UNIVERSIDADE FEDERAL DOS VALES DO
JEQUITINHONHA E MUCURI

DHELFESON WILLYA DOUGLAS DE OLIVEIRA

EFEITO DO RECOBRIMENTO RADICULAR SOBRE A HIPERSENSIBILIDADE DENTAL, ESTÉTICA E QUALIDADE DE VIDA – UM ESTUDO CLÍNICO

DIAMANTINA - MG
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Dissertação apresentada à Universidade Federal dos Vales do Jequitinhonha e Mucuri, como parte dos requisitos do Programa de Pós-Graduação em Odontologia, para obtenção do título de *Mestre*.

Orientadora: Profa. Dra. Patricia Furtado Gonçalves
Co-orientadora: Profa. Dra. Olga Dumont Flecha

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Ficha Catalográfica
Preparada pelo Serviço de Biblioteca/UFVJM
Bibliotecária: Adriana Kelly Rodrigues – CRB:6ª Nº: 2572

O48e
2013

Oliveira, Dhelfeson Willya Douglas de
Efeito do recobrimento radicular sobre a hipersensibilidade dental, estética e qualidade de vida – um estudo clínico./ Dhelfeson Willya Douglas de Oliveira – Diamantina: UFVJM, 2013.

81p.

Dissertação (Mestrado - Curso de Pós-Graduação em Odontologia) - Universidade Federal dos Vales do Jequitinhonha e Mucuri.

Orientador: Profa. Dra. Patricia Furtado Gonçalves
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Inclui bibliografia

1. Retração gengival. 2. Estética. 3. Hipersensibilidade dental. 4. Qualidade de vida. 5. Cirurgia plástica. I. Gonçalves, Patricia Furtado. II. Flecha, Olga Dumont. III. Título.

CDD – 617.6

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APROVADA em 01/02/2013.

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DIAMANTINA - MG
2013

DEDICATÓRIA

Dedico este trabalho a Deus, o alfa e o ômega, a quem tudo pertence.

E aos meus pais, João Pedro e Júlia, exemplos de honestidade, força de vontade e amor. Meus eternos mestres!

AGRADECIMENTOS

A Deus, por me conceder saúde e disposição para realizar este trabalho. Até aqui, o Senhor me ajudou.

Aos meus pais e irmãos por todo apoio e compreensão durante esta jornada. Não há palavras suficientes para dizer tudo o que vocês representam para mim.

Aos amigos, pelos momentos de convivência e compreensão.

Às professsoras Patricia e Olga, que me orientaram sabiamente. Pelo apoio no desenvolvimento deste trabalho e ajuda no crescimento profissional e pessoal.

Aos colegas e professores do mestrado, em especial às professoras Maria Letícia e Fernanda, pelos momentos de aprendizado e amizade.

Aos meus pacientes e funcionários que contribuíram para o desenvolvimento deste trabalho.

Ao Programa de Pós Graduação por todo apoio.

"A tarefa não é ver o que ninguém viu ainda,
mas pensar o que ninguém pensou sobre
algo que todos veem."

(Arthur Schopenhauer)

RESUMO

OLIVEIRA, Dhelfeson Willya Douglas de. Universidade Federal dos Vales do Jequitinhonha e Mucuri, fevereiro de 2013. 81p. **Efeito do recobrimento radicular sobre a hipersensibilidade dental, estética e qualidade de vida – um estudo clínico**. Orientadora: Patricia Furtado Gonçalves. Co-orientadora: Olga Dumont Flecha. Dissertação (Mestrado em Odontologia).

A retração gengival é o deslocamento apical da margem gengival em relação à junção cemento-esmalte, levando à exposição radicular. Esta condição clínica pode causar hipersensibilidade dentinária cervical (HSDC), comprometendo a estética e interferindo na qualidade de vida. O objetivo deste trabalho foi avaliar o efeito do recobrimento radicular na HSDC, estética e qualidade de vida de pacientes portadores de retrações gengivais classe I e II de Miller. O objetivo secundário foi avaliar os fatores etiológicos de retração gengival. Vinte e dois pacientes com idade variando entre 18 a 50 anos apresentaram 25 retrações gengivais em dentes caninos e pré-molares superiores sensíveis. Os seguintes parâmetros clínicos foram avaliados: largura e altura das retrações gengivais nas faces vestibulares foram medidas com um compasso de ponta seca e aferidas com o auxílio de um paquímetro. Também avaliou-se a altura e espessura da gengiva queratinizada, índice de placa, sangramento à sondagem, profundidade de sondagem e nível de inserção clínica. A HSDC foi avaliada utilizando estímulos evaporativo (jato de ar) e térmico (Endo-Ice®) por 5 segundos. Para mensuração da hipersensibilidade utilizou-se escala de avaliação numérica. A satisfação estética e qualidade de vida foram avaliadas pelos pacientes e pelo questionário OHIP-14 modificado, respectivamente. A etiologia das retrações gengivais também foi investigada através de anamnese e exame clínico. Todas as retrações foram tratadas através da técnica cirúrgica de retalho posicionado coronalmente associado ao enxerto conjuntivo subepitelial. Os parâmetros clínicos foram avaliados no *baseline* e 3 meses após o tratamento. A média de recobrimento radicular, após 90 dias, foi de 67,90%. Completo recobrimento radicular foi alcançado em 44% dos dentes tratados. Foi obtido redução estatisticamente significativa na HSDC ($p < 0,001$), na melhora da qualidade de vida ($p < 0,001$), e melhora dos parâmetros periodontais após 3 meses. Todos pacientes ficaram satisfeitos com a estética alcançada. Houve correlação entre qualidade de vida e estética. Não houve correlação entre a porcentagem de recobrimento radicular e HSDC estimulada por ar ($p = 0,256$) ou frio ($p = 0,563$). Houve correlação entre a dimensão deficiência física do OHIP-14 e quantidade de tecido queratinizado ($p = 0,010$) e recobrimento radicular ($p = 0,035$). Conclui-se que o recobrimento radicular apresentou um efeito positivo na HSDC e qualidade de vida, com melhora dos parâmetros clínicos periodontais. O principal fator etiológico identificado para a retração gengival foi o trauma devido à escovação.

Palavras-chave: retração gengival, estética, hipersensibilidade dentinária, qualidade de vida, cirurgia plástica.

ABSTRACT

OLIVEIRA, Dhelfeson Willya Douglas de. Universidade Federal dos Vales do Jequitinhonha e Mucuri, fevereiro de 2013. 81p. **Effect of root coverage on dental hypersensitivity, esthetics and quality of life - a clinical study.** Advisor: Patricia Furtado Gonçalves. Committee member: Olga Dumont Flecha. Dissertation (Master`s degree in Dentistry).

Gingival recession is the apical displacement of the gingival margin in relation to the cement-enamel junction, leading to root exposure. This condition may cause cervical dentin hypersensitivity (CDH), compromising the esthetics and interfering with quality of life. The objective of this study was to evaluate the effect of root coverage on the CDH, aesthetics and quality of life of patients with gingival recessions class I and II Miller. The secondary aim was to investigate the etiologic factors of gingival recessions. Twenty-two patients aged 18-50 years presented 25 gingival recessions in sensitive upper canines and premolars. The following parameters were assessed: width and height of the gingival recessions were assessed with a compass needle point and measured with a caliper. It was assessed the height and thickness of keratinized gingiva, plaque index, bleeding on probing, probing depth and clinical attachment level. The CDH was assessed by evaporative (air jet) and thermal (Endo-Ice®) stimuli for 5 seconds. Dentin hypersensitivity was measured using a numerical scale. The aesthetic satisfaction and quality of life were evaluated by the patients and the OHIP-14 form, respectively. The gingival recession etiology was also investigated by anamnesis and clinical exam. All gingival defects were surgically treated by the coronally advanced flap technique combined with sub-epithelial connective tissue graft. All clinical parameters were evaluated at baseline and 3 months after treatment. The mean root coverage after 90 days was 67.90%. Complete root coverage was achieved in 44% of the treated teeth. There was a statistically significant decrease in CDH ($p < 0.001$), improvement in quality of life ($p < 0.001$), and improvement in periodontal parameters after 3 months. All patients were satisfied with the aesthetics achieved. There was a correlation between quality of life and aesthetics. The percentage of root coverage was not correlated with the CDH stimulated by air ($p = 0.256$) or cold ($p = 0.563$). There was a correlation between the disability dimension of OHIP-14 form and the amount of keratinized tissue ($p = 0.010$) and root coverage ($p = 0.035$). It was concluded that the root coverage had a positive effect on CDH and quality of life. The clinical periodontal parameters were improved. In addition, it was noted that the main etiologic factor identified for the gingival recession was trauma due to brushing.

Keywords: gingival recession, aesthetic, dentin hypersensitivity, quality of life, plastic surgery.

SUMÁRIO

1. INTRODUÇÃO GERAL

Uma das causas da procura por atendimento odontológico é a presença de retração gengival. Esta se caracteriza pelo deslocamento apical da margem gengival em relação à junção cemento-esmalte, levando à exposição radicular. A inflamação presente no tecido gengival, provocada pelo biofilme ou escovação vigorosa é considerada fator etiológico primário para o desenvolvimento das retrações gengivais (KASSAB & COHEN, 2003).

A retração gengival aparece de forma isolada ou generalizada, e pode estar associada com fatores iatrogênicos locais, pouca gengiva inserida, mau posicionamento dentário, inserção anômala de freios e bridas, vestíbulo raso, tábua óssea fina, presença de fenestrações e deiscências ósseas, ou combinações desses (NARANG *et al.,* 2011).

Esta condição clínica é considerada um problema muito comum, tanto em populações com boa higiene oral, como em pessoas com higiene oral precária, sem predileção por faixa etária (MATAS *et al.,* 2011).

Além do problema estético, que pode levar o paciente a desenvolver desconforto psíquico de sua imagem, a retração gengival pode provocar hipersensibilidade dentinária, dificulta uma higiene oral adequada e deixa os dentes susceptíveis a lesões cariosas e não cariosas. Por isso, este problema pode interferir diretamente na qualidade de vida do paciente (FURLAN *et al.,* 2008).

A cirurgia plástica periodontal tem sido indicada tanto para recuperação da estética, quanto para redução da hipersensibilidade dentinária cervical decorrente das retrações gengivais (CHAMBRONE *et al.*, 2010). Sendo assim, justifica-se a busca de uma melhor compreensão do efeito terapêutico de recobrimento radicular sobre hipersensibilidade dental, estética e qualidade de vida dos pacientes.

1.1. Etiologia das Retrações Gengivais

A retração gengival (RG) é definida como exposição da superfície radicular causada por um deslocamento apical da margem gengival em relação à junção cemento-esmalte (JCE) (CHAMBRONE *et al*., 2010). Pode ser decorrente da perda de fibras conjuntivas do periodonto de proteção e sustentação do dente, acompanhada de reabsorção da crista óssea alveolar e necrose do cemento, originários de uma inflamação presente no tecido conjuntivo (KASSAB & COHEN, 2003).

Estudos sugerem que a partir de uma inflamação localizada, o epitélio do sulco pode proliferar em direção vestibular, invadir o cório gengival e anastomosar-se com o epitélio oral. A "invasão" epitelial resulta em uma diminuição da área ocupada pelo conjuntivo, fazendo com que a porção marginal do epitélio sofra necrose pela falta de nutrição (CHRYSANTHAKOPOULOS, 2011). A descamação sem substituição por novas células, causa diminuição da superfície epitelial, produzindo clinicamente retração gengival.

Tem-se como fatores desencadeantes da inflamação, primariamente, o trauma por escovação e a presença do biofilme. Como fatores predisponentes incluem-se: outros tipos de trauma sobre o tecido gengival, pouca espessura e altura de gengiva queratinizada, fatores iatrogênicos locais, inserção anômala de freios e bridas, mau posicionamento dental, vestíbulo raso, tábua óssea fina ou presença de fenestrações e deiscências ósseas. A etiologia das retrações é, portanto, multifatorial (NARANG & GUPTA, 2011, PATEL *et al*., 2011).

1.2. Hipersensibilidade Dentinária Cervical

A exposição da superfície radicular devido à retração pode causar hipersensibilidade dentinária cervical (HSDC), provocada particularmente por alimentos frios e ácidos, e pelo contato com a superfície dentinária exposta durante escovação ou mastigação (PINI-PRATO *et al*., 2010).

A HSDC se caracteriza como resposta dolorosa a um estímulo sensorial provocado na dentina exposta, na região cervical. Apresenta-se de forma aguda, súbita e de curta duração, podendo inibir a manutenção dos cuidados de higiene bucal (TRUSHKOWSKY & OQUENDO, 2011). A HSDC pode causar desconforto bucal, gerando uma série de inconvenientes na vida psicossocial do indivíduo, e levando-o a restrições alimentares (BOIKO *et al*., 2010; GIBSON *et al*., 2010).

Diversas teorias foram desenvolvidas a fim de explicar o mecanismo da HSDC (BAMISE & ESAN, 2011). A teoria hidrodinâmica de Brännström (1992), mais aceita atualmente, atribui à HSDC um movimento mínimo de fluido no interior do túbulo dentinário, provocando a movimentação do líquido intratubular. Este movimento estimula mecanicamente as fibras dentinárias da dor (fibras-α) presentes na parede pulpar, as quais funcionam como um receptor, fazendo com que os estímulos aplicados na superfície dentinária sejam interpretados como dor.

