

Chapter 10

THE SHORTENED DENTAL ARCH CONCEPT

Kübra DEĞİRMENCI¹
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Caries and periodontal diseases can cause loss of posterior teeth which is most effective chewing units of the stomatognathic system. The rehabilitation of missing teeth is one of the main goals of actual dental research. But, it is questioned that all missing posterior teeth should be replaced to achieve healthy chewing function, oral comfort and maintain the dynamics of the stomatognathic system. Nowadays, various prosthetic interventions can be used to replace missing posterior teeth include removable partial dentures, fixed partial dentures and implant supported dentures. However, financial constraints, systemic diseases and time-consuming procedures are most common reasons for patients who do not demand dental treatments.

Clinicians should consider the remaining teeth, the systemic condition of patients, the temporomandibular joint and the patient's demands while planning and choosing the dental treatment option. As an alternative choice, the presence of anterior teeth and few occlusal contacts in the presence of posterior teeth can be considered as a specific dentition, namely shortened dental arch concept (SDA). In 1981, 'Shortened dental arch' concept is presented by Kayser who is a prosthodontist (Kayser,1981a). According to Kayser and his colleagues, shortened dental arch concept can be described as the type of dentition with a minimum of 20 occlusal units and this is sub-optimal but can be acceptable for patient's healthy stomatognathic function. One occlusal units can be defined as one pair of occluding molars or premolars. It was stated that four occluding units could be sufficient to meet the properties of a healthy occlusion. Similarly, in 1992, the World Health Organization (WHO) stated that the dentition consisting of 20 well-placed teeth could successfully meet functional and aesthetic expectations. (Alam ve ark.,2014) Although shortened dental arch concept can be considered as a simplified treatment approach (Gupta ve ark.,2016), the concept is controversial

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There are studies which is about dentists' attitudes related with shortened dental arch have been published. Although most dentists are aware of shortened dental arch can be supply adequately chewing function, oral comfort and esthetic demands, they prefer to construct prosthesis for missing posterior teeth.(Allen ve ark.,1996, Nassani ve ark.,2010) Around the world, the studies related with awareness of dentist about shortened dental arch are published.

In the end of 1990s, according to the survey among the European dentists is widely accepted the concept. (Allen ve ark.,1996) In a study conducted in Nigeria in 2009, 36.1% of dentists reported that the concept was a good option for developing countries like Nigeria. (Arigbede ve ark., 2009) In a study in India, it was reported that prosthodontists' attitudes is positive in the concept. (Kumar ve ark.,2012) In Malaysia, dentists know the concept of a shortened dental arch, but it has been shown that the application is not performed to a large extent in the clinic.(Kasim ve ark.,2018) In India , the knowledge, awareness and practice of the shortened dental arch concept of dentists were evaluated. According to the results of this study, it is reported that there is an accurate ratio between the experience of the dentist and his awareness of the concept (Gupta ve ark.,2016).

The studies between 1980 and 2014 about the shortened dental arch concept was evaluated in 9-year periods. While the number of studies supporting the concept remained the same, the number of studies that did not support the concept increased.(Manola ve ark., 2017)

Despite the awareness of the dentists and the positive attitude, the concept is less applied over the years. The reason for this is the advances in the treatment options and materials of dentistry today. However, the shortened dental arch concept can be considered as a good alternative to patients, because it is less time-consuming, less costly and less complicated.

