

# CURRENT CONCEPTS OF SELECTING TEETH FOR COMPLETE DENTURES AMONG DENTISTS IN RIYADH, SAUDI ARABIA

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## ABSTRACT

*The objective of this study was to determine the current concepts, and methods of teeth selection for complete dentures by dentists in Riyadh, Saudi Arabia. A questionnaire was designed related to the methods of selecting artificial teeth for complete denture patients. The questionnaire was distributed to 205 dentists working in government and private sector in the Riyadh region. Data were collected and analyzed using descriptive analysis. Out of 205 dentists, 104 returned the completed survey resulting in a response rate of 51%. The most common guide in selecting the mold of anterior denture teeth was the form of the face (53.6%), the most prevalent guide in selecting the shade of anterior teeth was the patient's complexion (67.8%), and the most frequently used factor in selecting the size of anterior teeth was the inter-alar width (57.7%). Fifty-four percent of the dentists used the anatomic teeth as mould of posterior denture teeth. A great majority (97.0) used acrylic resin teeth. It can be concluded that the methods used to select denture teeth by dentists in Riyadh, Saudi Arabia coincide with the current trends used internationally.*

**Key words:** Current concepts, Selecting teeth for complete dentures

## INTRODUCTION

The objectives of teeth selection for edentulous arches are to provide esthetics and regain some masticatory efficiency which has been severely compromised.<sup>1</sup> The selection of artificial teeth for an edentulous patient requires artistic skills, knowledge and experience.<sup>1</sup> The selection of artificial teeth must be carried out by the dentist himself/herself, as he/she is the person qualified to accumulate, correlate, and evaluate the biomechanical information of the patient. This is to ensure that the selection of artificial teeth will meet the individual esthetic and functional needs of a patient.<sup>2</sup>

Over the past several decades various methods and/or guides of selecting the correct form, shade and size of anterior teeth for edentulous patients have been topics of controversy.<sup>1-9</sup> According to McArthur<sup>4</sup>, patients' own natural teeth are the best guide, and records of these should be obtained whenever possible. These records should include the size, shape and shade of the teeth and any special characteristics, or arrangement.<sup>4</sup>

Methods used for selecting the form of anterior teeth include; pre-extraction records such as photographs, extracted teeth, study casts, previous dentures, form of the face, shape of edentulous maxillary arch, patient's preference, gender, and age.<sup>1,8,9</sup> Several attempts have been made to find an association between the anatomic structures, or features of a patient and the shape or form of the teeth.<sup>10-11</sup> It has been found that there is a correlation between the outline form of

the maxillary central incisors and the inverted outline form of the face.<sup>12</sup> This method attempts to conform the tooth form to the form of the face from the labial, mesial, distal and incisal aspects.<sup>1</sup> Studies have shown that this is the most reliable method in cases where there are no previous pre-extraction records available.<sup>8,13-15</sup> Accordingly, most dental manufacturers base their entire systems of tooth selection on the different types of face forms.<sup>2,13</sup> Another method for selecting the form of the anterior teeth is based on patient's age, gender and personality.<sup>1-3</sup> There is a relationship between the age of the patient and the amount of attrition of the teeth as well as teeth exposure.<sup>3,16</sup> In addition, masculine tooth forms generally are square, or a combination type that includes the square form.<sup>2</sup> Conversely, feminine tooth forms generally are ovoid or a combination type that includes ovoid form.<sup>2</sup>

Methods for selecting the shade of anterior teeth include; patient's complexion, color of the hair and eyes, pre-extraction records such as photographs, previous dentures and patient's preference.<sup>11,17,18</sup> Most studies and textbooks recommend that the patient's complexion is the most reliable method in the absence of pre-extraction records.<sup>1-3,13</sup> Several authors have noted that teeth darken naturally with age and, therefore, recommend that darker shades be selected for older individuals.<sup>1-3,13-14</sup> Frush and Fisher<sup>19</sup> recommended the use of darker shades for men, as well as for patients with bold and vigorous personalities. Lighter shades are recommended for women and patients with delicate personalities.<sup>19</sup> However, Krajickek<sup>20</sup> empha-

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sized the importance of considering the patient's desires in the selection of the shade of teeth.