Os estímulos na dentina exposta podem ser classificados como mecânicos (escovação dental, forças oclusais não balanceadas, raspagem e alisamento radicular, cirurgia periodontal e preparos cavitários), térmicos (diferença térmica dos alimentos, choques rápidos de temperatura e jatos de ar) e químicos (estímulos provocados pela alteração do pH originados da ingestão de certos alimentos e biofilme bacteriano) (CORONA *et al*. 2003; LITKOWSKI *et al*., 2010; HE *et al*. 2011).

1.3. Tratamento Cirúrgico das Retrações Gengivais e Hipersensibilidade Dentinária Cervical

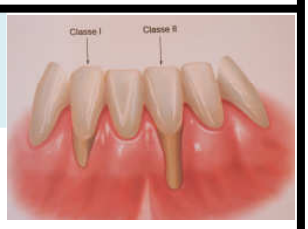
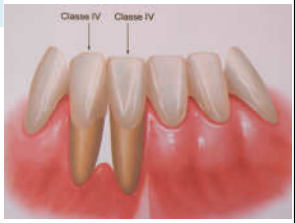
A compreensão dos diferentes estágios da retração gengival é importante para se planejar procedimentos de cobertura radicular (NEWMAN *et al*., 2012) sendo difícil de antecipar o seu sucesso, o qual depende de alguns fatores tais como tipo de retração, localização e técnica utilizada (KASSAB & COHEN, 2002).

Miller (1985) descreveu quatro tipos de retrações dos tecidos marginais, onde a altura das papilas adjacentes e o nível da retração são considerados para estabelecer a indicação e o prognóstico de recobrimento radicular. Essa classificação é baseada na altura da retração, sua relação com a junção mucogengival e quantidade de osso interproximal (Quadro 1).

Os sintomas da HSDC podem regredir sem tratamento. As terapias se estabelecem de acordo com a gravidade do problema, podendo ser realizadas com substâncias que visam à obliteração dos túbulos dentinários (flúor, verniz, cianoacrilato, resina), formação de *smear-layer* na superfície dentinária (abrasão e polimento dental), estimulação da produção de dentina reparadora/esclerótica (aplicação de laser de baixa intensidade, aplicação de cimento de hidróxido de cálcio ou cimento de ionômero de vidro), ou dessensibilizantes (nitrato de potássio, sulfato de magnésio) (BAMISE & ESAN, 2011).

O tratamento cirúrgico das retrações visa além de restabelecer a posição fisiológica da gengiva, evitar o aparecimento de HSDC, riscos de cáries radiculares, lesões de abrasão e erosão e alteração da topografia marginal (OATES *et al*., 2003; CHAMBRONE *et al*., 2009). Porém, é necessário que, antes da intervenção terapêutica, sejam removidas as suas possíveis causas e/ou fatores contribuintes (ALANI *et al*., 2011).

As técnicas de cirurgia plástica periodontal, que objetivam a correção dos defeitos de morfologia, posição e dimensão dos tecidos gengivais adjacentes aos dentes, tem sido indicadas para correção das retrações (ROCUZZO *et al*., 2002; CHAMBRONE *et al*., 2010). Segundo Miller (1985), as retrações classificadas como Classe I e II apresentam uma maior possibilidade de recobrimento total da superfície radicular exposta, quando submetidas ao procedimento de cobertura radicular. As retrações Classe III e IV já não possuem bom prognóstico para cobertura radicular completa.

Classe	Característica	Prognóstico de Recobrimento	Esquema
I	A retração não atinge a linha mucogengival, sem perda óssea proximal	Total	
II	A retração atinge ou ultrapassa a linha mucogengival, sem perda óssea proximal	Total	
III	A retração atinge ou ultrapassa a linha mucogengival. Há perda de osso interproximal e o tecido gengival proximal é apical à junção amelocementária, permanecendo coronária à base da retração, ou então há uma malposição	Parcial	
IV	A retração atinge ou ultrapassa a linha mucogengival. Os tecidos proximais estão situados no nível da base da retração e essa implica em mais de uma face do dente.	Nenhum	

Quadro 1 - Representação esquemática da classificação das retrações gengivais proposta por Miller (1985) e seu prognóstico de recobrimento.

Várias técnicas são descritas na literatura com a finalidade de se obter recobrimento radicular, dentre elas: a técnica do envelope (RAETZKE, 1985), o retalho semilunar posicionado coronalmente (TARNOW, 1986), os enxertos pediculados (HARRIS, 1992; NELSON, 1987) e retalho reposicionado coronalmente (BERNIMOULIN *et al*., 1975)

associado ou não a enxertos de tecido conjuntivo subepitelial (LANGER & CALAGNA, 1982; LANGER & LANGER, 1985).

Acredita-se que o tecido conjuntivo presente no enxerto gengival desenvolva importante papel no direcionamento da expressão epitelial, sendo capaz de induzir a queratinização das células epiteliais que migram do tecido adjacente não queratinizado (HSIEH *et al*. 2010). Este fato ocorre porque as características do tecido conjuntivo se mantêm idênticas à da região doadora, ou seja, como o enxerto é removido de uma região onde o tecido conjuntivo suporta um epitélio queratinizado, sua função permanece a mesma na região receptora e, assim, culmina na queratinização das células que repovoam sua superfície (LINDHE & NYMAN, 1980).

A especificidade do epitélio gengival é determinada por fatores genéticos inerentes ao tecido conjuntivo. Contudo, para que ocorra sucesso em longo prazo com a utilização de enxerto conjuntivo subepitelial é importante que ocorra sua adequada fixação primária, revascularização e íntimo contato enxerto/receptor (LINDHE *et al*., 2010). Outro fator importante para o sucesso é a remoção de excessos de tecidos epitelial, adiposo e glandular do enxerto, evitando interferências na indução da queratinização e revascularização (CAMARGO *et al*., 2001).

Para avaliar a influência do colar de epitélio na técnica proposta por Langer & Langer (1985), Bouchard *et al*. (1994) realizaram um estudo clínico randomizado. O grupo controle foi composto de 15 retrações tratadas com o enxerto conjuntivo subepitelial (ECS) com a permanência do colar epitelial, sem condicionamento radicular. O grupo teste foi composto de 15 retrações que receberam o ECS sem o colar epitelial, com condicionamento da superfície radicular pelo ácido cítrico. Não houve diferença estatisticamente significante entre os grupos para o recobrimento radicular alcançado. O recobrimento radicular médio

atingido pelos dois grupos foi de 69,7%. O grupo em que foi removido o colar epitelial demonstrou melhor estética segundo dois avaliadores independentes.

Raetzke (1985) propôs uma nova técnica de recobrimento radicular utilizando um retalho tipo “envelope” associado com enxerto conjuntivo subepitelial. Os resultados de 12 sítios com retração gengival em 10 pacientes mostraram um percentual de recobrimento radicular de 80%. Completo recobrimento radicular foi atingido em 41,7% dos casos. Houve um ganho de 3,5mm de tecido queratinizado.

Cordioli *et al*. (2001) utilizaram o ECS para o tratamento de retrações gengivais classe I e II de Miller em 21 pacientes, variando o tipo de retalho utilizado – técnica do envelope ou retalho posicionado coronariamente (RPC). Após 12 a 18 meses de acompanhamento, a média percentual de recobrimento radicular foi de 89,6% para a técnica do envelope e 94,7% com o RPC. Completo recobrimento radicular foi de 64% para a técnica do envelope e 81% para a técnica do ECS com RPC. Essas diferenças não foram estatisticamente significantes. A técnica do envelope aumentou a faixa de tecido queratinizado de 1,4mm para 4,5mm, enquanto a técnica do ECS com RPC aumentou de 2,0mm para 2,7mm, com diferenças estatisticamente significantes.

Em uma revisão sistemática (Chambrone *et al*., 2008), foram identificados e analisados 23 ensaios clínicos que compararam o efeito do tratamento de defeitos de retração com enxerto conjuntivo subepitelial versus outros procedimentos. Os autores reportaram que este tipo de enxerto aumenta significativamente a previsibilidade de recobrimento e a consideraram como padrão-ouro para tratamento cirúrgico de retração gengival. Além disso, esta revisão alerta para necessidade de estudos que foquem em resultados centrados no paciente.

1.4. Estética e Qualidade de Vida

Um sorriso é considerado uma saudação universal e amigável em todas as culturas, e na sociedade moderna, é uma das mais importantes habilidades de comunicação interativa que uma pessoa tem (HU *et al*., 2012). Problemas periodontais, como a retração gengival em áreas estéticas, podem ter uma influência negativa nos hábitos das pessoas e mesmo desencorajá-las a expressar as emoções positivas como um sorriso (ALANI *et al*., 2011).

Um sorriso atraente pode ter um impacto distinto sobre o psicossocial de uma pessoa, bem-estar e autoestima (HU *et al*., 2012). A análise do sorriso é baseada na inter-relação entre os lábios, os dentes e o seu contorno por tecido mole o qual é um elemento chave de diagnóstico e planejamento em tratamento odontológico estético (CHARRUEL *et al*., 2008; KURTZMAN, 2012). A odontologia aprimora suas técnicas a fim de promover um visual mais agradável para atender as exigências dos pacientes e clínicos (IŞIKSAL *et al*., 2006). Há uma crescente procura pela estética gengival, também chamada “estética rosa”, a qual desempenha um papel cada vez mais importante no tratamento odontológico (BELSER *et al*., 2009; RONAY *et al*., 2011).

Qualidade de vida é considerado um fator subjetivo, multidimensional e inclui as percepções individuais sobre o estado físico, psicológico e social. A qualidade de vida relacionada à saúde bucal (QV-SB) é definida como a parte da qualidade de vida de uma pessoa que é afetada pelo status de saúde bucal. Especificamente, ela compreende como a saúde oral afeta a fisiologia de uma pessoa, como: mastigação, mordida, fala, experiências de dor / desconforto e socialização (PATEL *et al*., 2008). Os componentes psicológico e social dos questionários de QV-SB estão mais relacionados à aparência dos dentes e a forma de auto avaliação do sorriso (LAWRENCE *et al*., 2008).

Nesta perspectiva, a retração gengival pode exercer importante papel na qualidade de vida (ALANI *et al*., 2011). Sua condição antiestética pode causar preocupação excessiva no

que diz respeito à aparência física, levando à um significante stress e/ou impacto nas atividades diárias (PATEL *et al*., 2008).

2. ARTIGOS

2.1. Is surgical root coverage effective for the treatment of cervical dentin hypersensitivity? - A systematic review

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Douglas de Oliveira DW, Oliveira-Ferreira F, Flecha OD, Gonçalves PF. Is Surgical Root Coverage Effective for the Treatment of Cervical Dentin Hypersensitivity? - A Systematic Review. J Periodontol. 2012 May 1. [Epub ahead of print]. (doi:10.1902/jop.2012.120143).

ABSTRACT

Background: Cervical dentin hypersensitivity is characterized by tooth pain arising from root exposure. **Aim:** The aim of the present systematic review was to survey the literature on the efficacy of surgical root coverage techniques at reducing cervical dentin hypersensitivity in cases of gingival recession. **Methods:** An online electronic search was performed in the Pubmed, Web of Science and Cochrane Library databases. Randomized clinical trials dating from the inception of the respective databases through to November 2011 were selected. Studies addressing clinical parameters of periodontal plastic surgery outcomes and variables related to cervical dentin hypersensitivity in patients aged 18 years or older were included. The studies were evaluated by two independent reviewers. For each article, methodological quality, size effect, the periodontal parameters measured, study design, methods and results

were analyzed. **Results:** Nine relevant articles were analyzed in the present review. A decrease in cervical dentin hypersensitivity was observed after periodontal surgery for root coverage. The risk of bias was considered low in two studies and the size effect was considered large in one study. **Conclusion:** There is not enough scientific evidence to conclude that surgical root coverage procedures predictably reduce cervical dentin hypersensitivity. Well-conducted clinical trials are needed to establish scientific evidence that allows periodontists to indicate root coverage as treatment for cervical dentin hypersensitivity.

KEYWORDS: Dentin hypersensitivity, tooth root/surgery, gingival recession/surgery, review, clinical trial

INTRODUCTION

Cervical dentin hypersensitivity (CDH) is a common clinical condition reported to affect 15% to 74% of the adult population.[1-4] CDH is characterized by tooth pain arising from exposed dentin in response to chemical, thermal, tactile, evaporative or osmotic stimuli that cannot be ascribed to any other form of dental defect or pathology.[5] The main symptom is sharp, short, well-localized pain.[6]

The hydrodynamic theory is the most widely accepted for explaining the mechanism of CDH.[1,4] This theory postulates that rapid shifts in the fluids within the dentinal tubules following the application of a stimulus result in the activation of sensory nerves in the pulp/inner dentin region of tooth, leading to pain.[1,4]

Dentin hypersensitivity is one of the most painful and least predictably treated chronic conditions in dentistry.[7] The approaches used in the treatment and prevention of CDH are tubular occlusion and/or the blockage of nerve activity.[4,8] Studies of adequate methodological quality have been conducted to evaluate the effectiveness of laser therapy,[9,10] oxalates[11,12] and agents at occluding dentinal tubules.[13,14]

Surgical root coverage is another form of treatment for CDH and is classified as a soft tissue pedicle graft and free soft tissue graft.[15] There are a large number of periodontal plastic surgery procedures for covering the exposed root surface, including a semilunar flap,[16] pedicle graft[17,18] or coronally advanced flap,[19] which may be combined with a subepithelial connective tissue graft.[20,21]

Surgical treatment occludes the exposed dentinal tubules and offers the benefit of the esthetic improvement in the sensitive areas associated with gingival recessions.[22,23] However,

the efficacy of surgical treatment for this condition is not well defined in the literature due to factors such as sample size and heterogeneity as well as differences in study designs, techniques used for root coverage, follow-up and the assessment of CDH.