REFERENCES

- Abuzar ,MA. Humplik, AJ. Shahim,N. (2015). The shortened dental arch concept: awareness and opinion of dentists in Victoria, Australia. *Australian Dental Journal*,60(3): 294-300.
- Alam, M. Joshi, S.& P, Joshi. Shortened dental arch: a simplified treatment approach. *Journal of Nepal Dental Association*,14(1),1-4.
- Allen,PF. Witter,DF.Wilson,NH. Kayser,AF.(1996). Shortened dental arch therapy: views of consultants in restorative dentistry in the United Kingdom. *Journal of Oral Rehabilitation*,23(7):481-485.
- Aras,K. Shinogaya,T. (2009). Masticatory performance, maximum occlusal force and occlusal contact area in patients with bilaterally missing molars and distal extension removable dentures. *The International Journal of Prosthodontics*,22(2): 204-209.
- Arigbede,AO. Ajayi,DM. Akeredolu,PA. Onyeyaso,CO. (2009). Attitudes and perception

- of Nigerian dentists about shortened dental arch therapy (SDAT). *Tropical Dental Journal*,32(126):13-19.
- Armellini,D. von Fraunhofer ,JA. (2004).The shortened dental arch: a review of the literature. *The Journal of Prosthetic Dentistry*,92(6):531–535.
- Ciancaglini,R. Gherlone, EF. Radaelli,G. (1999). Association between loss of occlusal support and symptoms of functional disturbances of the masticatory system. *Journal of Oral Rehabilitation*,26(3): 248-253.
- Elias,AC.Sheiham ,A.(1998). The relationship between satisfaction with mouth and number,position and condition of teeth:studies in Brazilian adults. *Journal of Oral Rehabilitation*,26(1):53-71.
- Fueki,K. Yoshida,E. Igarashi,Y. (2011). A systematic review of prosthetic restoration in patients with shortened dental arches. *Japanese Dental Science Review*,47(1):167-174.
- Fueki,K. Yoshida,E. Igarashi,Y. (2011). A structural equation model to investigate the impact of missing occlusal units on objective masticatory function in patients with shortened dental arches. *Journal of Oral Rehabilitation*,38(11): 810–817.
- Gerritsen,AE. Allen,PF. Witter, DJ. Bronkhorst,EM. Creugers ,NH.(2010). Tooth loss and oral health- related quality of life: a systematic review and meta-analysis. *Health and Quality of Life Outcomes*,8:126. doi: 10.1186/1477-7525-8-126.
- Gunne,HS. (1985).The effect of removable partial dentures on mastication and dietary intake. *Acta Odontologica Scandinavica*,43(5):269-278.
- Gupta,R. Malhi,R. Patthi,B. Singla,A. Janakiram,C. Pandita,V.Prasad,M.Kumar,JK. (2016). Experience from classroom teaching to clinical practice regarding shortened dental arch (SDA) concept among dentists-a questionnaire study. *Journal of Clinical and Diagnostic Research*,10(12),27-32.
- Hattori,Y. Satoh, C. Seki,S. Watanabe,Y. Ogino,Y. Watanabe,M.(2003). Occlusal and TMJ loads in subjects with experimentally shortened dental arches. *Journal of Dental Research*,82(7):523–536.
- Hendricson, WD.Cohen ,PA.(2001). Oral Health Care in the 21st Century:Implications for Dental and Medical Education. *Academic Medicine*,76(12): 1181-1205.
- Ikebe,K. Matsuda,K. Kagawa,R. Enoki,K. Okada,T. Yoshida,M. Maeda,Y.(2012) Masticatory performance in older subjects with varying degrees of tooth loss. *Journal of Dentistry*,40(1):71-76.
- Ikebe,K. Matsuda,K. Kagawa,R. Enoki,K. Yoshida,M. Maeda,Y.Nokubi,T. (2011). Association of masticatory performance with age, gender, number of teeth, occlusal force and salivary flow in Japanese older adults: is ageing a risk factor for masticatory dysfunction? *Archives of Oral Biology*, 56(10):991–996.
- Jepson,NJ. Moynihan,PJ. Kelly,PJ. Watson,GW. Thomason, JM.(2001).Caries incidence following restoration of shortened lower dental arches in a randomized controlled trial. *British Dental Journal*,191(3):140-144.
- Kasim,SKM.Razak,IA.Yusof,ZYM. (2018).Knowledge, perceptions and clinical application of the shortened dental arch concept among Malaysian government dentists. *International Dental Journal*,68(1):31-38. doi: 10.1111/idj.12325.
- Kayser, AF.(1981). Shortened dental arches and oral function. *Journal of Oral Rehabilitation*, 8(5),457-462.
- Käyser, AF. (1989). Shortened dental arch: a therapeutic concept in reduced dentitions and certain high-risk groups. *The International Journal of Periodontics& Restorative Dentistry*,9(6):426-449.
- Khan,SB. Chikte,UM. Omar,R. (2014).From classroom teaching to clinical practice: ex-

