



## **Short Dental Arch- A Treatment Modality**

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### **ABSTRACT**

*Patient functional needs vary depending on location, lifestyle, adaptability, economic situation, patient age, and type of treatment to be given. A functional dentition, according to the World Health Organization, should have at least 20 teeth to preserve good oral health and the capacity to chew. However, research shows that dental arches made up of the anterior and premolar regions satisfy this criteria. The short dental arch (SDA) was found to be a treatment option for partially dentate patients and may offer improved oral hygiene, comfort, functionality, and maybe cost savings.*

*Keywords: Oral Health, Premolar Regions, Dental Arch, Economic Situation*

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### **INTRODUCTION**

Patient functional needs vary depending on location, lifestyle, adaptability, economic situation, patient age, and type of treatment to be given. A functional dentition, according to the World Health Organization, should have at least 20 teeth to preserve good oral health and the capacity to chew. However, research shows that dental arches made up of the anterior and premolar regions satisfy these criteria. In partial dentition patients, Short dental arch is a good treatment option as it provides functionality, comfort, oral hygiene and also it is cost effective. The importance given to each element changes depending on the patient and the intended course of treatment, but the number of teeth required to meet functional requirements remains a mystery. This article defines oral functioning as the maintenance of masticatory capacity and effectiveness while maintaining healthy hard and soft tissues structure [1-3]. A dentist can fabricate RPD or FPD for the partially dentate patient with several posterior teeth that includes one or more natural teeth. RPD or FPD can also be created with distal extension, including one or more natural teeth, for these patient's. It is customary to incorporate the first or second molars when they are present into the prosthesis design, but it is uncertain whether doing so is necessary to preserve oral to maintain function of oral structures. The question remains same, Should the first and second molar teeth be included to the occlusal table.

If the implant is placed posteriorly, a longer occlusal table can be created with the implant supported restorations, however this is typically only possible in the first molar position. With implant-supported restorations, Cantilever extensions may be used to achieve complete posterior occlusion, but these should be kept to a maximum of 6 to 8 mm for the maxillary arch and 10 mm in the mandibular arch [4]. The dental literature does not clearly state whether this expansion is required or appropriate. To restore or enhance masticatory function, dentists replace or rehabilitate missing, broken and grossly decayed teeth with fixed or removable prostheses. Any treatment plan must address a basic issue, namely the ideal/required length of an occlusal table. The idea of maintaining short dental arch (SDA) as a specific treatment modality for the partially dentate patient has been mentioned numerous times in the literature. The short dental arch fills the need to offer the patient an economical and effective treatment, even if many dentists may agree that restoring the entire dental arch is not always necessary. Various search engines were used to locate and critically evaluate the English-language, peer-reviewed literature relevant to the short dental arch (SDA) from 1966 to the present.

### **ORAL FUNCTIONALITY**

According to the research, masticatory skill is closely related to tooth count, and it is hindered when a patient has less than 20 evenly spaced teeth [5-6]. The Shortened dental arch (SDA) can be described as having an intact anterior region but fewer pairs of posterior teeth occluding it [7]. The World Health Organization in 1992 stated that the treatment goal for oral health should be the retention of a

functioning, aesthetic, natural dentition of at least 20 teeth without requiring the need for fabrication of the prosthesis again. However, these requirements varies from person to person, it is impossible to determine the minimum number of teeth required to meet functional requirements. Additionally, the treatment plan is heavily influenced by dental and economical status factors. In reality, dental arches that include the premolar and anterior areas meet the criteria for a functional dentition [8-9]. Therefore, for patients with SDA, replacing missing/ lost molar teeth with cantilevers, resin-bonded partial dentures, implant-supported prostheses, or distal extension removable partial dentures may amount to over-treatment.