The aim of the present systematic review was to survey the literature regarding the efficacy of surgical root coverage techniques at reducing cervical dentin hypersensitivity in cases of gingival recession.

METHODS

Focus Question

In patients with Miller's Class I and II gingival recession, do surgical root coverage procedures result in reduction in cervical dentinal hypersensitivity?

Search strategy

The studies included in this systematic review were obtained through searches of the following electronic databases:

- Pubmed/Medline
- Web of Science
- Cochrane Library

The keywords were searched in Health Sciences Descriptors (DeCs) and Medical Subject Headings (MeSH) and the following terms were used: (dentin hypersensitivity* OR cervical dentin hypersensitivity* OR dentin sensitivity*) AND (gingival recession* OR gingival recession therapy* OR gingival recession treatment* OR root coverage).

To identify studies of interest for this review, a general search strategy was adapted to the characteristics of each database. The references contained in all studies and systematic reviews included were checked for additional trials. The databases were searched for articles and abstracts published in English, Spanish and Portuguese.

Study selection

For this systematic review, randomized clinical trials (RCTs) meeting the inclusion criteria and dating from the inception of the respective databases through to November 2011 were selected. Inclusion was based on an analysis of the title and abstract of studies with regard to the eligibility criteria listed below.

Type of study

Randomized clinical trial meeting the following criteria: 1) evaluation of clinical parameters of periodontal plastic surgery outcome and 2) related CDH parameters

Participants

Participants aged 18 years or older presenting with CDH stemming from root surface exposure

Type of intervention

The surgical interventions of interest were those aimed at root coverage, such as guided tissue regeneration, enamel matrix protein, free gingival graft, laterally positioned flaps (LPF), coronally positioned flaps (CAF), subepithelial connective tissue grafts alone or combined with LPF or CAF, semilunar flaps and acellular dermal matrix grafts.

Exclusion criteria

RCTs clearly not meeting the inclusion criteria were excluded.

Types of outcome measures

Primary outcomes: Changes in reported pain/hypersensitivity symptoms pre- and post-treatment in response to assessment parameters (thermal, tactile, evaporative and electrical stimuli) or in the patient's subjective evaluation of pain/hypersensitivity during routine activities.

Secondary outcomes: Impact of oral health on quality of life, occurrence of adverse effects (yes/no) and postoperative complications (yes/no).

Review method

The study selection process was performed by two reviewers (DWDO and PFG) in two phases. In the first phase, the two reviewers independently identified all relevant studies through an electronic search of the titles based on the inclusion criteria. In the second phase, the preselected studies were analyzed by the same two authors. When necessary, the authors of the RCTs were contacted by email to clarify issues related to the trials. Disagreements were resolved through a consensus among the two reviewers and a third reviewer (ODF). Each researcher qualitatively assessed the studies using an evaluation form. Data were collected on the following items: author, year of publication, parameters measured, study design, methods and results regarding CDH.

A methodological quality assessment of the studies was performed based on the revised recommendations of the Consolidated Standards of Reporting Trials statement[24] and a previous systematic review.[25] The criteria used are listed in Table 1. The risk of bias was estimated for each selected RCT based on the Cochrane Handbook for Systematic Reviews of Interventions:[26] low risk of bias (when all criteria were met), moderate risk of bias (when ≥ 1 criterion was partially met), high risk of bias (when ≥ 1 criterion was not met).

Table 1. Variables[§] used to assess the quality of the RCTs included	
Description	**Score**
Sample-size calculation, estimating the minimum number of participants required to detect a significant difference among compared groups	0 = did not exist/not mentioned/not clear 1 = was reported but not confirmed 2 = reported and confirmed
Allocation concealment	0 = inadequate 1 = possibly adequate 2 = clearly adequate
Randomization	0 = inadequate 1 = possibly adequate 2 = clearly adequate
Losses (specified reasons for withdrawals and dropouts in each study group)	0 = no/not mentioned/not clear 1 = yes/no withdrawals or dropouts occurred
Blinding of assessors	0 = no 1 = unclear/not complete 2 = yes
Appropriate statistical analysis	0 = no 1 = unclear/possibly not the best method applied 2 = yes

Data Analysis

The data concerning the observation of CDH presented in the RCTs were compiled using software[‡] for statistical analysis. The presence/absence of CDH was coded "0" and "1". The chi-square test was used to compare the frequency of CDH before and after surgery. To check the magnitude of the differences obtained between the pre- and post-treatment periods, the effect size was analyzed for each study. The effect size is an additional measure to the traditional statistical test of the null hypothesis, the aim of which is to determine the clinical significance of the effect found and is not limited to dichotomous (significant or non-significant) results. Thus, effect size analysis allows the identification of whether the observed differences are small, moderate or large. The effect size for the chi-square test was then calculated (w). For such, the model proposed by Cohen (1988)[27] was employed, which is represented by the following equation: $w = \sqrt{\frac{X^2}{N}}$. The w coefficient ranges from -1 to +1 and the results were categorized as having a small (w = 0.1), medium (w = 0.3) or large (w = 0.5) effect.[27]

RESULTS

After eliminating duplications, the electronic search yielded 155 potentially relevant references. In the first stage of study selection, 131 publications were excluded following the examination of the title and abstract. The full texts of the remaining 24 articles were read. Six

articles were excluded in this second stage due a lack of CDH evaluation.[28-33] Three articles were excluded because the CDH was not reported at baseline or in the postoperative period.[34-36] Five articles were excluded for not being conducted as an RCT.[37-41] Among the ten remaining RCTs, one reported the treatment of patients younger than 18 years and was therefore excluded.[42] Thus, a total of nine studies met the selection criteria and were qualified for the final analysis (Figure 1).[43-51]

Six RCTs were conducted in Brazil,[45-48,50,51] two in Italy[43,49] and one in the United States.[44] Seven studies were conducted with a split-mouth design[43-48,51] and two were conducted with a parallel group.[49,50] Miller Class I was the most common gingival recession treated in the RCTs.[43,45-51] All clinical trials assessed in this review used coronally positioned flap variants.[43-51] The main characteristics of the nine studies are summarized in Table 2.

CDH was assessed using patient opinions in six studies[45-48,50,51] and with evaporative stimuli in two studies.[44,49] One RCT did not mention the method employed to assess dentin sensitivity.[43] CDH was measured as present or absent in six studies[43,46,47,49-51] and on a qualitative scale in the other RCTs[44,45,48] (Table 2).

Two RCTs did not mention the sample size.[43,48] All studies presented appropriate statistical analysis.[43-51] The risk of bias was considered low in two studies[44,49] and high in the other RCTs assessed[43, 45-48,50,51] (Table 3).

A reduction in CDH was reported in all studies reviewed.[43-51] The mean percentage of decreased dentin hypersensitivity was 77.83% (Table 4). No study correlated the decrease in CDH with the root coverage procedure.

Postoperative complications were reported in four studies. The findings of these subjective evaluations included pain, swelling, bleeding, bruising and inflammation.[44,45,49,51] One study assessed the postoperative interference with daily living, work and relationships.[49] No adverse effects were described in the studies.

The size effect (*w*) was considered large in one RCT,[43] medium in three[47,49,50] and small in the other studies[44-46,48,51] (Table 5).