- periences of senior dental students regarding the shortened dental arch concept. *Journal of Dental Education*,78(6):906-913.
- Khan,S. Musekiwa ,A. Chikte, UM. Omar,R. (2014). Differences in functional outcomes for adult patients with prosthodontically-treated and -untreated shortened dental arches: a systematic review. *PLoS One*,9(7): 1-31.
- Khan,SB. Omar,R. Chikte,UM.(2012). Perceptions regarding the shortened dental arch among dental practitioners in the Western Cape Province, South Africa. *Journal of The South African Dental Association*,67(2):60-68.
- Kiola,IA. Astrøm ,AN. Strand,GV. Masalu, JR.(2007).Chewing problems and dissatisfaction with chewing ability: a survey of older Tanzanians. *European Journal of Oral Sciences*;115(4):265-274.
- Krall,E. Hayes,C. Garcia,R.(1998). How dentition status and masticatory function affect nutrient intake. *Journal of the American Dental Association*,129(9):1261–1269.
- Kreulen, CM. Witter,DJ. Tekamp,FA. Slagter,AP. Creugers, NH.(2012). Swallowing threshold parameters of subjects with shortened dental arches? *Journal of Dentistry*, 40(8): 639–643.
- Kumar PC, George S.(2012). An assessment of prosthodontists' attitudes to the shortened dental arch concept. *Journal of Interdisciplinary Dentistry*,2(2):104-107.
- Manola,M.Hussain,F.Millar,BJ. (2017). Is the shortened dental arch stil a satisfactory option? *British Dental Journal*,223(2):108-112.
- McKenna,G. Allen,PF. O'Mahony,D. Cronin,M. DaMata, C.Woods,N.(2015). The impact of rehabilitation using removable partial dentures and functionally orientated treatment on oral health-related quality of life: a randomised controlled clinical trial. *Journal of Dentistry*,43(1):66-71. doi: 10.1016/j.jdent.2014.06.006.
- Nassani,MZ. Devlin,H. Tarakji,B.McCord,JF.(2010). A survey of dentists' practice in the restoration of the shortened dental arch. *Medicina Oral,Patologia Oral y Cirugia Bucal*, 15(1): 85-89.
- Oosterhaven, SP. Westert ,GP. Schaub,RM. van der Bilt, A. (1988). Social and psychologic implications of missing teeth for chewing ability. *Community Dentistry and Oral Epidemiology*,16(2):79–82.
- Owen,CP. Appropriatech: prosthodontics for the many, not just for the few.(2004). *The International Journal of Prosthodontics*,17(3):261-262.
- Sarita,PT. Kreulen,CM. Witter, DJ. Van't Hof M. Creugers,NH.(2003). A study on occlusal stability in shortened dental arches. *The Internatonal Journal of Prosthodontics*,16(4): 375-380.
- Sarita, PT. Witter ,DJ. Kreulen ,CM. Van't Hof ,MA. Creugers ,NH.(2003). Chewing ability of subjects with shortened dental arches. *Community Dentistry and Oral Epidemiology*,31(5):328-334.
- Shoi,K. Fueki,K. Usui,N. Taira,M. Wakabayashi,N. (2014). Influence of posterior dental arch length on brain activity during chewing in patients with mandibular distal extension removable partial dentures. *Journal of Oral Rehabilitation*,41(7):486-495.
- Sierpinska,T. Golebiewska,M. Dlugosz, JW. (2006). The relationship between masticatory efficiency and the state of dentition at patients with non rehabilitated partial loss of teeth. *Advances in Medical Sciences*,51(1): 196–199.
- Solow, RA.(2010). Comprehensive implant restoration and the shortened dental arch. *General Dentistry*,58(5):390-399.
- Tallents,RH. Macher, DJ. Kyrkanides, S. Katzberg,RW. Moss ,ME.(2002). Prevalence of missing posterior teeth and intraarticular temporomandibular disorders. *The Journal*

