

What's new for the clinician– summaries of recently published papers

SADJ May 2022, Vol. 77 No.4 p234 - p237

Prof V Yengopal, Dean, Faculty of Dentistry, University of the Western Cape, University of the Western Cape

1. Is there an association between tooth loss and cognitive function?

More than 90% of the world's population suffer from one or more oral conditions that affects their oral health related quality of life. Edentulism (partial or full) is a major public health problem especially in poorer settings where people have limited options to manage tooth pain, tooth decay or periodontal disease. Often the only treatment option available is tooth extraction resulting in early tooth loss. In other settings, for example, the Western Cape, cultural and traditional norms practiced over generations has resulted in some of the highest edentulism rates in the world.

Neurological disorders are the leading cause of disability-adjusted life-years (DALY) globally. Neurocognitive disorders (NCDs) is also expected to escalate worldwide in parallel with the longer lifespans of people. One of the most common NCDs is mild cognitive impairment (MCI).¹ MCI is a syndrome defined as cognitive decline greater than that expected for an individual's age and education level but that does not interfere notably with activities of daily life, and may be indicative of Alzheimer's disease or another dementia.¹ Alzheimer's disease and other types of dementia are the second group of disorders to which DALYs are risk attributable, only after stroke. Among such risk factors, the 2020 report of the Lancet Commission for Dementia proposed three new risk factors, namely, alcohol intake, head injury, and air pollution, in addition to the nine previously proposed in 2017 (i.e., less education, hypertension, hearing impairment, smoking, obesity, depression, physical inactivity, diabetes, and infrequent social contact).¹

The possible etiologic role of edentulism in the development of MCI and dementia has attracted the attention of researchers in recent years¹. Possible mechanisms supporting this relationship include the following: (1) the inflammation/infection mechanism: *Porphyromonas gingivalis*, a well-known periodontopathogen, may induce the local release of pro-inflammatory cytokines and subsequently increase both the peripheral

circulation and brain accumulation of amyloid- β ; (2) the masticatory mechanism: preclinical and clinical studies have demonstrated the negative effect of impaired masticatory function on the incidence of cognitive performance¹; (3) the diet and nutrition mechanism: this is strongly related to the masticatory one, since tooth loss may influence dietary patterns, which can have a deleterious effect on intraoral food pre-processing before deglutition, leading to a reduction in the intake of nutritional components that have a neuroprotective effect and also promote obesity¹.

Galindo-Moreno and colleagues (2022)¹ sought was to investigate the association between edentulism and cognitive function through a combined analysis of large national health surveys. They hypothesized that cognitive function depended, at least in part, on tooth status and masticatory function when other potential important factors, such as age or socioeconomic status, were controlled.

MATERIALS AND METHODS

This was a retrospective observational study in which data from two national health surveys were analysed to assess the potential association between oral health and cognitive status. The United States of America's (USA) National Health Interview Survey (NHIS, 2014–2017) and the National Health and Nutrition Examination Survey (NHANES, 2005–2018) were used. These are public databases and no ethics approval is required to use their data. They both measured the cognitive status (memory/concentration problems) subjectively. The NHIS asked the participants four questions relevant to understand their cognitive function: (1) degree of difficulty remembering or concentrating? (no difficulty, some, a lot, cannot do at all), (2) difficulty remembering, concentrating, or both? (remembering only, concentrating only, both), (3) how often do you have difficulty remembering? (sometimes, often, all the time), and (4) number of things you have difficulty remembering? (a few, a lot, almost everything). This survey also presents some limitations regarding dental status, as only either presence of complete adult dentition or absence of at least one tooth was registered. The NHANES survey asked the participants only a cognitive question (memory/concentration problems), but included an examination of the dentition status with detailed information

Prof V Yengopal: BChD, BScHons, MChD, PhD, Dean, Faculty of Dentistry, University of the Western Cape, South Africa.
ORCID Number: 0000-0003-4284-3367
Email: vyengopal@uwc.ac.za

regarding each individual tooth. Both surveys collected information about age, sex, education level, socioeconomic status (SES), body mass index.

The primary outcome was cognitive function relative to edentulism in adults 45 years or older. Age, gender, SES, education level, cardiovascular health index, body mass index, exercise, alcohol and smoking habits were used as covariates. In the NHIS analysis, depression and anxiety were added as confounders. In the NHANES analysis, only depression was included. For the analyses, the independent variable was edentulism as measured in each survey, and the dependent variables were the cognitive function measures, as defined in each survey as well.

RESULTS

The National Health Interview Survey (NHIS, 2014–2017) sample was composed by 17,134 (1169 missing) in 2014, 15,075 (1864 missing) in 2015, 15,350 (1128 missing) in 2016, and 12,122 (1203 missing) in 2017. It was observed that the presence of teeth was beneficial in the maintenance of a good cognitive status. Relative to the reference category “no problem,” completely edentulous subjects exhibited a larger Odds Ratios for having difficulties in remembering only, concentrating only and both. This was also observed for gender, education, SES, and CV risks variables.