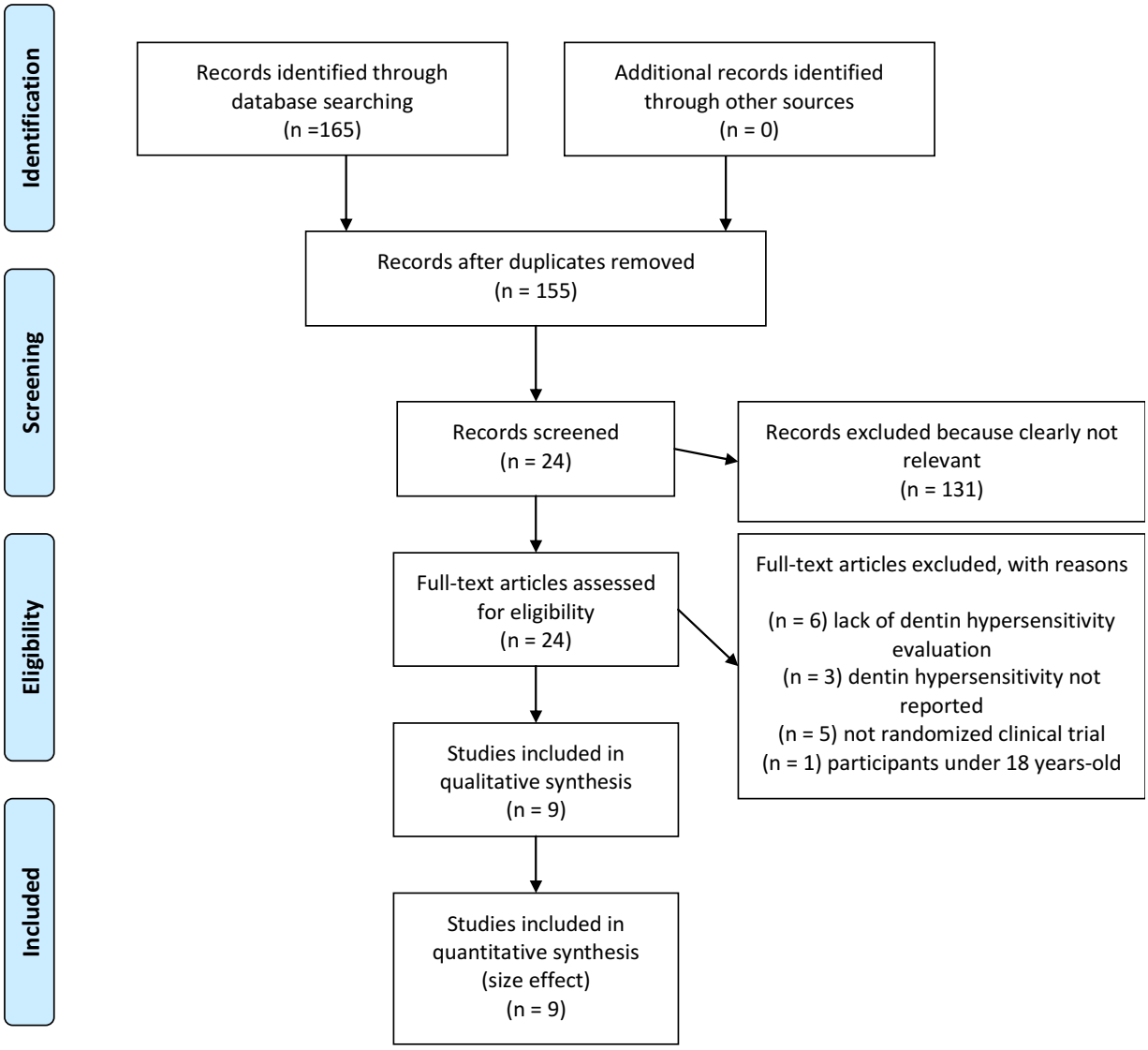

Figure 1. Flow chart for search results

Table 2. Characteristics of studies included in the present systematic review

Study	Study design	Follow-up	Participants	Miller class	Intervention	Primary measurements	Hypersensitivity measurement	Hypersensitivity outcome
Pini-Prato *et al*., 2000 [43]	Randomized Clinical Trial, split-mouth	3 months	4 males, 7 females; 22-41 years	I	1. CAF without tension 2. CAF with tension	Rec, PD, CAL, WKT, AC	Present or absent (unclear method)	1. 12/22 teeth with baseline root hypersensitivity; 5/22 postoperatively 2. 6/22 teeth with baseline root hypersensitivity; 3/22 postoperatively
McGuire & Nunn, 2003 [44]	Randomized Clinical Trial, split-mouth	12 months	10 males, 10 females; 23-62 years	II	1. CAF + EMD 2. CAF + SCTG	Rec, WKT, PD, CAL, inflammation, GM position	None, moderate or severe (air evaporative stimuli)	1. 10/20 teeth with baseline root hypersensitivity; 1/17 postoperatively 2. 8/20 teeth with baseline root hypersensitivity; 0/17 postoperatively
Bittencourt *et al*., 2006 [45]	Randomized Clinical Trial, split-mouth	6 months	6 males, 11 females; 21-52 years	I	1. SCTG 2. SCPF	Rec, WKT, RW, PD, CAL, TKT	None, low, moderate or severe (patient opinion)	7/17 patients reported baseline root hypersensitivity; 0/17 postoperatively
Bittencourt *et al*., 2007 [46]	Randomized Clinical Trial, split-mouth	6 months	9 males, 6 females; 22-59 years	I	1. SCRF 2. SCRF + EDTA	Rec, WKT, RW, PD, CAL, TKT	Present or absent (patient opinion)	1. 9/15 teeth reported baseline root hypersensitivity; 0/15 postoperatively 2. 9/15 teeth reported baseline root hypersensitivity; 3/15 postoperatively
Santamaria *et al*., 2008 [47]	Randomized Clinical Trial, split-mouth	6 months	9 males, 10 females; 24-58 years	I	1. CAF + R 2. CAF	PD, Rec, CAL, CLH, WKT, TKT	Present or absent (patient opinion)	1. 13/19 teeth with baseline root hypersensitivity; 1/19 postoperatively 2. 13/19 teeth with baseline root hypersensitivity; 9/19 postoperatively
Bittencourt *et al*., 2009 [48]	Randomized Clinical Trial, split-mouth	30 months	6 males, 11 females; 21-52 years	I	1.SCTG 2.SCPF	Rec, WKT, RW, PD, CAL, TKT	None, low, moderate or severe (patient opinion)	1. 7/17 teeth reported baseline root hypersensitivity; 0/17 postoperatively 2. 7/17 teeth reported baseline root hypersensitivity; 3/17 postoperatively
Cortellini *et al*., 2009 [49]	Randomized Clinical Trial, parallel group	6 months	37 males, 48 females; 20-59 years	I, II	1. CAF 2. CAF + CTG	PD, Rec, RW, CAL, WKT	Present or absent (air evaporative stimuli)	1. 17/43 teeth with baseline root hypersensitivity; 5/43 postoperatively 2. 18/42 teeth with baseline root hypersensitivity; 5/42 postoperatively
Santamaria *et al*., 2009 [50]	Randomized Clinical Trial, parallel group	6 months	21 males, 19 females; 19-71 years	I	1. CTG 2. CTG + R	PD, Rec, CAL, CLH, WKT, TKT	Present or absent (patient opinion)	1. 12/20 teeth with baseline root hypersensitivity; 7/20 postoperatively 2. 14/20 teeth with baseline root hypersensitivity; 1/20 postoperatively
Bittencourt *et al*., 2011 [51]	Randomized Clinical Trial, split-mouth	12 months	13 males, 11 females; 19-71 years	I, II	1. SCTG with operative microscope 2. SCTG without operative microscope	Rec, WKT, RW, PD, CAL, TKT	Present or absent (patient opinion)	1. 11/24 teeth reported baseline root hypersensitivity; 0/24 postoperatively 2. 11/24 teeth reported baseline root hypersensitivity; 3/24 postoperatively

AC: anatomical crown length; CAL: clinical attachment level; CLH: cervical lesion height; GM: gingival marginal; PD: probing depth; Rec: recession depth; RW: recession width; TKT: thickness of keratinized tissue; WKT: width of keratinized tissue. CAF: coronally advanced flap; CTG: connective tissue graft; EMD: enamel matrix derivative; R: resin-modified glass ionomer restoration; SCPF: semilunar coronally positioned flap; SCRF: semilunar coronally repositioned flap; SCTG: subepithelial connective tissue graft.

Table 3. Evaluation of bias risk in the studies							
Study	**Sample size**	**Allocation concealment**	**Random allocation**	**Losses**	**Assessors blinding**	**Statistical analysis**	**Judged bias risk**
Pini-Prato *et al*., 2000 [43]	0	0	2	0	2	2	High
McGuire & Nunn, 2003 [44]	2	2	2	1	2	2	Low
Bittencourt *et al*., 2006 [45]	2	0	2	1	2	2	High
Bittencourt *et al*., 2007 [46]	2	0	2	1	2	2	High
Santamaria *et al*., 2008 [47]	1	0	2	1	1	2	High
Bittencourt *et al*., 2009 [48]	0	0	2	1	2	2	High
Cortellini *et al*., 2009 [49]	2	2	2	1	2	2	Low
Santamaria *et al*., 2009 [50]	2	1	1	1	0	2	High
Bittencourt *et al*., 2011 [51]	2	0	2	1	2	2	High

Table 4. Absolute and relative frequency of cervical dentin hypersensitivity in all studies			
Study	**Dentin hypersensitivity before intervention (n)**	**Dentin hypersensitivity after intervention (n)**	**Percentage of decreased dentin hypersensitivity**
Pini-Prato *et al*., 2000 [43]	18	8	55.55 %
McGuire & Nunn, 2003 [44]	18	1	94.44 %
Bittencourt *et al*., 2006 [45]	7	0	100.00 %
Bittencourt *et al*., 2007 [46]	18	3	83.33 %
Santamaria *et al*., 2008 [47]	26	10	61.53 %
Bittencourt *et al*., 2009 [48]	14	3	78.57 %
Cortellini *et al*., 2009 [49]	35	10	71.42 %
Santamaria *et al*., 2009 [50]	26	8	69.23 %
Bittencourt *et al*., 2011 [51]	22	3	86.36 %

Table 5. Effect size of randomized clinical trials included in this review				
Study	**Pearson X^2 value**	**Observations number (N)**	***p*-value**	**Effect size (*W*)**
Pini-Prato *et al*., 2000 [43]	14.123	44	<0.001	0.5665
McGuire & Nunn, 2003 [44]	2.654	40	0.103	0.2575
Bittencourt *et al*., 2006 [45]	0.744	17	0.744	0.2092
Bittencourt *et al*., 2007 [46]	2.222	30	0.136	0.2721
Santamaria *et al*., 2008 [47]	10.237	49	0.001	0.4570
Bittencourt *et al*., 2009 [48]	2.303	34	0.129	0.2602
Cortellini *et al*., 2009 [49]	15.426	85	<0.001	0.4260
Santamaria *et al*., 2009 [50]	6.253	40	0.012	0.3953
Bittencourt *et al*., 2011 [51]	3.075	45	0.080	0.2614

DISCUSSION

Evidence from previous systematic reviews support the use of periodontal plastic surgery, especially subepithelial connective tissue graft, for the treatment of Miller Class I and II gingival recession with excellent predictability for root coverage and clinical attachment gain.[23, 52-54] However, a gap remains in current knowledge on the efficacy of plastic surgery at reducing CDH. As CDH is one of the major complaints of patients with gingival recessions, such research is essential. This is the first study to focus on this issue based on RCTs addressing root coverage.

None of the clinical trials in the present review reported adverse effects from the surgical procedures performed. Four studies[44-46,49] evaluated postoperative complications,

such as inflammation, bleeding, pain and swelling, which are possible conditions following surgery that have been addressed in other studies.[55-57] The findings provide evidence of the clinical safety of root coverage using periodontal surgery.

The maturation period of the periodontium, including the formation of new fibers, ranges from 45 to 60 days.[15] The follow-up period in the studies reviewed ranged from three to 30 months, with six months being the most common.[45-50] This suggests that the long-term effect of root coverage on CDH could be observed, as the evaluations were performed in a period surpassing two months. The results described by Bittencourt et al. (2009)[48] are from a longitudinal follow up (30 months) of patients whose data were published in a previous study.[45] The importance of longitudinal studies demonstrating the long-term results achieved by periodontal plastic surgery should be stressed.

Descriptive data from some studies in the present review reveal a decrease in CDH following periodontal surgery. According to Clauser et al. (2003),[58] only complete root coverage ensures total recovery from CDH. It is noteworthy that only two studies[47,50] reported a significant decrease in hypersensitivity after treatment and one study[44] reported no significant difference in CDH in an evaluation between groups. The other studies evaluated were limited regarding this point, as they presented no statistical evidence of the effectiveness of root coverage in the reduction of CDH. Thus, it is not possible to rule out the occurrence of type I errors. The statistical analysis of CDH before and after root coverage was performed in the present study and revealed that only four studies achieved a significant reduction in CDH.[43,47,49,50] The other studies found no significant differences after surgery and the effect size ranged from small to moderate.

The analysis of the effect size allows determining whether the sample size was adequate for obtain sufficient statistical power.[59-60] Some clinical trials in the present review had a low size effect[44-46,48,51] and statistical significance in these studies would likely require a larger sample. Effect size analysis provides a quantitative way of estimating the reduction in hypersensitivity after surgery, which is an appropriate measure for estimating the clinical importance of a procedure.[59,61] Only one study demonstrated a statistically significant reduction in CDH as well as a large effect size.[43] Statistically significant reductions in CDH were reported in another three studies, but the effect size was moderate,[47,49-50] suggesting that the reduction in hypersensitivity after surgery was moderate. The other studies did not demonstrate statistical significance regarding the reduction in CDH, but had a small effect size, indicating that the decrease in CDH had little clinical significance. All studies exhibited

a clinical effect in reducing CDH after surgery (effect size ranging from small to high). Together, these data suggest that periodontal plastic surgery has variable clinical efficacy in the treatment of CDH.

Bayesian analysis using the results from the study by Pini-Prato et al. (2005)[38] revealed a negative correlation between CDH and complete root coverage.[62] None of the nine clinical trials included in the present review performed a correlation test between hypersensitivity and percentage of root coverage or degree of gingival recession. Thus, one should consider that the reduction in hypersensitivity may be explained by other factors, such as brushing or the placebo effect.[63-65]

A variety of methods for evaluating CDH were used, such as evaporative stimulus,[66-67] tactile stimulation[11,68] and thermal stimulation.[69-70] Moreover, the form of measuring pain was also variable: the use of an arbitrary pain scale (absent, mild, moderate or severe),[66,71] visual analogue scale,[72,73] etc. The methodological variability in the tests for the assessment of CDH reflects the difficulty in measuring this subjective phenomenon. This inconsistency is likely due to the lack of a standardized protocol for the evaluation of this clinical condition and it is not yet possible to state whether some methods are more valid than others.

Santamaria et al. (2008)[47] and Santamaria et al. (2009)[50] report a greater reduction in CDH in the test groups (CAF + R and CTG + R, respectively). These results should be evaluated with caution, however, as both groups were treated with restorations with resin-modified glass ionomer cement besides the surgical procedure. This may lead to a bias in the evaluation, as the restorative procedure fills the exposed dentinal tubules and glass ionomer also releases fluoride, thereby contributing toward a reduction in CDH.[65,74-76] Consequently, restoration with glass ionomer cement should be considered a confounding variable.

Dentin hypersensitivity is a common problem in many populations[68,77,78] and the variability in geographic location, socioeconomic development and climate can influence both self-perception and therapeutic conduct. In the present systematic review, a greater production of scientific studies on root coverage (randomized controlled trials, clinical trials, case series) reporting CDH was found at two research centers: one in Brazil[39,45-48,50] and one in Italy.[37-38,43,49] This finding underscores the need for further studies in different populations correlating cervical dentin hypersensitivity with root coverage for a better comparison of results and reliability.

A root exposed due to gingival recession can be hypersensitive, causing unpleasant consequences to the patient, such as food restrictions, difficulty brushing, poor esthetics and

inconvenience during speech or smiling.[79-81] It is believed that these factors can impair quality of life. A number of studies have correlated oral health status and quality of life.[82-85] However, only one RCT[49] in the present review sought to evaluate factors related to quality of life, which was measured based on a questionnaire drafted by the author to evaluate the interference of the surgical procedure in routine situations using a 100-mm visual analog scale. No studies have yet correlated CDH to quality of life using validated instruments, demonstrating a gap in the literature regarding whether the treatment of CDH through root coverage affects quality of life.

The risk of bias was considered high in seven studies.[43,45-48,50-51] The factor that most compromised methodological quality was the lack of allocation concealment. Without adequate allocation concealment, even randomized, unpredictable sequences can be corrupted.[86] The operator may intervene, tending to favor one group over another, which leads to selection bias. According to Schulz (1996),[86] an inadequately hidden allocation sequence can produce greater estimated treatment effects. In future studies, this bias can be avoided by using central randomization or sequentially numbered, sealed, opaque envelopes.[87]

The data extracted from the studies evaluated in the present review reveal heterogeneity in relation to the type of intervention, follow-up period, clinical parameters assessed, type-class of gingival recession, evaluation of CDH and study design. Thus, it was not possible to establish a quantitative synthesis of the data, thereby rendering meta-analysis impossible.

A protocol was employed to guide the search strategy, study selection and data collection. However, the present systematic review has potential limitations. Firstly, selection bias may have occurred, since the search was restricted to publications in Portuguese, Spanish and English. Secondly, only an electronic search of published studies was conducted. Finally, meta-analysis was not possible.

Well-conducted randomized controlled trials with good methodological quality and long-term postoperative follow up are needed to corroborate or refute the findings of this systematic review. Future studies should focus on CDH as the primary outcome and address other important outcomes, such as the impact of CDH and respective therapy on quality of life.

CONCLUSION

The results of the present systematic review must be viewed with caution, as most of the studies reviewed had a high risk of bias and CDH was assessed as a secondary outcome. There is not enough evidence to conclude that surgical root coverage procedures predictably reduce CDH. Adequately powered RCTs with robust measurements of dentinal hypersensitivity are needed to allow periodontists to indicate root coverage as safe, lasting treatment for CDH.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest. The study was self-funded by the authors.

FOOTNOTES

[‡]SPSS®, version 17.0, IBM Corp., New York, USA

[§]Sgolastra et al. 2011,[25] modified

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2.2 Effect of surgical defect coverage on cervical dentin hypersensitivity and quality of life

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Douglas de Oliveira DW, Marques DP, Aguiar-Cantuária IC, Flecha OD, Gonçalves PF. Effect of surgical defect coverage on cervical dentin hypersensitivity and quality of life. J Periodontol. 2012 August 16. [Epub ahead of print]. (doi:10.1902/jop.2012.120479).

