

# Shortened Dental Arch: A Simplified Treatment Approach

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## ABSTRACT

The Shortened Dental Arch (SDA) concept introduced as early as 1981 by Kayser and was accepted by a great majority of dentists but not widely practiced. The SDA comprising anterior and premolar teeth in general fulfill the requirements of a functional dentition. Patients' needs and demands vary much and should be individually assessed but the SDA concept deserves to be included in all treatment planning for partially edentulous patients. The SDA concept is relevant for developing countries as it offers a functional approach at a reduced cost without compromising patient's oral health care.

**Key words:** developing countries, functional approach, functional dentition, shortened dental arch, treatment planning.

## INTRODUCTION

In the past, it was considered essential to replace all the missing teeth, as it was considered that failure to replace teeth would result in occlusal instability and Temporomandibular disorders. However the major challenge to present day practitioners is to provide a dental restoration which will integrate and function successfully with the dynamics of stomatognathic system and the SDA concept deals with such challenges, where in it decreases emphasis on restorative treatments of the posterior regions of the mouth.<sup>1</sup> The SDA is defined as a specific type of dentition with an intact anterior region and a reduction in the occluding pairs of posterior teeth, starting posteriorly.<sup>2</sup> The SDA was a philosophy proposed by a Dutch Prosthodontist, Arnd Kayser in 1981. Kayser emphasized that it was needless to restore all the teeth which are lost for successful and satisfactory functioning of oral function. The molars do not have any exclusive function: all separate functions performed by molars are also provided by the anterior teeth and premolars (Table 1). Kayser developed a system considering occlusal units as premolar equivalents in which a molar is equivalent to two premolar units and a premolar is equivalent to a single occlusal unit (Figure 1).

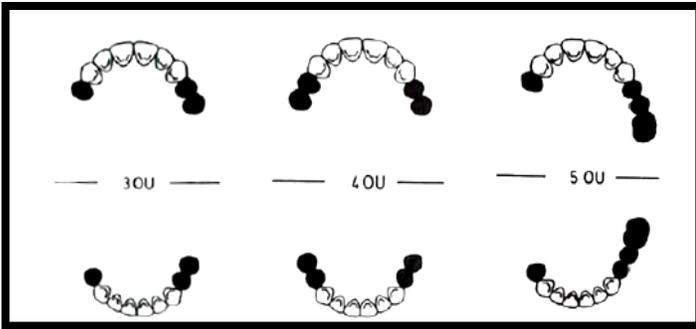
Thus a single arch of four molars and four premolars would account for 12 occlusal units. Kayser also said that subjects with at least four occlusal units had sufficient adaptive capacity (Table 2).

**Table 1:** Minimum number of teeth required to meet functional demands<sup>3</sup>

	Anteriors	Premolars	Molars
Biting	+	-	-
Chewing	-	+	+
Speech	+	-	-
Esthetics	+	+	±
TMJ(Mandibular) stability	+	+	+
Dental arch(Occlusal) stability	+	+	+
Preservation of alveolar process	+	+	+

+ = major involvement ; ± = minor involvement (depending in age, adaptation) ; - = no involvement

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**Fig 1:** Schematic representation of SDA with 3, 4 and 5 ou (Occlusal Units).

**Table 2:** Requirement of occluding pairs for satisfactory oral function<sup>3</sup>

Age	Functional level	Occluding Pairs
20-50 yrs	I(optimal)	12
40-80 yrs	II(Sub-optimal)	10(SDA)
70-100 yrs	III(minimal)	8(ESDA)

“Oral health by retention of healthy, natural, functioning dentition comprising not less than 20 teeth and not requiring prosthesis” has been described as a goal for oral health by WHO in 1992.<sup>3</sup> This indicates a shift away from the traditional treatment philosophy of restoring a complete dentition in all cases. There is a criteria for healthy and physiologic occlusion developed by Mohl et al., Ash and Ramfjord, which enumerates the following<sup>4</sup> :

- Absence of pathologic manifestations
- Satisfactory functioning of dentition (aesthetics, chewing, oral comfort)
- Mandibular stability
- Variability in form and function of the stomatognathic system
- Adaptive capacity of stomatognathic system to changing situations

An important implication of the physiological and functional approach of occlusion is that the number of teeth may vary and thus may be less than 28.