### **MASTICATORY EFFICIENCY**

A successful course of treatment depends on the patient adapting to alteration in arch length brought on by gradual tooth loss, even if masticatory efficacy and aptitude are important elements in oral functionality. Oral functionality depends on the patient's capacity to adjust to changes in dental arch length brought on by tooth loss. Masticatory efficiency and masticatory ability are two crucial aspects of it. Subjective and objective evaluations can be used to categorize the literature on masticatory efficiency and ability during the past 50 to 60 years Interviews with patients who are assessing their own masticatory functionality are typically used to assess subjective masticatory function or masticatory competence.

Measuring the patient's capacity to grind food is a standard part of an objective examination of masticatory function or efficiency. Overall, the body of research shows that masticatory function is decreased when there are fewer than 20 teeth that are uniformly distributed across the mouth. 6 Rarely is the relationship between the length of the tooth arch and masticatory effectiveness discussed in the literature. In a study, 118 patients were divided into 6 groups according to the length and symmetry of the shortened dental arch in a cross-sectional clinical investigation [10]. There were two patterns seen of change in oral function, the dentition had been reduced to 4 occlusal units in 1 group, masticatory efficiency altered gradually? Thereafter, it declined quickly. Masticatory efficiency gradually improved at a nearly consistent rate in the second group. The authors hypothesised that as long as at least 4 occlusal units—which must be symmetrically positioned—remain, patients have the adaptive capacity to retain acceptable oral function in shorter dental arches. Another study compared patient evaluations of masticatory effectiveness in 54 individuals with complete dentitions with those from 43 people with SDAs. The findings showed that although SDA patients' masticatory function, food perception, food consumption were all impacted, the patients experienced a reduction that was acceptable [11]. In a different study, the oral functionality of patients with shorter dental arches was contrasted with that of individuals who had detachable partial dentures that extended their dental arches distally [12].

The overall functionality of patient's wearing RPD's and FPD's showed similar results. Overall, the study's findings revealed that distal extension RPDs did not enhance oral functionality for SDA patients, and the majority of concerns seemed to be about aesthetics because of anterior tooth loss. A recent study compared the masticatory skills of people with full dental arches to those subjects with shorter dental arches in Tanzania. The SDA patients varied in arch length and arch symmetry and had 0 to 8 pairs of occluding posterior teeth. Masticatory capacity was evaluated based on 20 typical Tanzanian dishes' perceived mastication challenges. Patients with very short arches—0 to 2 pairs of teeth, including premolars—had the highest rates of complaints and the most challenging mastication. For participants with undamaged premolar regions and at least one set of occluding molars, the prevalence of complaints was only 3% to 5%. Other subject groups, those who had a variable number of premolars and molars, reported a middle-sized amount of complaints (33 percent to 54 percent). According to the study, there is a negative correlation between the perceived difficulty of mastication and the number of pairs of occluding teeth. For instance, patients with 0 to 2 pairs of occluding premolars had very poor masticatory skills. Similarly, those with asymmetric dental arches and irregular tooth distribution reported more difficult mastication than individuals with more full dental arches. Harder foods made any discrepancies in masticatory skills worse. Overall, the authors came to the conclusion that an SDA does not reduce masticatory efficiency if the premolar areas are intact and there is at least one pair of occluding molars. And when a patient has fewer occluding premolars and/or asymmetrical arches, there is a considerable impairment of masticatory function, especially with hard food. However, according to some writers, SDAs do not cause changes in food preferences even when patients only have the adequate masticatory ability when 20 or more "well distributed" teeth—that is, when anterior and premolar teeth are still present—remain [13]. Therefore, reduced masticatory function and related alterations or shifts in food preferences only become apparent when there are fewer than 10 pairs of occluding teeth. 12 factors relating to prosthetics Occlusal stability, creating the proper vertical dimension, and maintaining the health of the soft and hard tissues as well as that of the temporomandibular joint are all prosthodontic factors in