ABSTRACT

Background: The root exposure due the gingival recession can origin cervical dentin hypersensitivity which is characterized by tooth pain. **Aim:** The aim of this study was to evaluate the effect of surgical defect coverage on cervical dentin hypersensitivity (CDH) and quality-of-life in patients with gingival recessions. **Methods:** Twenty-five gingival recessions in maxillary canines and premolars were treated with coronally positioned flap plus connective-tissue-graft. Gingival recession dimensions, amount of keratinized gingiva and clinical attachment levels were evaluated. CDH was assessed by thermal and evaporative stimuli. Quality-of-life was assessed by the Oral Health Impact Profile-14 (OHIP-14) questionnaire. All parameters were evaluated at baseline and after 3 months. **Results:** Statistically significant reduction in CDH ($p<0.001$), oral-health-related quality-of-life ($p<0.001$), and significant changes in periodontal parameters were observed after 3 months. Mean defect coverage of 67.90% and full-coverage in 11 cases was achieved. Percentage defect coverage showed no correlation with air-jet-stimulated CDH ($p=0.256$) or cold stimuli ($p=0.563$). Correlation was established between OHIP-14 physical-disability dimension, amount of keratinized-tissue ($p=0.010$) and defect-coverage ($p=0.035$). **Conclusion:** Surgical defect coverage may reduce CDH and improve patient's quality-of-life, by keratinized

gingiva augmentation and impact on physical-disability, irrespective of amount of defect coverage.

Keywords: Dentin hypersensitivity; gingival recession; tooth root/surgery; quality of life.

INTRODUCTION

Gingival recession (GR) is the oral exposure of the root surface due to gingival margin displacement apical to the cement-enamel junction.[1] When this happens, dentinal tubules may be exposed and patent to the pulp, causing cervical dentin hypersensitivity (CDH).[2]

CDH is characterized by short, sharp pain in response to thermal, evaporative, tactile or osmotic stimuli, not attributable to any other dental defect or pathology.[3] Patients presenting CDH experience the impact of oral conditions on quality-of-life in everyday activities, such as eating, drinking, talking, toothbrushing, social interaction, and more subtle impacts on emotions and identity.[4,5]

Several approaches to CDH therapy have been investigated, including lasers, ions, oxalates and dentinal sealants.[6-9] In such cases, the treatment goals are to occlude dentinal tubules system and/or block neural transmission by pulp.[10,11] Periodontal surgery is a treatment option for gingival recessions.[12] A few clinical trials have reported CDH as secondary outcome in cases of surgically treated gingival recession (GR), showing a post-operative reduction in CDH.[13-15]

However, little is known of the actual effects on CDH achieved by defect coverage.[16] Thus, the aim of this study was to evaluate the effect of defect coverage on CDH and quality-of-life in patients with gingival recessions.

METHODS

Sample size

Calculations at 5% significance level and 95% power showed that 25 gingival recessions were sufficient to detect a difference of 0.8mm in recession depth after treatment. Standard deviation was obtained from a previous study.[17]

Subject selection

The Institutional Ethics Committee approved the study (UFVJM 007/09), conducted between June 2009 and August 2011, in accordance with the Helsinki Declaration, 1975,

revised in 2008. All patients signed an informed consent after thorough explanation of the nature, risks, and benefits of the clinical investigation.

Participants were recruited from among individuals referred to the Periodontology Clinic (UFVJM). The patients (n=22) aged from 20 to 49 (mean age, 28.08 years, 7 men and 15 women) and presented 25 recession-type defects.

Eligibility criteria were: Isolated Miller Class I or II[14] recession defects on maxillary canine and/or premolar teeth; presence of dentin hypersensitivity; periodontal and systemic health; no contraindications for periodontal surgery; age ≥ 18 years. Exclusion criteria were: recessions associated with caries or restorations, teeth with evidence of pulpal pathology, smokers and frequent use of analgesics, anti-inflammatory drugs, antidepressants and desensitizing agents.

Examiner calibration

The investigator in charge of clinical assessments was calibrated for intraexaminer repeatability before the trial began. The intra-class correlation coefficient was 0.99.

Pre-treatment and clinic measurements

Oral hygiene instructions, instrumentation and coronal polishing were performed before surgery. The criterion for surgery was optimal plaque control with a full-mouth plaque score of 15% or less. Full-mouth sulcus bleeding index (FMBI)[18] and plaque index[19] were used to assess gingival health and hygiene conditions throughout the study. All patients were instructed to use dental floss and Stillman's technique with gentle, atraumatic toothbrushing using a soft-bristle toothbrush.

Clinical measurements were performed by one examiner at baseline and 3 months after surgery, quantified with a caliper (0.05-mm resolution). Clinical parameters were : (1) GRD, gingival recession depth - distance measured between the most apical point of the cement-enamel junction (CEJ) and the gingival margin (GM); (2) GRW, gingival recession width - distance measured between the mesial GM and distal GM of the tooth (on a horizontal line tangential to the CEJ); (3) PD, probing depth - distance measured from the GM to the bottom of the gingival sulcus, using a Williams probe[†]; (4) CAL, clinical attachment level - measured as GRD + PD; (5) KTW, keratinized tissue width - distance measured from the mucogingival junction (MGJ) to the GM, with the MGJ location determined using a visual method; (6) KTT, keratinized tissue thickness - measured using a fine endodontic spreader[‡], perpendicular to a mid-point located between the GM and MGJ, through soft tissue with light pressure until a hard surface was felt. The percentage of defect coverage was calculated as:

[(preoperative GRD – postoperative GRD)/preoperative GRD] *x* 100. GRD, GRW and KTW were obtained with a needle-point compass and transferred to a caliper.

Dentin hypersensitivity assessment

CDH was diagnosed as described in a previous study.[20] The amount of CDH was assessed by cold stimulation spray[§] and air blast from a triple syringe. Cold was applied to the tooth using a cotton swab, for five seconds. The air blast was applied to the exposed buccal cervical area at a distance of ~1-cm for five seconds. Contiguous teeth were protected using utility wax. A numerical rating scale (NRS) was used to record the CDH related to the stimuli, with a pain score from 0 (no pain) to 10 (extreme pain).

Quality-of-life evaluation

The Oral Health Impact Profile-14 (OHIP-14) questionnaire was used to assess oral health-related quality-of-life.[21] The OHIP-14 evaluates seven dimensions: functional limitations, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap. The same instrument was used at the baseline and 3 months after treatment. This questionnaire was completed by the patient before the evaluation of clinical measures and CDH. The participants responded on a 5-point Likert scale. The OHIP-14 scale ranges from 0 to 56 points with higher scores indicating more impacts of oral conditions on quality-of-life.

Surgical procedure

One single operator (DWDO) performed all surgeries, using a previously described technique[22] of a coronally advanced flap associated with a connective tissue graft harvested with a double-blade-scalpel (Figure 1).

Before surgery, extraoral antisepsis was performed with topical iodopovidine and intraoral antisepsis with 0.12% chlorhexidine rinse for 1 minute. Lidocaine (2.0%) with 1:100,000 epinephrine was used for local anesthesia. An initial horizontal incision was made slightly coronal to the CEJ at the distal/mesial papillae of the tooth with recession (Figure 1B). A second incision, 1 to 2 mm apart and parallel to the first was made apically. Both incisions were performed at a 90^{o} angle to the tissue surface and the facial soft tissues between them were de-epithelialized. A sulcular incision was made and a full thickness flap was elevated to expose ~1 mm of bone. Apical to the bone exposure, a partial-thickness flap was made using a #15 blade. The blade was progressively inserted, extending beyond the MGJ to create a uniform partial-thickness flap. To allow coronal advancement of the flap, all muscle insertions and fibers in the flap were incised. Coronal flap mobilization was

considered adequate when the flap GM could passively reach a level coronal to the CEJ. The exposed root surface was planed with diamond burs and curettes (Figure 1C). Graft length was obtained by measuring the distance between the centers of the papillae mesial and distal to the tooth. A double-bladed scalpel (1.5 mm distance between blades) was used to obtain a standardized subepithelial connective-tissue graft from the palatal donor site, at least 2mm away from the gingival margin (Figure 1D). Fat tissue was removed, but the epithelium was preserved, and the graft was transferred to the receptor site, adapted and stabilized with cyanoacrylate adhesive and sutures (Figure 1E). Cyanoacrylate[‖] was carefully dripped on the graft edge and tooth crown enamel, without attaining the root exposure. Subsequently, the flap was coronally positioned with sling sutures to cover the exposed root surface, graft and part of the crown (Figure 1F). The surgical area was protected with surgical dressing[¶].

Post-Surgical Care

Patients were instructed to take 500 mg sodium dipyrone, every 4 hours for 3 days, only when in pain; and 100 mg nimesulid, every 12 hours for 5 days; not to brush their teeth in the operated areas until suture removal; and to rinse with 0.12% chlorhexidine digluconate solution for 1 minute BID, for 15 days.

Periodontal dressings and sutures were removed after 7 days. Afterwards, the atraumatic plaque control technique was reinforced.

Statistical analysis

Statistical analysis was performed using statistical software[#]. Mean values and standard deviations were calculated for the clinical variables. Shapiro-Wilk test was used to confirm normal data distribution, and Wilcoxon test to compare periodontal parameters and quality-of-life before and after treatment (α=0.05). Correlations between clinical parameters and CDH were investigated by the Spearman-rho test. Receiver Operating Characteristic (ROC) curve analysis comparing OHIP-14 scores before and after surgery was performed to evaluate diagnostic accuracy, its sensitivity and specificity.

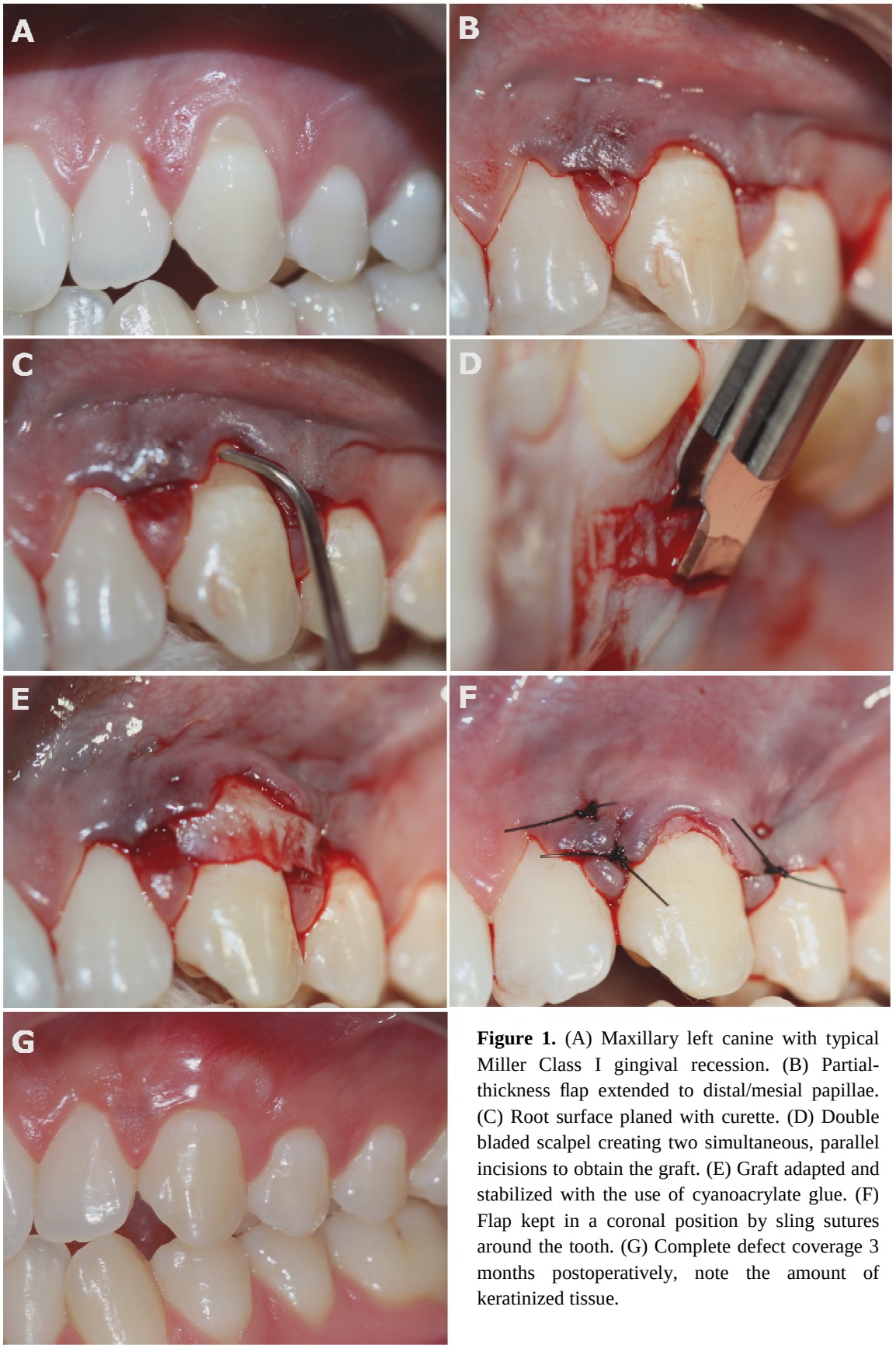

Figure 1. (A) Maxillary left canine with typical Miller Class I gingival recession. (B) Partial-thickness flap extended to distal/mesial papillae. (C) Root surface planed with curette. (D) Double bladed scalpel creating two simultaneous, parallel incisions to obtain the graft. (E) Graft adapted and stabilized with the use of cyanoacrylate glue. (F) Flap kept in a coronal position by sling sutures around the tooth. (G) Complete defect coverage 3 months postoperatively, note the amount of keratinized tissue.

