa-indirecta de dentes anteriores com facetas em compósito.

Após a reapreciação da informação solicitada, a Comissão de Ética considera nada haver a opor à realização do estudo.

A CE informa que é necessária a autorização da Direcção Clínica das CPMD-UFP para que o projeto possa ser iniciado.

Com os melhores cumprimentos.

A Presidente da
Comissão de Ética da UFP

Inês Lopes Cardoso

Fundação Ensino e Cultura "Fernando Pessoa"
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Rua Delfim Maia, 334 - 4200-253 Porto - Portugal
T. +351 22 509 6371 - geral@ess.fernandopessoa.pt

Figure 6 - Ethics committee authorization

DC **Direcção Técnica CPMD** 10:22

Re: Autorização para iniciar projeto de investigação

Para: Marta Tourais Nunes de Matos, Cc: Liliana Teixeira Detalhes

Ex.ma Senhora aluna Marta Matos

Autoriza-se a realização do caso clínico proposto.

A utilização da informação recolhida apenas poderá ser utilizada com os objetivos apresentados e devidamente autorizados.
A responsabilidade da supervisão deste processo é da Prof. Doutora Liliana Teixeira
As publicações resultantes desta têm de estar obrigatoriamente afiliadas à UFP:

FP-I3ID, CPMD FCS, Universidade Fernando Pessoa, Porto - Portugal.

Com os melhores cumprimentos,
Sandra Gavinha
Direção Técnica CPMD

Figure 7 - Clinical director authorization

Figure 8a and Figure 8b - Intraoral photographs of both lateral incisors

Figure 9 - Working cast/model after impression of both jaws with Hydrogum – Zhermack®

Figure 10 - Diagnostic waxing on the cast model

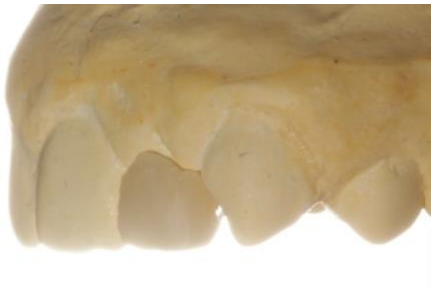

Figure 11 - Simulation of the direct-indirect technique on the cast model

Figure 12 - Silicone key try-in

Figure 13 - Try simulated veneer (mock-up substitute)

Figure 14 - Shade selection (in colour and black & white) to evaluate the hue, chroma and value - Vita scale A3

Figure 15 - Application of a mechanical anti-adherent barrier (glycerine)

Figure 16 - Direct restoration with the incremental technique. Photopolymerization with the Woodpecker LED-B Curing Light® (1000mW/cm2 – 1700mW/cm2 of power) of each layer for 20s. Removal with a probe

Figure 17 - Heat tempering using a microwave, selecting 450-500W power for 4 minutes

Figure 18 - Enamel abrasion with air abrasive aluminium oxide (Ultra-blaster from Ultradent products Inc ®)

Figure 19 - Bonding of the surface after etching with 37% phosphoric acid for 30 seconds. A thin layer of an etch-and-rinse primer (Optibond FL- Kerr®), was applied followed by the adhesive layer, and light cured for 20 secs.

Figure 20 - Final light curing with the Woodpecker LED-B Curing Light® (1000mW/cm2 – 1700mW/cm2 of power) after placing glycerine

Figure 21 - Final photograph

Figure 22 - 1 month control photograph