patient care. A better definition of occlusal stability may be the stability of tooth positioning relative to its spatial relationship in the occluding dental arches. Occlusal stability is sometimes defined as the absence of the tendency for teeth to migrate other than the normal physiologic compensatory movements that occur over time [14-16]. Periodontal stability, number of teeth in arch-interdental distance, occlusal contacts, and tooth wear are some of the factors which affect occlusal stability. When one or more teeth from an arch are missing, there is frequently tooth mobility, tooth migration, and supra-eruption of opposing teeth. In SDAs, distal tooth grinding may increase anterior load, which in turn raises the frequency and intensity of SDAs and interdental spacing. In SDAs, distal tooth migrating might lead to an increased anterior load, which in turn raises the quantity and severity of anterior occlusal contacts as well as interdental space [17]. When unopposed teeth and single-standing teeth lack proper periodontal support, these consequences may be exaggerated. Similar to how tooth movement can alter the vertical and horizontal overlap, occlusal wear, and posterior support loss, among other things.

Few researchers have examined the relationship between shorter dental arches and occlusal stability, despite the fact that it is commonly accepted that alterations in occlusal balance lead to tooth movement, migration, and supra-eruption. Extremely small dental arches, particularly those with only 0 to 2 pairs of occluding teeth in premolar region, are thought to diminish occlusal stability. While longer dental arches—those with three to four occluding units—are said to have stronger occlusal stability, elderly patients typically experience more occlusal integrity changes [18].

SDAs made up of premolar and anterior teeth meet oral functional demands and exhibit patterns of vertical overlap and occlusal tooth wear that are comparable to those seen in full dental arches [19]. Although patients with SDAs have more anterior teeth in occlusal contact, more interdental spacing and lower alveolar bone scores (i.e., the height of the alveolar bone at the distal surface of each premolar) than patients with complete or longer dental arches, these differences in dentition and occlusal characteristics appear to remain stable over time. This shows that long-term occlusal stability is, in fact, a feature of the SDA. There aren't many data available on the frequency of TMJ issues in people with reduced dental arches. In a study, people with SDA and controls with entire dental arches were compared to SDA subjects with an intact anterior region and 0 to 8 posteriorly occlusive pairs of teeth. According to the study, participants with only one lateral posterior support and those without any posterior support experienced a higher prevalence of joint clicking/crepitation. However, there were no differences between the SDA and control groups in terms of discomfort, mandibular mobility, maximal mouth opening, or clicking/crepitation of the joints. However, it was discovered that diminished posterior support was substantially associated with increased tooth wear. Although there is no proof that SDAs cause TMJ issues, it was noticed that when either unilaterally or bilaterally lacking posterior support, there is a higher risk for pain and joint noises [20]. Another study looked into the possibility that SDAs could overload the TMJ and teeth, which could result in TMD and periodontal disease.

A FEM (fine element) model was used to quantify the occlusal forces and joint loads from electromyographic masticatory muscle investigations [21], and the calculated values were then compared to the actual measured occlusal forces. The occlusal force per root surface area was always highest on the most posterior tooth, the joint loads seemed to be decreasing overall even if the occlusal force on each individual tooth increased with missing molar occlusion. There were no signs that an SDA might overload the TMJ or the teeth, indicating that neuromuscular regulatory systems are capable of effectively regulating the maximum clenching force under a range of occlusal circumstances. 19 customer comfort Dentures need functional and emotional adaptation from patients, and some may never succeed. Therefore, a patient may be unsatisfied and occasionally intolerable of a denture based on subjective evaluation of comfort, functionality, and appearance, even when the placed prosthesis may satisfy all subjective criteria regarding fit, quality, and aesthetics. The correlation between dentist and patient opinions of dentures typically isn't great since patient evaluation criteria are hard to quantify [22]. When the SDA patient is receiving treatment, these discrepancies between clinician and patient perception are crucial. Few clinical investigations have evaluated patient oral comfort objectively, which is commonly measured by the absence of pain or distress, masticatory capacity, and dental appearance in terms of arch length. There were no discernible variations in pain or discomfort between the three groups when the oral comfort of SDA patients was compared to that of SDAs and distal extension RPDs and for subjects with complete dental arches, and only 8% of the SDA participants reported reduced masticatory function. 22 RPDs were reported to be unsatisfactory by 20% of SDA and RPD patients, and many patients discontinued using them for longer periods of time. There were no signs that offering distal extension RPDs improved oral comfort for SDA patients, even though an SDA can marginally reduce patient satisfaction with their mouths [23]. Another study using patient questionnaires discovered that even while patients' masticatory function was enhanced when bilateral RPDs were used to correct shortened mandibles, they not only preferred not to wear them but also there were signs of negative effects on the