RESULTS

All 22 enrolled patients completed the study. The data set was completed without missing data or post-operative complications.

Twelve isolated gingival recessions were located in first premolars (48%), nine in second premolars (36%), and four in canines (16%). Complete defect coverage was accomplished in 44% of the treated cases (n=11) (Figure 1G). The mean percentage of defect coverage was 67.90 (SE=6.40). Table 1 shows the clinical parameter values at baseline and 3 months postoperatively. There was statistical difference between GRD, GRW, KTW, KTT, PD CAL, and FMBI parameters before and after treatment. Plaque index showed no significant difference.

Total OHIP-14 scores varied from 2.71 to 13.57 points with a median of 5.45 at baseline; and from 0.00 to 8.90 points (median = 1.20) at three months ($p<0.001$). Table 2 shows OHIP-14 dimension values obtained before and after defect coverage surgery.

The area under the ROC curve for the OHIP-14 curve was 0.827 (SE 0.059, 95%CI [0.711 – 0.944], $p<0.001$). The OHIP-14 score cut-off calculated to predict quality-of-life was 2.64, with a sensitivity >99.9%, and specificity of 64.0%.

After 3 months, no hypersensitivity was observed in six teeth tested by evaporative stimuli; however, thermal stimuli showed evidence of residual hypersensitivity in all patients. There was statistically significant reduction in CDH evaluated by thermal ($p<0.001$) and evaporative stimuli ($p<0.001$) (Table 3).

There was no correlation between CDH and the periodontal parameters after surgery (Table 4). Correlation was shown between the OHIP-14 physical disability dimension and: 1) KTW ($r = -0.50$, $p = 0.010$); 2) defect coverage ($r = -0.42$, $p = 0.035$). KTT correlated negatively with the OHIP-14 social disability subscale ($r = -0.35$, $p = 0.039$). CDH to evaporative stimuli showed correlation with functional limitation ($r = 0.35$, $p = 0.039$) (Table 5).

Table 1. Clinical parameters (mm) at baseline and 3 months postoperatively

Parameters	Mean (SD)	Median (Q_1 – Q_3)	p*
GRD			
Baseline	1.59 (0.48)	1.60 (1.22 – 1.85)	<0.001
3 months	0.54 (0.51)	0.65 (0.00 – 1.00)	
GRW			
Baseline	3.11 (0.66)	3.00 (2.70 – 3.42)	<0.001
3 months	1.60 (1.56)	2.10 (0.00 – 2.80)	
KTT			
Baseline	1.11 (0.39)	1.00 (0.87 – 1.37)	<0.001
3 months	1.64 (0.38)	1.80 (1.27 – 2.00)	
KTW			0.001
Baseline	3.52 (1.08)	3.35 (2.75 – 4.20)	
3 months	4.27 (1.02)	4.00 (3.55 – 5.07)	
PD			
Baseline	1.56 (0.50)	2.00 (1.00 – 2.00)	0.001
3 months	2.12 (0.60)	2.00 (2.00 – 2.50)	
CAL			
Baseline	3.16 (0.74)	3.30 (2.67 – 3.60)	0.014
3 months	2.68 (0.84)	2.95 (2.00 – 3.30)	
FMBI (%)			
Baseline	6.67 (1.54)	4.03 (1.27 – 9.35)	0.014
3 Months	3.66 (0.94)	2.43 (0.83 – 4.39)	
Plaque index (%)			
Baseline	10.23 (1.06)	9.82 (6.46 – 12.50)	0.097
3 months	8.44 (1.09)	7.8 (3.73 – 10.93)	

* Wilcoxon test

Table 2. Mean (SE) OHIP-14 for the subscales and total scores at baseline and 3 months after surgery

Dimensions	Baseline		3 months		p*
	Mean (SE)	Median (Q_1 – Q_3)	Mean (SE)	Median (Q_1 – Q_3)	
Functional limitation	0.56 (0.14)	0.00 (0.00 – 1.00)	0.27 (0.09)	0.00 (0.00 – 0.74)	0.148
Physical pain	1.99 (0.17)	2.00 (1.83 – 2.66)	0.88 (0.19)	0.34 (0.00 – 1.69)	0.001
Psychological discomfort	1.82 (0.16)	1.80 (1.45 – 2.45)	0.65 (0.16)	0.00 (0.00 – 1.50)	<0.001
Physical disability	0.87 (0.15)	0.96 (0.00 – 1.50)	0.43 (0.12)	0.00 (0.00 – 1.00)	0.033
Psychological disability	0.72 (0.15)	0.60 (0.00 – 1.30)	0.13 (0.05)	0.00 (0.00 – 0.00)	0.001
Social disability	0.29 (0.08)	0.00 (0.00 – 0.69)	0.09 (0.05)	0.00 (0.00 – 0.00)	0.074
Handicap	0.44 (0.15)	0.00 (0.00 – 1.00)	0.13 (0.06)	0.00 (0.00 – 0.00)	0.107
OHIP total score	6.87 (0.65)	5.45 (4.48 – 9.79)	2.63 (0.59)	1.20 (0.00 – 5.17)	<0,001

*Wilcoxon test

Table 3. Inferential statistic for dentin hypersensitivity

Evaluation Time	CDH to air blast			CDH to thermal stimulus		
	Mean (SE)	Median (Q_1 – Q_3)	p*	Mean (SE)	Median (Q_1 – Q_3)	p*
Baseline	6.20 (0.49)	7.00 (4.00 – 8.00)	<0.001	8.84 (0.26)	9.00 (8.00 – 10.00)	<0.001
3 months	3.08 (0.56)	3.00 (0.50 – 6.00)		5.60 (0.58)	5.00 (3.00 – 8.50)	

* Wilcoxon test

Table 4. Dentin hypersensitivity correlated to gingival parameters in the postoperative period

Gingival Parameters	CDH to air blast		CDH to thermal stimulus	
	r_s	p	r_s	p
Gingival recession depth	-0.15	0.472	-0.18	0.379
Gingival recession width	-0.07	0.718	-0.26	0.200
Defect coverage percentage	0.23	0.256	0.12	0.563
Keratinized tissue thickness	-0.03	0.868	-0.03	0.854
Keratinized tissue width	-0.05	0.781	-0.19	0.346

Spearman`s rho test

Table 5. OHIP-14 scores related to amount of keratinized gingiva, percentage of defect coverage and hypersensitivity in the postoperative period

OHIP-14 dimensions	Keratinized tissue thickness		Keratinized tissue width		Percentage of defect coverage		CDH to air blast		CDH to thermal stimulus	
	r_s	P	r_s	P	r_s	P	r_s	p	r_s	p
Functional limitation	0.14	0.252	-0.24	0.230	0.09	0.667	0.35*	0.039	0.28	0.082
Physical pain	-0.18	0.194	-0.36	0.075	-0.04	0.832	0.26	0.100	0.19	0.179
Psychological discomfort	-0.17	0.204	-0.29	0.156	-0.14	0.481	0.21	0.150	0.25	0.113
Physical disability	-0.26	0.103	-0.50*	0.010	-0.42*	0.035	-0.01	0.488	-0.02	0.463
Psychological disability	-0.15	0.225	0.18	0.382	0.31	0.127	0.18	0.189	0.02	0.465
Social disability	-0.35*	0.039	-0.09	0.670	-0.18	0.374	0.10	0.318	-0.18	0.190
Handicap	0.12	0.279	0.14	0.506	-0.25	0.229	-0.03	0.438	-0.16	0.218
OHIP-14 total	-0.17	0.197	-0.36	0.076	-0.16	0.435	0.20	0.166	0.10	0.311

* Correlation is significant at the 0.05 level (Spearman`s rho test)

DISCUSSION

The treatment of CDH and predictability of defect coverage have become important goals in periodontal therapy. To our knowledge, this study is the first to directly assess the effect of defect coverage on the treatment of CDH, and it shows a significant decrease in the CDH and gain in gingival parameters after surgical therapy.

Considering the normality of periodontal measurements at baseline, differences in clinical outcomes after treatment can be attributed to the periodontal plastic surgery performed. The surgical approach adopted has shown to be very reliable and highly successful.[1] It was highly effective and predictable in obtaining defect coverage of Miller Class I gingival recessions and improved periodontal parameters. These results corroborate the findings of other clinical trials that used the same technique.[2,14,22-25]

The difference found in CDH before and after the surgery may be explained by the increase of keratinized gingiva which enabled to occlude the dentinal tubules. However, some patients still complained of CDH after the surgery, despite pain levels being lower in comparison with baseline. According to Clauser et al.,[26] only complete defect coverage ensures total recovery from CDH.

The statistically significant decrease in CDH after defect coverage corroborates the findings of previous studies.[15,27] However, these studies used no stimuli to assess CDH; only patients' reports were used, and CDH was measured as absent or present. Other randomized clinical trials also found a reduction in CDH after surgery,[13,14,28] but CDH was reported as absolute frequency and no statistical analyses were performed as regards CDH and defect coverage.

In the present study, OHIP-14 was used to evaluate the impact of oral conditions on quality-of-life. Although some authors[4,29] do not consider OHIP-14 a good instrument to evaluate quality-of-life in patients with CDH, in this study the ROC curve showed a 82.7% accuracy. Moreover, OHIP-14 had high sensitivity in discerning the impact of gingival recession and CDH on patients' quality-of-life before and after defect coverage.

Quality-of-life is directly related to oral health.[5,30] The subscales of OHIP-14 that showed statistically significant differences before and after the treatment were physical pain and disability, and psychological discomfort and disability. The results as regards physical pain may be associated with CDH (which is pain) reduction. The decline in psychological dimensions scores may be explained by the conditioning and instructions the patients received before surgery.[31] Furthermore, the decrease in CDH and increase in clinical parameters may motivate people to feel more secure in adopting behavior that they previously did not have, for example, eating cold food. The decrease in physical disability correlated moderately with the keratinized tissue width and percentage of defect coverage. This suggests that the amount of keratinized tissue and defect coverage play a role to improve the physical ability of the patient's mouths.

At three months, there was a significant correlation between quality-of-life and air-blast-stimulated CDH. These findings are compatible with those of Bekes et al.[29] and Gibson et al.[5] who concluded that there are significant impacts on everyday life, associated with dentin sensitivity.

The surgical procedure resulted in a reduction in CDH and improvement in quality-of-life irrespective of the defect coverage rate. This result is very important, considering that the percentage of defect coverage has commonly been considered the main parameter to evaluate the success of the surgery by clinicians.[32] The present study suggests that in order to improve the quality-of-life and reduce CDH, other factors seem to be more important than the rate of defect coverage, such as the amount of keratinized gingiva, reduction in physical disability and the psychological impact.

Although well conducted, the present study has potential limitations. Firstly, there is no control or placebo group, since all patients were referred to periodontal surgery. Secondly, measurement bias may have occurred, as it was not blinded or double-blinded. Randomized controlled double-blinded trials focusing on dentin hypersensitivity should be conducted to corroborate or refute the findings of this study. Furthermore, long-term postoperative studies are necessary to determine the predictability of defect coverage in the treatment of CDH. Specific instruments to identify the effect of psychological factors in CDH are recommended.

CONCLUSION

Defect coverage surgery may reduce CDH, and influence oral health-related quality-of-life by the augmentation of keratinized gingiva and impact on physical and psychological disability, irrespective of the amount of defect coverage.

ACKNOWLEDGEMENTS

We would like to thank the Foundation for Research Support of the State of Minas Gerais (FAPEMIG, Minas Gerais, Brazil) for the financial support. The authors declare that they have no conflict of interests.

FOOTNOTES

† Golgran, São Paulo, Brazil

‡ Dentsply, Rio de Janeiro, Brazil

§ Endo-Ice®, Paraná, Brazil

|| SuperBonder®, São Paulo, Brazil

¶ PerioBond®, Rio de Janeiro, Brazil

Statistic Package for Social Science®, version 17.0, IBM Corp., New York, USA

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2.3 Effect of Root Coverage on Esthetics and Periodontal Status

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Artigo a ser submetido ao The International Journal of Periodontics & Restorative Dentistry (ISSN: 0198-7569; Qualis A2).

Abstract

This study aimed to evaluate the effect of root coverage on esthetics and periodontal status. Twenty-five gingival recessions in upper canine and premolars were treated with periodontal plastic surgery. Gingival recession and keratinized gingiva, were evaluated at baseline and three months postoperatively. Esthetics and quality-of-life were assessed by the patient`s opinion and by the OHIP-14 form, respectively. All patients were satisfied with the achieved esthetics. The average amount of root coverage was 67.90%. Statistical differences were observed for periodontal clinical parameters before and after the treatment. There was a correlation between the OHIP-14 scores and esthetics. It was concluded that root coverage could improve esthetics and periodontal status.

Keywords: Gingival recession; quality of life; dental esthetic; periodontal disease/surgery; tooth root/surgery.