After quantification of memory failures in function of edentulism, it was found that, relative to the reference category “no problem,” completely edentulous subjects exhibited an increased probability of forgetting “a few things” and “a lot of things”. The same trend was observed for age, education, SES, cardiovascular health, exercise, and anxiety and depression.

Data from the NHANES surveys (N= 17,189, missing=5061, overall) were used to precisely analyze the impact of tooth loss on the development of cognitive problems. The analysis indicated that the best cut-off was 20.5 remaining teeth. Results showed that, compared with no edentulism (more than 20.5 teeth), edentulism has a significantly higher probability of being associated with confusion/memory problems. When analysed independently by tooth type, the worst results emerged when molars were missing. It was also found that people under age 45 showed an increased probability of having memory/confusion problems [OR= 1.877 (95% CI [1.331, 2.646]).

CONCLUSION

In this sample of more than 100 000 individuals, the authors noted that there was an association between edentulism and a decline in cognitive function.

Implications for practice

Maintenance of functional teeth through the promotion of oral health may contribute to the preservation of memory/concentration and other essential cognitive functions

REFERENCE

1. Galindo-Moreno, P., Lopez-Chaichio, L., Padial-Molina, M. et al. The impact of tooth loss on cognitive function. *Clin Oral Invest* 26, 3493–3500 (2022).

2. Stainless steel crown vs bulk fill composites for the restoration of primary molars post-pulpectomy

Placement of a stainless steel crown (SSC) is the most commonly recommended restoration following endodontic treatment of primary molars,¹ as it provides a good coronal seal, preventing microbial infiltration or restoration failure over time. However, dental aesthetics are compromised due to colour characteristics of the SSCs, which may influence child's and parent's acceptance, especially when compared to more aesthetic options such as composite resins (CRs).¹

The main problem of CR, however, is the high polymerization shrinkage that results in marginal deficiencies, cracked cusps, and material fracture, especially in multisurface restorations after pulp treatment.¹ The fracture of the restoration can lead to a microbial infiltration, resulting in the failure of the endodontic treatment. In order to solve this problem of polymerization shrinkage, bulk fill composite resin (BF) was launched in the market, with promising evidence level in both clinical and in vitro studies⁷; however, no clinical trial has been performed to date using BF as a restorative material after pulp treatment in primary teeth.

Olegário *et al* (2022)¹ reported on a randomized clinical trial that sought to evaluate the 1-year survival rate of endodontic treatment followed by stainless steel crowns (SSCs) or bulk fill composite resin (BF) as a restorative option and also the acceptance of these restorations by the child and parent.

MATERIAL AND METHODS

Allowing for a 25% lost-to-follow-up rate, 147 subjects were This was a two-arm, controlled, 1:1 allocation ratio, non-inferiority clinical trial reported in the CONSORT (Consolidated Standards of Reporting Trials) format.

Informed consent was obtained from the parent or guardian of each child before participation in the study. Inclusion criteria were as follows: healthy (ASA I) cooperative children aged 3-8 years, who had at least one primary molar indicated for endodontic treatment irrespective of sex or socio-economic status; Primary molars with irreversible pulpitis or non-vital pulps with restorable tooth structure (adequate sound coronal tooth structure and periodontal support), confirmed by clinical and periapical radiographic examinations. Potential patients were excluded they presented with underlying systemic conditions and special healthcare needs or there was a presence of bone rarefaction involving more than a half of the root, severe mobility, or resorption of more than half of the root or root perforations.

Participants were randomly assigned to two different treatment groups: SSC: restorations using SSC for primary molars (3M ESPE) that were cemented with a glass ionomer cement (GC Fuji Plus); and BF: restorations using BF (Filtek Bulk Fill) using Scotchbond™ Universal Adhesive (3M ESPE).

All treatments were performed by a single operator. After clinical and radiographic examination, baseline variables

related to demographic and tooth/lesion characteristics were collected. Child's age (3-5 or 6-8 years) and sex, and the presence of fistula, initial diagnosis (necrosis without or without furcal rarefaction or irreversible pulpitis), number of surfaces of the caries lesion (one, two, or more than two surfaces involved), molar (first or second molar), and jaw (upper or lower) were evaluated by the operator of the trial in order to analyse whether those variables could be related to treatment success. All children included in this trial received endodontic treatment following a standardized protocol. All the pulpectomies and restorations were performed in a single session. After finishing the endodontic treatment, the randomization envelope was opened by a third person and the child was treated according to the following treatment groups: (1) In the SSC group, the crowns were cemented with a glass ionomer cement (GC Fuji Plus). Tooth preparation was only carried out when there was insufficient space to fit the crown, (2) In the BF group, the cavity walls of the treated tooth were cleaned, etched with a 37% phosphoric acid, washed, and dried using 3:1 air/water syringe. For occluso-proximal restorations, a metal contoured matrix and a wooden wedge were used to provide an appropriate contour. Scotchbond™ Universal Adhesive was applied with a microbrush and light-cured for 10s. The restoration was completed using BF (Filtek Bulk Fill). If the cavity size was greater than 4 mm deep, two increments were applied.

