Canadian Agency for Drugs and Technologies in Health

HTA

HEALTH TECHNOLOGY INQUIRY SERVICE (HTIS)

Title: Shortened Dental Arch and Restorative Therapies: Evidence for Functional Dentition

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Context and policy issues:

For patients who lose teeth due to various reasons, a fundamental problem that needs to be solved is how many teeth should be replaced in order to assure satisfactory oral function.[1] In 1992, the World Health Organization stated that "the retention, throughout life, of a functional, esthetic, natural dentition of not less than 20 teeth and not requiring resources to prostheses should be the treatment goal for oral health".[2] In clinical practice, many patients would still be treated with prostheses. The treatment options include a complete restoration of the missing teeth, a partial restoration, or "no treatment", which would result in a shortened dental arch (SDA).[3]

An SDA is a specific type of a dentition with a reduced number of posterior dental units. Studies have indicated a lack of strict correlation between a reduced number of occlusal posterior units and perceived oral function.[1] The effect of an SDA on the potential relationship with temporomandibular disorders (TMDs)[4] are under debate. Some researchers also pointed out that the replacement of missing molars was a common source of iatrogenic periodontal disease and should therefore be avoided if aesthetics and functional stability can be satisfied.[5]

It can be unclear whether replacement of missing teeth or allowing a shortened dental arch is more beneficial to the patient. This report examines the impact of shortened versus complete dental arch on patients with tooth loss.

Research question:

What is the evidence that the shortened dental arch can meet the requirements of functional dentition and prevent the need for removable partials or other therapies?

Methods:

A limited literature search was conducted on key health technology assessment resources, including MEDLINE, EMBASE and CINAHL, all published through the Ovid platform, the Cochrane Library (Issue 2 2008), University of York Centre for Reviews and Dissemination (CRD) databases, ECRI, EuroScan, international HTA agencies, and a focused Internet search. Results include articles published between 2003 and April 2008, and are limited to English language publications only.

HTIS reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews and meta-analyses are presented first. These are followed by randomized controlled trials and observational studies.

Summary of findings:

No systematic reviews or health technology assessment reports were identified.

A pilot randomized controlled trial was identified to examine the effect of SDA on oral health-related quality of life (OHQoL).[6] In this trial, patients were enrolled if all molars were missing but had at least both canines and one premolar in each quadrant. Patients were randomly assigned to two treatment groups: 1) missing teeth were replaced at least up to the first molar with a removable partial denture (RPD group), or to the second premolar with conventional porcelain-fused-to-metal crowns, while molars were not replaced (PROC group). The interested outcomes were OHQoL, which was assessed using the Oral Health Impact Profile (OHIP) and the Research Diagnostic Criteria (RDC) before treatment, 6 weeks, 6 months and 12 months after treatment. OHIP measures people's perceptions of the social impact of oral disorders on their well-being and it has been used in a number of clinical trials investigating the impact of implant prostheses on OHQoL. RDC was used to assess psychological distress, psychosocial dysfunction and orofacial disability caused by TMD, and it has been used in clinical trials to measure the effects of treatment for TMD.

The results showed that before treatment, there was no statistical difference between groups for the baseline OHIP scores ($p>0.05$). At 6-months and 12-months follow-up, marked reductions of impacts from implant prostheses in both treatment groups were observed when compared with pre-treatment scores ($p\leq0.001$); however, there were no significant differences between treatment groups at any time ($p>0.05$). As for RDC scores, before treatment, there was no significant difference between groups for any of the RDC dimensions (pain severity, disability points, jaw disability checklist [JDL] and symptom checklist-90). Within the RPD group, there was a significant increase of JDL impacts from pre-treatment (1.0 point) to the 6-month follow-up (7.2 points, $p=0.013$). This significance disappeared at the 12-month follow-up and there were no other significant changes of JDL impacts in either group.

The authors concluded that within both treatments, an improvement of OHQoL was achieved. No significant difference could be detected between the two therapies. However, this may be due to the low sample size within this pilot study. Even though 34 patients participated in this study, only 23 of them filled out the OHIP questionnaire before treatment. At the 12-month follow-up session only 24 forms were filled out correctly and completely. In addition, only 21 of 30 participants (70%) completed the OHIP form correctly and completely at all four stages of the trial. The results from this study should be interpreted with caution due to the high attrition rate.

A non-randomized controlled study that compared shortened versus complete dental arches with respect to signs and symptoms related to TMD was identified.[4] Seventy-four patients with SDA and 72 controls with complete dental arches were compared in this study. Patients in the study group had non-interrupted dental arches and consisted of intact anterior regions and 3-5 occlusal units in the posterior area, while patients included in the control group had complete dental arches with or without third molars. A total of 42 subjects with SDA and 41 subjects with complete dental arches had a complete follow-up of nine years. Assessment of TMD was based on symptoms (pain, noises/clicking during mandibular movements and restricted mandibular mobility) and signs (clicking/crepitus of the TMJ and active maximal mouth opening).

The results showed that baseline data on symptoms and signs were not significantly different between drop-out subjects and subjects with complete follow-up, neither in the shortened nor in the complete dental arch group. Covariate analyses using a mixed model revealed a higher estimated mean for pain in case of SDA (0.24 in the study group versus 0.16 in the control group). However, none of the differences regarding the reported symptoms and the clinical signs between the two groups was statistically significant ($p>0.05$). The number of years of the SDA appeared to have no significant influence on symptoms and signs. Of the subjects with complete follow-up, the frequency distributions showed that the most serious symptoms, being heavy and/or frequent pain and restricted mobility, rarely occurred. The authors concluded that subjects with SDA had similar prevalence and severity of symptoms and signs related to TMD compared to those with complete dental arches.

Limitations

- Evidence that addressed the research questions is very limited; few studies were published from 2003 to date.
- No health technology assessments or systematic reviews were identified. Only one randomized controlled trial was identified. One non-randomized study was identified, which may be subject to selection bias.
- Results of the included studies should be interpreted with caution, due to the high attrition rates.
- There were no studies identified that assessed important outcomes, such as chewing function and migration of the remaining teeth.

Conclusions and implications for decision or policy making:

The evidence of SDA was limited. Only one randomized trial and one non-randomized trial were identified through the literature search. Both studies examined the impact of SDA comprising the anterior and premolar regions. The limited data implies that patients with SDA had comparable OHQoL and similar symptoms and signs of TMD when compared to those with complete dental arches. A comprehensive description of the impact of SDA on the studied patient population cannot be made.

One narrative review article[5] described the English literature on SDA with special focus on publications of a Dutch group (the Käyser/Nijmegen group). The search revealed 77 articles in total, of which 32 articles including epidemiological and clinical studies and opinion papers on SDA by the Dutch group constituted the basis of their review; 45 articles by other authors were also included. Their major findings were: in general, no clinically significant differences between subjects with SDA of three to five occlusal units and complete dental arches regarding variables such as masticatory ability, signs and symptoms of TMD, migration of remaining teeth,

periodontal support, and oral comfort. The studies reviewed showed that SDA comprising anterior and premolar teeth generally fulfilled the requirements of a functional dentition.

In conclusion, SDA appeared to be as effective as complete dental arch with respect to improving OHQoL, and patients with SDA had similar TMD profile with complete dental arch. Several factors are under consideration before choosing an appropriate therapy: sufficient oral function, patient's comfort, and cost. Since the patient's needs and demands vary from individual to individual, the dentists should discuss with the patients the potential benefits and harms of all available treatment options. In addition, further well-designed clinical trials are warranted to provide more compelling evidence to estimate the roles of SDA on dental care for patients with teeth loss.

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