The size of artificial teeth is selected by using various guides such as pre-extraction records, patient's gender, bizygomatic width, intercanthal width, intercommisural width and interalar width.<sup>1-5,21-25</sup> Many attempts have been made to establish methods of estimating the combined width of maxillary anterior teeth.<sup>1-2,13</sup> Generally, larger people have larger teeth.<sup>23</sup> In addition, men usually have larger teeth than women.<sup>23</sup> Nevertheless, it has been found that the maxillary anterior teeth should be in proportion with the size of the face and head to achieve good esthetics.<sup>21</sup> The proportion of facial structures and the relationship between facial measurements and natural teeth could also be used as a guide in selecting teeth for dentures.<sup>13,22,24</sup> The most common method used is to scribe two vertical lines on the maxillary occlusion rim directly from the right and left alae of the nose.<sup>1,23</sup> The distance between these lines gives the width of the anterior teeth.<sup>1,21</sup> The second preferred method is to mark the canine lines on the contoured maxillary occlusion rim at each corner of the mouth. The distance between the marks around the labial surface of the occlusion rim represents the total width of the maxillary anterior teeth.<sup>1,21</sup>

Occlusal forms of posterior denture teeth are classified as anatomic, semi-anatomic and non-anatomic.<sup>1,2,6,13</sup> Anatomic teeth look like natural teeth and appear more suitable for younger patients.<sup>1-2,13</sup> They are used when the quantity of remaining bone offers enough resistance to stabilize the prosthesis during function.<sup>1-2,13</sup> In contrast, non-anatomic teeth are flat simulating severe occlusal wear and therefore, appear to be more suitable for elderly patients, or in cases where severe bone resorption is evident, and retention or stability of the prosthesis is compromised.<sup>1-2,13</sup> Semi-anatomic teeth offer a solution for intermediate clinical situations.<sup>1</sup> However, there is no evidence that any particular occlusal scheme contributes significantly to the comfort or efficiency of the dentures.<sup>1,26,27</sup>

There are artificial teeth are made of various materials such as porcelain and acrylic.<sup>1-2,13</sup> Porcelain teeth are more resistant to abrasion and staining; and therefore maintain their luster longer than acrylic teeth.<sup>1,2,13</sup> Acrylic resin teeth can be easily altered and bond chemically to the acrylic denture base. Therefore, they are indicated in most cases including those with limited inter-arch space.<sup>1,2,3</sup>

Dental practitioners in Riyadh (the capital city of Saudi Arabia) come from different countries and educational backgrounds. In addition, controversy exists in teeth selection for complete dentures. Therefore, the objective of the current survey was to determine the concepts and methods which are currently used in the artificial teeth selection for complete denture among dentists practicing in the Riyadh.

## MATERIALS AND METHODS

A self-administered questionnaire (Fig. I) was prepared and pre-tested before it was distributed to 205 dentists from government and private clinics in Riyadh. A reminder visit was made to the dentists that had not returned the questionnaire within two weeks.

The questionnaire was composed of five closed-ended multiple-choice questions related to the methods used in selecting artificial teeth for complete denture patients. Each respondent was asked to circle the methods that apply to his/her practice. The option of providing a specific answer other than the listed choices was also available for each question. Data were analyzed using SPSS software (Version #10).

## RESULTS

One hundred and four dentists (24% female and 76% male) responded to the questionnaire yielding a response rate of 51%. Out of the 104 who answered the questionnaire, 59 (56.7%) were general practitioners, 35 (33.7 %) were prosthodontists and 10 (9.6%) were other dental specialists. Seventy-three (70.2%) respondents were Saudi, and 29 (27.9%) were non-Saudi; and two did not specify their nationality. Twenty (19.2%) dentists were faculty members and 84 (80.8%) were working in other sectors.

The most frequently used method for the form (shape or mold) selection of the anterior teeth was the patient's face shape or form (53.6%) followed by patient's gender (20.2%), patient's age (17.4%), pre-extraction records (16.6%), previous dentures (13.8%), patient's preference (9.7%) and the shape of maxillary arch (7%) [Table 1].

For shade selection, the most frequently used method was the patient's complexion (67.8%) followed by patient's preference (23.1%), patient's age (20.6%), previous dentures (15.7%) and pre-extraction records (12.7%) [Table 2].