INTRODUCTION

Gingival recession (GR) is characterized by the displacement of the gingival margin apically from the cementoenamel junction, exposing the root surface.[1,2] The GR can be localized or generalized, and may be initiated by plaque-induced gingival inflammation and/or toothbrushing trauma. It is associated with predisposing factors, such as: thin gingiva, a prominent root surface, bucally positioned tooth, frenum pull, periodontal disease and iatrogenic damage.[3,4]

Root exposure often causes dentin hypersensitivity, leading to increased plaque accumulation and increased risk of further recession. Patients presenting GR have an augmented risk of root caries and the esthetics may be compromised, especially when affecting the anterior teeth.[5,6] Esthetics represent an inseparable part of today's oral concerns, and numerous procedures have been proposed to preserve or enhance patient esthetics.[7]

Several surgical techniques are available to treat the gingival recession defects, such as free gingival graft, laterally positioned flaps (LPF), coronally advanced flaps (CAF), subepithelial connective tissue grafts (SCTG) alone or combined with LPF or CAF and semilunar flaps.[8,9] These procedures may improve esthetic conditions and other clinical outcomes.[10,11] The criteria for success of periodontal plastic surgery should not only be based on the amount of root coverage but also on the cosmetic integration of the operated zone within the surrounding tissues of the mouth.[12,13]

Studies focusing on the patient's own assessment, adapted to the procedures for root coverage are needed. There is a lack of evidence of how patients perceive the outcome of root coverage in esthetics and everyday´s life. Thus, this study aimed to evaluate the effect of root coverage on esthetics and on periodontal status in patients with gingival recessions. The secondary aim of this clinical research was to investigate the etiologic and correlated factors of gingival recessions.

METHODS

Sample size

Sample size was calculated based on the standard deviation of the height of gingival recessions[2] with the difference to be detected after treatment set at 0.8-mm. The minimum sample size thus was required to be 25 recessions considering a 95% confidence and power.

Subject selection

The approval of the Ethics Committee of Federal University of Jequitinhonha and Mucuri Valleys (UFVJM) was obtained (protocol 007/09) in accordance with Helsinki Declaration of 1975, as revised in 2008. The participants were chosen among individuals referred to the Periodontics Clinic of UFVJM between June 2009 and August 2011. All patients agreed to participate in the study and signed a consent form after thorough explanation of the nature, risks, and benefits of the clinical investigation and associated procedures. Twenty-two systemically and periodontally healthy subjects (7 males and 15 females), aged 20–49 years (mean age, 28.08 years) were enrolled in this study. All subjects were non-smokers. These patients contributed with 25 recession-type defects.

Eligibility criteria

All participants met the study inclusion criteria: Age $\geq$ 18 years; Miller Class I or II recession defects on upper canines and premolars; esthetic concerns; periodontal and systemic health; no contraindications for periodontal surgery. Recession defects associated with caries or restoration and teeth with evidence of pulp pathology were not included. Patients who made frequent use of analgesics, non-steroidal antiinflammatory drugs and/or antidepressants were excluded.

Examiner calibration

The investigator charged with clinical assessments was calibrated for intraexaminer repeatability prior to the start of the trial. Three patients with a total of 3 teeth with gingival recessions were enrolled for this purpose, and were not included in the main study. Measurements of gingival recession depth, gingival recession width, keratinized tissue width and keratinized tissue thickness were collected with an interval of 1, 24 and 72 hours after the first recording. The intra-class correlation coefficient was 0.99.

Initial therapy and clinical measurements

Oral hygiene instructions, instrumentation and coronal polishing were performed before surgery. The criterion for surgery was optimal plaque control with a full-mouth plaque score of 15% or less. Full-mouth sulcus bleeding index (FMBI)[14] and plaque index[15] were used to assess gingival health and hygiene conditions throughout the study.

All patients were instructed to use dental floss and an atraumatic brushing. Stillman's technique was recommended with gentle toothbrushing and a soft-bristle toothbrush, using a toothpaste without desensitizing agents.

All measurements were recorded by a trained and calibrated examiner at baseline and 3 months after surgery and quantified with a caliper of 0.05-mm resolution. The baseline measurements were recorded immediately before the surgery. The following clinical parameters were recorded to assess periodontal status: (1) GRD – gingival recession depth – measured as the distance between the most apical point of the cement-enamel junction (CEJ) and the gingival margin (GM); (2) GRW – gingival recession width – measured as the distance between the mesial GM and the distal GM of the tooth (measurement was recorded on a horizontal line tangential at the CEJ); (3) PD – probing depth – measured as the distance from the GM to the bottom of the gingival sulcus, using a periodontal probe; (4) CAL – clinical attachment level – measured as the distance from the CEJ to the bottom of the sulcus (GRD + PD); (5) KTW – keratinized tissue width – measured as the distance from the mucogingival junction (MGJ) to the GM, with the MGJ location determined using a visual method; (6) KTT – keratinized tissue thickness – measured using a digital endodontic spreader, perpendicular to a mid-point location between the GM and the MGJ, and through the soft tissue with light pressure until a hard surface was felt. The percentage of root coverage (RC) was calculated as: ([preoperative GRD – postoperative GRD]/preoperative GRD) *x* 100. The GRD, GRW and KTW parameters was obtained with a needle-point compass and transfer to caliper. Before the surgery, the gingival recession etiology and associated risk factors were investigated trough anamnesis and clinical examination.

Esthetic and quality of life evaluation

The esthetic of the tooth with gingival recession was considered unsatisfactory (esthetic = 0) at baseline. The final esthetic (Figure 1) obtained was assessed by the patient who assigned a score from 0 to 10: 0-2 unsatisfactory esthetic, 3-5 reasonable esthetic, 6-8 satisfactory esthetic, 9-10 excellent esthetic. The quality of life was assessed by the OHIP-14 form at baseline and 3 months post-operative, as described in a previously study.[16]

Surgical procedure

Before surgery (Figure 2), extraoral antisepsis was performed with topic iodopovidine and intraoral antisepsis with 0.12% chlorhexidine rinse for 1 minute. Lidocaine (2.0%) with 1:100,000 epinephrine was used for local anesthesia.

One single operator performed all surgeries. An initial horizontal incision was made slightly coronal to the CEJ at the distal/mesial papillae of the tooth with the recession. A second incision, 1 to 2 mm apart and parallel to the first incision, was made apically. Both incisions were performed at a 90 angle to the tissue surface and the facial soft tissue of the

interdental papillae were de-epithelialized. A sulcular incision was made linking the second incisions using a #15C blade. The soft tissue apical to the root exposure was elevated full thickness by inserting a periosteum elevator into the sulcus and proceeding in the apical direction to expose ~1 mm of bone. Apical to the bone exposure, a partial-thickness flap was made using a #15 blade. The blade was progressively inserted, extending beyond the MGJ to create a uniform partial-thickness flap. To permit the coronal advancement of the flap, all muscle insertions and fibers present in the flap were eliminated. Coronal mobilization of the flap was considered adequate when the GM of the flap was able to passively reach a level coronal to the CEJ of the teeth with the recession defect. The graft length was then obtained by measuring the distance between the centers of the papillae mesial and distal of the tooth. A subepithelial connective tissue graft was obtained of palatal donor area with the use of a double blade scalpel (1.5 mm distance between the blades), at least 2mm away from the gingival margin. Fat tissue was removed from the graft, but the epithelial collar was preserved. The subepithelial connective tissue graft was transferred to the receptor site, adapted and stabilized with the use of cyanoacrylate glue (SuperBonder®, Henkel, São Paulo, Brazil) and sutures. The cyanoacrylate was dripped over the edge of the graft and the enamel of the tooth crown, carefully not to reach the root exposure. Subsequently, the flap was coronally positioned with suspensory sutures in order to cover the exposed root surface, the graft and part of the crown. The surgical area was protected with surgical dressing (PerioBond®, Dentsply, Rio de Janeiro, Brazil). The wound on the donor site of the palate was also sutured.

Post-Surgical Care

All patients received postoperative care instruction. The patients were instructed to take 500 mg sodic dipyrone, every 4 hours for 3 days, only if they experienced pain; and 100 mg nimesulid, every 12 hours for 5 days. They were informed not to brush their teeth in the operated areas until suture removal, and instructed to rinse with a 0.12% chlorhexidine digluconate solution, during 1 minute twice a day, for 15 days.

Periodontal dressing and sutures were removed after 7 days. Patients were reinstructed for an atraumatic brushing technique. At the end of the trial, patients received a letter thanking their voluntary participation in the study and were enrolled for maintenance care

Statistical analysis

Statistical analysis was performed using SPSS (Statistic Package for Social Science, version 17.0, IBM Corp., USA). Mean values and standard deviations for all clinical variables

were calculated. The Shapiro-Wilk test was used to confirm the data normal distribution. The significance of the difference in periodontal measures before and after treatment was evaluated with the Wilcoxon test. The correlate between quality of life and esthetics was performed by Spearman correlate test. Differences were considered statistically significant when the p-value was <0.05.

Figure 1. Demonstration of functional and esthetic morphology of the periodontium after treatment in the upper left canine.

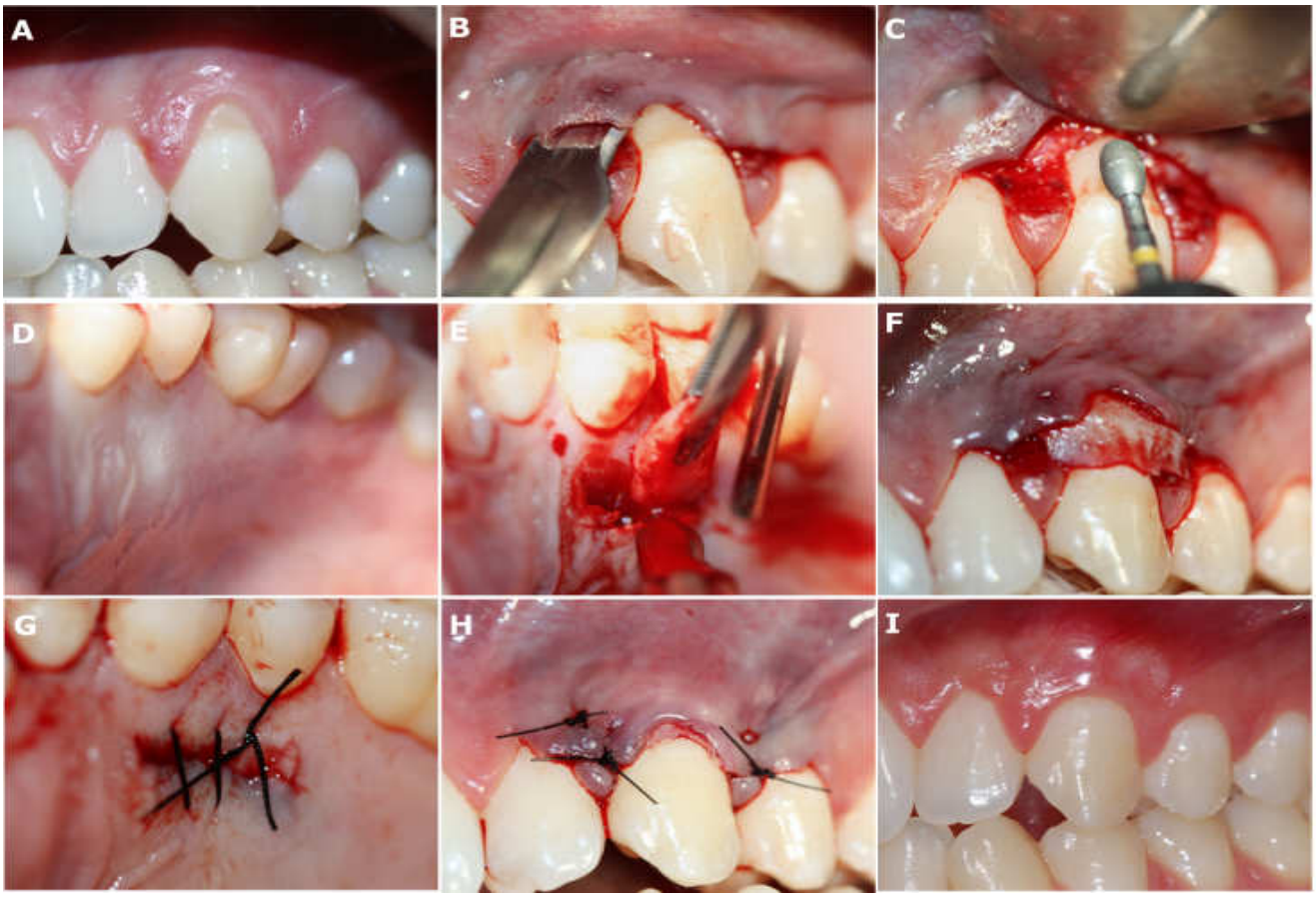

Figure 2. (A) Upper left canine with gingival recession. (B) Partial-thickness flap extended to distal/mesial papillae. (C) Root surface planed with diamond bur. (D) Palatal donor area. (E) Graft with 1.5mm thickness obtained by a double blade scalpel. (F) Graft adapted and stabilized with the cyanoacrylate glue. (G) Suture in the donor bed. (H) Flap maintained in a coronally position by suspensory sutures around the tooth. (I) Complete root coverage 3 months post-operative.