All restorations were light cured using LED light, ensuring a minimum irradiance of 400 mW/cm². When necessary, a finishing bur was used for adjustments.

The primary outcome of this study was the success of the endodontic treatment after 12 months. All treatments were evaluated by a calibrated independent examiner. Clinical evaluation took place after 1, 3, 6 as 12 months while radiographical evaluation took place after 3, 6 and 12 months. Clinical failure was considered when the tooth presented with fistulae, abscess, or pathological tooth mobility. Radiographical failure was considered when there was a progression of inter-radiolar radiopacities, increased pathological root resorption, or absence of periodontal integrity.

The clinical and radiographic criteria to determine success were the absence of all the conditions described above until the end of the follow-up period. In case of failure of the endodontic treatment, the extraction of the tooth was performed.

In addition to the clinical and radiographical evaluation of the endodontic treatment, the restoration success was also evaluated by examining the marginal integrity and checking for secondary caries, and fracture restoration. Furthermore, the SSCs were evaluated for the presence of perforation and crown loss.

Acceptance of the type of treatment questionnaire were administered immediately after treatment by an external

researcher who did not participate during the endodontic treatment phase, and who was instructed to read the questions and show the possible answer in the same way for all the participants to avoid interview bias. The new restoration was shown to patients and their parents using a mirror to identify the treated tooth.

The questionnaire for the children (C) consisted of five questions in Portuguese regarding appearance, acceptability, treatment experience, and their views on the metal crown or composite restoration. The questionnaire for the parents (P) consisted in five questions in Portuguese regarding their attitudes towards the SSC or composite restoration and how they felt their child had coped with the dental treatment. The child's and parent's answers for each question were enumerated from 0 to 4 (0 = strongly agree; 1 = agree; 2 = no opinion; 3 = disagree; and 4 = strongly disagree). Thus, for the total score, all scores from the answers were summarized per children and parents, and the higher the total score, the worse their acceptance in general.

RESULTS

A total of 91 children were included in this study and received the interventions. Among the participants, 37 (40.66%) were female and 54 (59.34%) were male and the mean DMFT/dmft was 7.2 (± 3.2 ; min 5–max 14). A total of 46 teeth were restored with BF and 45 with SSC. After 12 months, 14 children were not evaluated because they moved to another city or changed their mobile phone numbers (dropout = 15.38%).

The survival rate after 1 year was BF = 75% and SSC = 88% ($p = 0.45$). The non-inferiority hypothesis between the treatment's survival could not be concluded (HR = 1.41; 90% CI 0.57-3.43, $p = 0.645$). Intention-to-treat analysis found that the success rates after 12 months were 86.7% and 82.6% for SSC and BF groups, respectively. An absolute difference of -4% was found, however since the lower confidence limit was -19% the non-inferiority between the groups could not be claimed (RR = 0.95; 0.78-1.16, $p = .149$).

In terms of the restorations, there were 9 in the BF group and 0 in the SSC group. The second primary molars had lower risk of endodontic failure when compared to the first primary molars ($p = .026$). All other analysed variables (sex, age, size of inter-radicular lesion, presence of fistula, abscess, or mobility) were not associated with the failure of the endodontic treatment in this secondary analysis.

Two parents and two children from the BF group did not answer the acceptance questionnaire after treatment. The reasons for the non-response were as follows: the child was sleeping after the treatment ($n = 2$) so they were unable to answer the questions; and the parents had to rush to another appointment ($n = 2$). Those questionnaires were excluded from data analysis due to missing data (response rate = 97.8%). Most of the answers are either 'strongly agree' or 'agree', showing a high acceptance for all responses, regardless of the treatment group

CONCLUSION

The results of the trial indicate that it is not possible to affirm that restorations of teeth with endodontic treatment performed with BF resin are non-inferior to restorations made by SSC; however, failures in BF restorations lead to a failure of the endodontic treatment. In terms of acceptance, both materials were well accepted by both children and their parents.

Implications for practice

The finding of this trail suggest that both materials were equally effective and accepted by patients and their parents. BF composites however should more failures with respect to the restorative phase of the treatment than SSCs.

REFERENCE

1. Olegário IC, Bresolin CR, Pássaro AL, de Araujo MP, Hesse D, Mendes FM, Raggio DP. Stainless steel crown vs bulk fill composites for the restoration of primary molars post-pulpectomy: 1-year survival and acceptance results of a randomized clinical trial. *International Journal of Paediatric Dentistry*. 2022; 32: 11-21.

CPD questionnaire on page 242



The Continuous Professional Development (CPD) section provides for twenty general questions and five ethics questions. The section provides members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure continuing education. The importance of continuing professional development should not be underestimated, it is a career-long obligation for practicing professionals.