- of Prosthetic Dentistry,87(1):45–50.
- Tan,H. Peres,KG.Peres ,MA. (2016). Retention of teeth and oral health-related quality of life. *Journal of Dental Research*,95(12):1350-1357. doi: 10.1177/0022034516657992.
- Tan,H. Peres, KG. Peres,MA. (2015). Do people with shortened dental arches have worse oral health-related quality of life than those with more natural teeth? a population-based study. *Community Dentistry and Oral Epidemiology*,43(1):33-46.
- Thomason ,JM. Moynihan, PJ. Steen,N. Jepson,NJ.(2007). Time to survival for the restoration of the shortened lower dental arch. *Journal of Dental Research*,86(7):646-650.
- van Der Bilt, A. Olthoff ,LW. Bosman, F. Oosterhaven, SP. (1993). The effect of missing post canine teeth on chewing performance in man. *Archives of Oral Biology*,38(5): 423–429.
- Yoshida,M. Kikutani,T. Yoshikawa,M. Tsuga,K. Kimura,M. Akagawa,Y.(2011). Correlation between dental and nutritional status in community-dwelling elderly Japanese. *Geriatrics& Gerontology International*,11(3):315–319.
- Witter ,DJ. Creugers, NH. Kreulen, CM. de Haan, AF.(2001).Occlusal stability in shortened dental arches. *Journal of Dental Research*,80(2):432-436.
- Witter,DJ. de Haan,AF. Kayser,AF.(1994). A 6 year follow-up study of oral function in shortened dental arches. Part II: Craniomandibular dysfunction and oral comfort. *Journal of Oral Rehabilitation*,21(4):353–366.
- Witter,DJ. de Haan,AF. Kayser ,AF.(1991). Shortened dental arches and periodontal support. *Journal of Oral Rehabilitation*,18(3):203-212.
- Witter,DJ. de Haan,AF. Kayser,AF.(1994). A 6-year follow-up of oral function in shortened dental arches. Part I: Occlusal stability. *Journal of Oral Rehabilitation*,21(2):113-125.
- Witter, DJ. Van Elteren, P. Kayser,AF. (1988). Signs and symptoms of mandibular dysfunction in shortened dental arches. *Journal of Oral Rehabilitation*,15(5):413–420.
- Witter,DJ. Van Elteren, P. Kayser,AF. Van Rossum,GM.(1990). Oral comfort in shortened dental arches. *Journal of Oral Rehabilitation*,17(2):137-143.
- Wolfart,S. Heydecke, G. Luthardt, RG. Marré,B. Freesmeyer,WB. Stark,H. Wöstmann,B. Mundt,T. Pospiech,P. Jahn, F. Gitt,I. Schädler,M. Aggstaller,H.Talebpur, F. Busche,E. Bell,M. (2005). Effects of prosthetic treatment for shortened dental arches on oral health-related quality of life, self-reports of pain and jaw disability: results from the pilot-phase of a randomized multicentre trial. *Journal of Oral Rehabilitation*,32(11):815-822.
- Wolfart,S. Marré,B. Wöstmann, B. Kern, M.Mundt ,T. Luthardt, RG. Huppertz ,J. Hannak, W. Reiber ,T . Passia,N. Heydecke,G. Reinhardt,W. Hartmann ,S. Busche,E. Mitov ,G. Stark, H. Pospiech, P. Weber, A. Gernet, W. Walter, MH.(2012). The randomised shortened dental arch study: 5 – year maintenance? *Journal of Dental Research*, 91(7): 65-71.