The most commonly used method to select the size (width) of the six maxillary anterior teeth was the interalar width (57.7%), followed by the intercommisural width (35.1%), the bizygomatic width (28.5%), pre-extraction records (24.7%), previous dentures (23.5%), and the patient's gender (12.2%). Four (3.2%) dentists selected others meth-

TABLE 1: METHOD USED FOR SELECTION OF MOLD OF ANTERIOR TEETH

Method used	Prevalence (%)
Patient's face shape or form	53.6
Patient's gender	20.2
Patient's age	17.4
Pre-extraction records	16.6
Previous dentures	13.8
Patient's preference	9.7
Shape of the maxillary arch	7.0
Other procedures	2.3

1. **How do you select the mold (shape or form) of anterior teeth?**
  - pre-extraction records (photographs, teeth, study models)
  - previous denture
  - patient's face shape (form)
  - shape of edentulous maxillary arch
  - patient's gender (male or female)
  - patient's age
  - patient's preference
  - not a clinical procedure
  - other (pls. specify)
2. **How do you select the shade (color) of anterior teeth?**
  - patient's age
  - complexion (color of skin, eyes, or hair)
  - pre-extraction records (photographs, teeth, study models)
  - previous denture
  - patient's preference
  - other (pls. specify)
3. **How do you select the size (width) of the maxillary six anterior teeth?**
  - Pre-extraction records (photographs, teeth, study models)
  - Previous denture
  - Patient's gender (male or female)
  - Bizygomatic width
  - Corners of the mouth at rest to record inter canine width
  - Lateral surface of the nose to record inter canine width
  - Not a clinical procedure
  - other (pls. specify)
4. **What do you currently use for your posterior tooth form?**
  - Non-anatomic (flat)
  - Semi-anatomic (10°, 12°, 15°)
  - Anatomic (20°, 30°, 33°)
5. **What material of artificial teeth do you use?**
  - Porcelain
  - Acrylic resin

Fig I: The questionnaire used in the study.

TABLE 2: PREFERRED METHOD FOR COLOR SELECTION OF ANTERIOR TEETH

Method	Prevalence (%)
Patient's complexion	67.8
Patient's preference	23.1
Patient's age	20.6
Previous denture	15.8
Pre-extraction records	12.7

TABLE 3: METHOD USED FOR WIDTH OF THE SIX ANTERIOR TEETH

Method	Prevalence (%)
Lateral surface of the nose	57.7
Corners of the mouth	35.1
Bizygomatic width	28.5
Pre-extraction records	24.7
Previous denture	23.5
Patient's gender	12.2
Others	3.6

ods such as the use of location of the incisive papilla, the buccal frenum and the canine eminence (Table 3).

The most frequently used posterior tooth form was "anatomic teeth" (54.2%) followed by "non-anatomic teeth" (36.1%) and "semi-anatomic" (29.7%) teeth. Two dentists did not answer that question. The most often used material of artificial teeth was acrylic resin (96.8%) whereas only 3.2% used porcelain teeth.

## DISCUSSION

The results of the present study indicated that the most commonly used guide for selecting the mold of artificial anterior teeth was the patient's face form. This is in agreement with several previous studies.<sup>5,8,12-15</sup> Though there is no reliable method for determining anterior teeth form,<sup>8</sup> it has been shown that using patient's face form is the most reliable and practical method in the absence of pre-extraction records.<sup>8,13-15</sup> Patient's age and gender were the second most prevalent guides for selecting the form of the anterior teeth, which is in agreement with a similar study by Levin and Sauer.<sup>5</sup>

In the present study, the most prevalent guide for selecting the shade of anterior teeth was the patient's complexion which is also in concurrence with results of previous studies.<sup>1-3,13</sup> The second most prevalent guide was the patient's own personal preference which is not usually reliable, as the patient tends to select teeth that are whiter and brighter in color.<sup>1,9,17</sup> The next common guide was the patient's age, since the shade of the teeth becomes more yellowish and darker with age.<sup>1,3,13-14,21</sup>

As for the tooth size selection, the most common method was the measurement of intercanine width using the interalar width. It has been reported that it is one of the most commonly used method for tooth size selection.<sup>1,5,21,23</sup> The second most common method was the use of the intercommisural width as a guide in the selection of the maxillary anterior teeth



width. The third common method was using bizygomatic width, that has been reported previously.<sup>5</sup> However, a weak correlation between the width of anterior teeth and facial measurements has been found.<sup>25</sup>