remaining teeth. 23 Patients who received distal cantilever resin-bonded FPDs to correct the reduced mandibular dental arch reported improved overall satisfaction and better masticatory ability than those who received RPDs [24]. Clinical assessments of SDAs Numerous individuals with shortened dental arches receive treatment, but the SDA isn't formally acknowledged as a part of clinical care, and there aren't many publications in the literature that discuss clinical attitudes about the SDA in current treatments. The SDA is broadly acknowledged but not commonly used in the UK, according to a survey administered by British writers [25].

Regarding patient oral function, comfort, and wellbeing, the results of SDA therapy (SDAT) were discovered to be acceptable in about 82 percent of patients. Approximately 88 percent of survey respondents said they had prescribed SDAT in the previous five years, however only 37 percent of respondents said they had needed to lengthen reduced dental arches after taking SDAT.

The 64 restorative dentistry faculty members at the Nijmegen School of Dentistry in the Netherlands were the subject of a second questionnaire-based study that assessed their views and use of the SDA concept in clinical practise [26]. There was a response rate of 64%, and all respondents—all except one—thought THE Small dental arch concept had a place in clinical practise. Considerations of oral functionality, prosthodontic treatment, and patient comfort become more significant as the number of surviving teeth declines [27-28]. Even though restoration of the entire dental arch, that is, up to and including the second molars, is ideal, not every patient will be able to have this course of treatment due to practical or economical reasons. Complete dental arch restoration may also not be advised for vulnerable and high-risk patients, such as those who are immunosuppressed and receiving radiotherapy, chemotherapy, or both. However, the issue of what constitutes an appropriate and reasonable level of care for the partially dentate patient still needs to be addressed, with the apparent corollary of whether the expense of care is reasonable given the expected and/or actual clinical outcome [29]. A functional, aesthetically pleasing, natural dentition of at least 20 teeth that does not require the use of prosthetics is what constitutes acceptable oral health throughout life. This suggests that adult patients have appropriate oral functionality if their second premolars are posterior most teeth in the arch. This problem is addressed by the idea of the shorter but still functioning dental arch (SDA), which, according to the literature, has a number of advantages over conventional occlusion theories [30]. The SDA protocol, in particular, places less focus on restorative procedures for the back of the mouth. In other words, the SDA might provide high-quality care at a low cost without running the danger of treating the patient excessively [31]. The second premolar region is when the occlusal platform is terminated by the SDAT protocol. As there are no posterior implants required, the surgical implant placement and restoration processes are made simpler, which may be advantageous for the implant patient [32]. The SDA protocol may also be advantageous for high-risk patients since it shortens the treatment schedule without sacrificing oral functionality by restraining the dental arch length.

## CONCLUSION

According to the literature, dental arches made up of the premolar and anterior regions satisfy the requirements for a functional dentition. Treatment planning must be customized according to patient's needs and level of adaptability because functional demands and the required number of teeth differ from person to person. The short dental arch strategy offers an advantage by giving the partially dentate patient a treatment alternative that ensures oral functionality, improved oral cleanliness, comfort and cost-effectiveness without sacrificing patient's care. The SDA principle does not conflict with current occlusion theories and seems to be a good fit for the problem-solving methodology popular in contemporary dentistry. One of the significant benefits of supporting the SDA may be a decreased focus on restorative procedures for the posterior areas of the mouth.

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