## DISCUSSION

### BASIS OF SDA CONCEPT:

**A) Adequate oral function namely: chewing ability, occlusal stability and mandibular stability**

#### *Chewing ability*

It has been focussed that SDAs with four pairs of occluding premolars can provide adequate oral function. Satisfactory chewing ability is perceived as long as the dental arch comprise an intact anterior region and 3-5 occluding pairs of teeth posteriorly. Only small differences in chewing ability were found between subjects with these types of SDAs and subjects with complete dental arches.<sup>5</sup>

#### *Occlusal stability*

The dentition with intact anterior region and bilateral premolar support posteriorly can provide durable occlusal stability. This was demonstrated in clinical and epidemiological studies where SDAs comprising 3-4 occluding pairs of premolars posteriorly did not differ significantly from complete dental arches with regard to interdental spacing, occlusal tooth wear, vertical overbite and tooth mobility.<sup>6,7</sup> Extreme SDAs, comprising 0-2 pairs of occluding premolars, had significantly more interdental spacing, occlusal contact and vertical overlap of incisors compared to intermediate categories of SDAs. Hence the risk to occlusal instability seemed to occur in extreme SDAs comprising 0-2 occluding pairs of teeth whereas no such evidence was found for intermediate categories of SDAs.

#### *Mandibular stability*

As long as premolar support is present bilaterally, signs and symptoms of temporomandibular disorders are unlikely to manifest themselves. The increased risk was found only when all posterior support was unilaterally or bilaterally absent.<sup>8,9</sup>

**B) Replacement of extracted molars by free-end removable partial dentures does not significantly improve oral function**

In the studies done by Witter, Van and Kayser, the patients felt that the replacement of molars with free-end removable partial dentures does not contribute to

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oral comfort.<sup>10,11</sup> Removable partial dentures (especially free-end) are potential sources of iatrogenic periodontal diseases particularly when dentures are made of acrylic without occlusal rests.<sup>12</sup> According to Ramfjord "Replacement of missing molars is a common cause of iatrogenic periodontal diseases and should be avoided if aesthetics and functional stability can be satisfied without such replacements". Kayser et al. suggested that in certain circumstances, replacement of missing molars may constitute overtreatment and inappropriate use of dental services.

### C) Economically effective and problem oriented

The cost of restoring complete dentition is beyond the financial capacity of the majority of patients and health care systems in developing countries like Nepal. The extensive and complex dental restorations have inherent risks, the so called "**Biological prices**" on the related oral tissues. The SDA concept fits well to an approach termed as "**The problem oriented approach**" i.e it is a functional repair in which it is considered sufficient to restore or replace only the teeth that are essential for oral function including social and biological demands.

### CRITERIA FOR APPLICATION OF SDA<sup>11</sup>

When considering the SDA concept as a treatment approach to simplify a complex treatment plan, the clinician should assess whether subjects meet the following criteria :

- (i) Major problems (caries, periodontal disease, severe tipping and drifting as a result of interrupted dental arches) confined mainly to the molar region.
- (ii) Good prognosis of the anterior and the premolar regions.
- (iii) Limited possibilities for restorative care.
- (iv) Motivated patients for maintaining remaining dentition

### ADVANTAGES OF SDA CONCEPT<sup>11</sup>

- 1) The remaining teeth are easily accessible for oral hygiene and restorative procedures.
- 2) The shortened dental arch concept is a simplification of holistic restorative treatment and the subsequent maintenance of restorations.

3) It enhances prognosis for the remaining teeth (due to quality care).

4) It reduces the amount of restorative work and the associated costs, thus allowing more people to benefit from the available resources.

### DISADVANTAGES OF SDA CONCEPT

1) Most people can functionally accept shortened dental arch but not everyone, many people with SDAs found that their chewing ability is hindered or that they had to change food preparation practices.

2) Some patients with shortened dental arches reported the prevalence of TMJ problems. There is greater prevalence of joint sounds with subjects having only unilateral posterior support and those with no posterior support.

3) People with SDAs have been found to have more mobile teeth and lower alveolar bone levels. The combinations of increased occlusal loading and existing periodontal disease represent a risk factor for further loss of teeth in these people.

### CONTRA-INDICATIONS TO SDA<sup>11</sup>

- Marked dento-alveolar malrelationship - severe Angle Class II and Class III relationship
- Parafunction - intensive bruxism
- Pre-existing TMD
- Advanced pathological tooth wear
- Advanced periodontal disease - marked reduction in alveolar bone support
- Patient under the age of 40 years

### CONCLUSION

The SDA concept introduced as early as 1981 by Kayser was accepted by a great majority of dentists but not widely practised. The concept may be considered a significant development to have influenced prosthodontic thinking in the last few decades. Studies reviewed showed that SDA comprising anterior and premolar teeth in general fulfill the requirements of a functional dentition. Therefore the concept deserves serious consideration in treatment planning for partially edentulous patients. However, with ongoing changes,

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e.g. in dental health and economy, the concept requires continuing research, evaluation and discussion. Patients' needs and demands vary much and should be individually assessed but the SDA concept deserves to be included in all treatment planning for partially edentulous patients.

For most developing countries dental treatment is not on the priority list of public services, therefore strategies have to be cost conscious. The SDA concept is relevant for developing countries as it offers a functional approach at a reduced cost without compromising patient's oral health care.

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