RESULTS

Healing was successfull in all 22 enrolled patients (25 recessions), and no patient was excluded from the study. In the third day after surgery, one participant exhibited facial hematoma which was healed within 15 days. Another patient exhibited a fistula 3 months postoperative. It was performed an excisional biopsy, and a ductal-like epithelial structure was observed. The data set was complete with no missing data. The gingival recessions were located mainly in first premolar. The demographic and clinical data are shownon Table 1.

Three months after surgery, the patients' evaluation of esthetics demonstrated that no patient considered the esthetic outcome as unsatisfactory and 15 patients evaluated the surgical area esthetic as excellent (Figure 3).

Statistical difference was observed after treatment for GRD, GRW, KTW, KTT, PD, CAL, and FMBI parameters. There was no significant difference for plaque index. The values of the clinical parameters at baseline and after treatment are shown in the Table 2. Complete root coverage (100%) was acchieved in 44% of the treated cases. The mean percentage of root coverage was 67.90% (6.40). Almost all participants had the vigorous tooth brushing as the main etiological factor for gingival recessions(Table 3).

The sum of the OHIP-14 scores varied from 2.71 to 13.57 points with a median of 5.45 points in the baseline, and ranged from 0.00 to 8.90 points (median = 1.20) three months post-operatively ($p<0.001$). There was a negative correlation between the esthetic and: the physical pain dimension of OHIP-14; psychological discomfort; OHIP-14 total scores (Table 4).

Table 1. Descriptive statistics of the patient characteristics.

	CAF + SCTG (*n=25*)
Age [mean (SD) (years), range]	28.08 (7.88), 20 to 49
Sex [n(%) (male)]	7 (28)
Type of tooth [n (%)]	
Canine	4 (16)
First pre-molar	12 (48)
Second pre-molar	9 (36)
Miller class [n (%)]	
Class I	25 (100)

Table 2. Clinical parameters (mm) at baseline and 3 months postoperatively.

Parameters	CAF + SCTG			
	Mean (SD)	**Median (Q_1 – Q_3)**	**Mean difference (SE)**	**p***
GRD				
Baseline	1.59 (0.48)	1.60 (1.22 – 1.85)	-1.05 (0.11)	<0.001
3 months	0.54 (0.51)	0.65 (0.00 – 1.00)		
GRW				
Baseline	3.11 (0.66)	3.00 (2.70 – 3.42)	-1.50 (0.28)	<0.001
3 months	1.60 (1.56)	2.10 (0.00 – 2.80)		
KTT				
Baseline	1.11 (0.39)	1.00 (0.87 – 1.37)	0.53 (0.11)	<0.001
3 months	1.64 (0.38)	1.80 (1.27 – 2.00)		
KTW				
Baseline	3.52 (1.08)	3.35 (2.75 – 4.20)	0.74 (0.18)	0.001
3 months	4.27 (1.02)	4.00 (3.55 – 5.07)		
PD				
Baseline	1.56 (0.50)	2.00 (1.00 – 2.00)	0.56 (0.13)	0.001
3 months	2.12 (0.60)	2.00 (2.00 – 2.50)		
CAL				
Baseline	3.16 (0.74)	3.30 (2.67 – 3.60)	-0.48 (0.16)	0.014
3 months	2.68 (0.84)	2.95 (2.00 – 3.30)		
FMBI (%)				
Baseline	6.67 (1.54)	4.03 (1.27 – 9.35)	-1.78 (1.08)	0.014
3 Months	3.66 (0.94)	2.43 (0.83 – 4.39)		
Plaque index (%)				
Baseline	10.23 (1.06)	9.82 (6.46 – 12.50)	-3.00 (1.51)	0.097
3 months	8.44 (1.09)	7.8 (3.73 – 10.93)		

* Wilcoxon test. CAF: coronally advanced flap. SCTG: subepithelial connective tissue graft.GRD: gingival recession depth. GRW: gingival recession width. KTT: keratinized tissue thickness: KTW: keratinized tissue width. PD: probing depth. CAL: clinical attachment level. FMBI: full mouth bleeding index.

Table 3. Etiologic and predisposing factors of gingival recession.

Factors	**n (%)**
Traumatic toothbrush	23 (92)
Traumatic occlusion	8 (32)
Inadequate width of attached gingiva	6 (24)
Aberrant frenum	6 (24)
Cervical abrasion	5 (20)
Previous orthodontic treatment	3 (12)
Attrition	2 (08)
Incorrect tooth position	1 (04)
Associate factors	
Traumatic toothbrush + traumatic occlusion	7 (28)
Traumatic toothbrush + Inadequate width of attached gingiva	6 (24)
Traumatic toothbrush + aberrant frenum	6 (24)
Traumatic toothbrush + Inadequate width of attached gingiva	3 (12)

+ aberrant frenum	
Traumatic toothbrush + Inadequate width of attached gingiva + traumatic occlusion	1 (04)

Table 4. Correlation of OHIP-14 scores and esthetic, 3 months postoperatively.

	Estethic	
	r_s	p
Functional limitation	-0.24	0.242
Physical pain	-0.40*	0.046
Psychological discomfort	-0.47*	0.016
Physical disability	-0.31	0.128
Psychological disability	-0.20	0.330
Social disability	0.05	0.812
Handicap	-0.10	0.610
OHIP-14 total	-0.44*	0.026

Figure 3. Patient self-evaluation of the esthetic outcome at 3months postoperatively

DISCUSSION

Periodontal plastic surgery is focused at esthetics outcomes, which extend elsewhere tooth color. It allows including the soft tissue component as a dentition frame. Due to the relevant subject, the present clinical study attempted to analyze the gingival esthetics under patients watch. The results achieved 3 months postoperatively showed significant improvement of periodontal status and patient´s satisfaction regarding the esthetics.

The root coverage procedure used in this study was the coronally advanced flap associated with subepithelial connective tissue graft. Previous systematic reviews showed the high predictability for root coverage and clinical attachment gain by using subepithelial connective tissue graft for the treatment of Miller Class I gingival recession.[1,7,17,18] The technique used in this study guarantees a close contact of the graft with the recipient site and a double blood supply. Otherwise, this technique results in harmony of color in relation to adjacent tissues.

In this study, the epithelial collar of the graft was not removed, thus avoiding excessive handling and possible damage to it. According to Bouchard et al. (1994)[20] and Byun et al. (2009),[21] there is no statistically significant difference in the success of root coverage and periodontal parameters when the epithelial collar of the graft is removed or not.

When using the SCTG, it is acceptable an increase in thickness of the keratinized tissue, which in this study was 0.53mm. This value was higher than those reported by da Silva et al. (2004) that reported 0.44mm.[22] However, that clinical trial did not use double blade scalpel differing from the present study that used grafts with an uniform thickness of 1.5mm. This suggests that thicker grafts result in higher values of the KTT in 3 months. The thickness augmentation of the keratinized tissue observed in the present study is in agreement with similar studies which used SCTG and reported increase of KTT.[23,24] An increase in gingival thickness, as obtained in the present study, may prevent future GR in patients with thin periodontal phenotype.

There was a statistically significant increase of keratinized tissue width. This may be explained by the ability of the transplanted graft to display keratinization in the epithelium once situated in its new location.[25] The augmentation of the keratinized gingiva and the coronally replacement of the flap enabled the root coverage, reducing significantly the gingival recession. In addition, gingival recession can reduce over time, considering the "creeping attachment". This phenomenon corresponds to the late coronally migration of the gingival margin, and it can occur up to 12 months after surgery.[26-28] Long-term follow-up of the patients should allow this observation in the present study.

The percentage of total root coverage achieved in this study was close to those reported by Paoloantonio et al. (1997),[29] Jepsen et al. (1998),[30] Wang et al. (2001),[31] and Keceli et al. (2008),[32] and different from those found by Harris (1997),[33] Trombelli et al. (1998),[34] Borghetti et al. (1999)[35] and Tatakis & Trombelli (2000).[36] The mean percentage of root coverage of this study was 67.9% which is constant with previous systematic reviews that

found the mean root coverage ranged from 50.0% to 97.7%.[1,17,37,38] The difference in the percentage of root coverage among the studies may be due the initial periodontal phenotype, the size of recession defect, the classification of gingival recession, the time of reassessment, the operator's experience and cooperation of the patient after the treatment.

In this study, there was no statistically significant difference in plaque index before and after treatment which may be explained by the fact that the patients initially presented excellent plaque index. Otherwise, the optimal percentage of plaque and bleeding index indicate that the patients maintained a good level of oral hygiene during the experimental period. These data agree with Matas et al. (2011),[39] who stated that gingival recession is common in people with high standards of oral hygiene.

In this study, the patients` opinion about the esthetics suggested that all patient was satisfied with the appearance of the healed tissue. After surgery, the tissue volume, gingival color, contour, and contiguity with the adjacent gingival tissue may have contributed to a better acceptance by the patients, even those who had residue of gingival recession. In addition, the esthetic was not evaluated by a professional. According to Bouchard et al. (2001),[12] the patient, not the researcher, primarily should evaluate the esthetic achieved by root coverage procedures.

In this study, the physical pain correlated negatively with esthetics. It may be explained considering that the better esthetic (achieved 3 months postoperatively) was related to the decreased of gingival recession depth. Thus, the dentin hypersensitivity (pain) also decreased, since the dentin exposed was covered. The psychological discomfort also correlated negatively with improved esthetics. Many people are anxious about gingival recession for having poor esthetics.[40] The high percentage of root coverage acchieved in this study improved the esthetic, reduced the GR and the patients anxiety, enabling the decrease in the psychological discomfort.

Although this study used a non-probabilistic judgment sample, the present gingival recession etiologies were in agreement with the literature.[3,4] The traumatic brushing was present in almost all cases. According to Kassab & Cohen (2003),[40] brushing with excessive force, inadequate technique or hard brush generate an inflammation of the gingival tissue. The localized inflammatory process causes proliferation of epithelial cells into the connective tissue. This fact brings about a collapsing of the epithelial surface which is manifested clinically as gingival recession.[41]

In order to maintain the postoperative position of the gingival margin, the habit of brushing would be more important than the clinical attachment gain.[42-44] Therefore, patients were instructed to perform an atraumatic tooth brushing technique with rotary motion of the brush in apico-coronal direction along the axis of the teeth, and use a soft brush.

In this study, twenty-four percent of cases of gingival recession were associated with inadequate attached gingiva. The importance of the keratinized gingiva to prevent gingival recessions is not well defined in the literature.[45]The keratinized tissue around the teeth may be affected by inflammation induced by plaque and/or traumatic tooth brushing; or a thin keratinized gingiva may not be able to maintain periodontal health. In such cases, there is a risk of gingival recession.

The present study may have few limitations. Firstly, there is no group to compare which surgery procedure achieve more attachment gain and better esthetic. Secondly, the patient did not assess the esthetic in the beginning of the study, limiting statistical analysis for esthetics.

Randomized clinical trials (RCTs) focusing on clinical parameters and esthetics are needed to corroborate or refute the findings of this study. Long-term postoperative studies should be developed to determine the root coverage predictability in the esthetics. Further RCTs should be performed to establish the effect of graft thickness in the root coverage outcomes. In future studies, the success of the surgical root coverage should include some points beyond the amount of root coverage, such as, patient`s satisfaction and amount of keratinized gingiva.

CONCLUSION

It can be concluded that surgical root coverage can improve the clinical periodontal status and the esthetics. Thus, periodontal plastic surgery can be indicated as treatment when the patient desire to improve the appearance in gingival recession defects. The vigorous tooth brushing was the main factor linked with gingival recession.

ACKNOWLEDGEMENTS

We would like to thank the Minas Gerais State Research Foundation (FAPEMIG, Minas Gerais, Brazil) for the financial support. The authors declare that they have no conflict of interests.

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3. CONCLUSÕES GERAIS

Dentro dos limites do presente estudo, pode-se concluir que:

- Houve redução na altura e largura da retração gengival.

- Houve aumento na espessura e altura da gengiva queratinizada.

- Houve redução na hipersensibilidade dentinária cervical.

- Houve melhora da qualidade de vida e estética.

- O principal fator etiológico para a retração gengival foi o trauma devido à escovação.

- O recobrimento radicular exerce influência na diminuição da HSDC, assim como na melhora da qualidade de vida e estética.

4. CONSIDERAÇÕES FINAIS

Atualmente, há uma tendência em se procurar serviços odontológicos para uma melhoria das condições estéticas locais. Isso se deve a uma grande quantidade de pesquisas clínicas realizadas sobre o assunto e pelo desenvolvimento e aprimoramento de técnicas e biomateriais.

A escolha do tratamento mais adequado para a retração gengival assim como para a hipersensibilidade representa um problema para o periodontista. Assim, o cirurgião-dentista deve propor ao paciente as opções de tratamento e discutir seus prováveis benefícios, além de alertar quanto ao prognóstico, limitações e riscos associados à terapêutica, ou às conseqüências da ausência de tratamento.

Há uma tendência dos pesquisadores em buscar técnicas cirúrgicas para tratamento de diversas alterações, sem muitas vezes realizar avaliações de parâmetros subjetivos, como limitações no dia-a-dia. O presente estudo preocupou-se com o bem-estar do paciente, abordando a avaliação estética, qualidade de vida e hipersensibilidade dentinária cervical dos mesmos após terem sido submetidos à cirurgia para recobrimento radicular.

Recomenda-se que mais trabalhos com este enfoque sejam elaborados ao longo do tempo, uma vez que tão importante quanto um resultado clínico ideal, é a satisfação do paciente quanto ao tratamento.

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