The present study showed that the most frequently used form of posterior teeth was the anatomic teeth. This result is in agreement with other previous studies.<sup>5-7</sup> However, there is no conclusive evidence from previous studies that any particular tooth form is more efficient than the other.<sup>26-27</sup> Apparently, the choice depends more upon the clinical situation or the dentist's preference.<sup>9</sup>

The majority of the respondents preferred acrylic resin teeth. This result is in contrast to other studies where porcelain teeth were preferred over acrylic resin teeth.<sup>5,18</sup> This new trend could be justified as the use of porcelain teeth for dentures has declined remarkably in the past years due to their tendency to chip or fracture.<sup>1-2,21</sup> The new generations of hard acrylic resin teeth, and the recent composite resin teeth, have considerably lessened the use of porcelain teeth during the past decade.<sup>7,21</sup>

The response rate remained low in spite of follow-up efforts. However, it has been a common problem with such type of research, and has been reported by previous studies.<sup>5-7,18</sup> The present survey shows that the methods of selecting teeth for dentures vary from one dentist to another. The use of porcelain or acrylic resin teeth, and whether they are anatomic or non-anatomic posterior teeth clearly reflect difference in established philosophies. The selection of form, shade, size and type of artificial teeth for complete dentures remains a contentious issue.

## CONCLUSIONS

- 1 The majority of the dentists in Riyadh use face form of their patients to select the shape of the artificial maxillary anterior teeth for complete dentures.
- 2 The shade of the teeth is selected mainly according to the patient's complexion.
- 3 The interalar width is mostly used to select the width of maxillary anterior teeth.
- 4 Anatomic posterior teeth are preferred over semi-anatomic or non-anatomic teeth.
- 5 The material of choice for the artificial teeth is acrylic resin.

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## REFERENCES

- 1 Hassaballa MA. Clinical complete denture prosthodontics. King Saud University, Academic Publishing and Press, Riyadh, Saudi Arabia. 2004, pp: 235-256.
- 2 Johnson DL, Stratton RJ. Fundamentals of removable prosthodontics. Quintessence Publishing Co., Inc. Chicago, Ill. 1980, pp: 387-408.
- 3 Watt DM, MacGregor AR. Designing complete dentures. 2<sup>nd</sup> ed, Bristol, Wright. 1986, pp 119-141.
- 4 McArthur D. Determining approximate size of maxillary anterior artificial teeth when mandibular anterior teeth are present. J Prosthet Dent 1985;53:216-218.
- 5 Levin B, Sauer JL. Results of a survey of complete denture procedures taught in American and Canadian dental schools. J Prosthet Dent 1969;22:171-177
- 6 Arbree NS, Fleck S, Askinas SW. The results of a brief survey of complete denture prosthodontic techniques in predoctoral programs in North American dental schools. J Prosthet Dent 1996;5:219-225.
- 7 Jagers JH, Javid NS, Colaizzi FA. Complete denture curriculum survey of dental schools in the United States. J Prosthet Dent 1985;53:736-739.
- 8 Sellen PN, Jagger DC, Harrison A. Methods used to select artificial anterior teeth for the edentulous patient: A historical overview. Int J Prosthodont 1999;12:51-58.
- 9 Hoffman W, Bomberg T, Hatch R, Benson B. Complete denture: A review. Quintessence Int 1985;5: 349-355.
- 10 Lombardi RE. The principles of visual perception and their clinical application to denture esthetics. J Prosthet Dent 1973;29:358-382.
- 11 Brodbelt RH, Walker GF, Nelson D, Seluk LW. Comparison of face shape and tooth form. J Prosthet Dent 1982;52: 588-592.
- 12 Young HA. Selecting the anterior tooth mould. J Prosthet Dent 1954;4:148-160.
- 13 Halperin AR, Graser GN, Rogoff GS, Plekavich EJ. Mastering the art of complete dentures. Chicago, IL, Quintessence Publishing, 1988, pp 107-131.
- 14 Wehner PJ, Hickey JC, Boucher CO. Selection of artificial teeth. J Prosthet Dent 1967;18:222-232.
- 15 Esposito SJ. Esthetics for denture patients. J Prosthet Dent 1980;44:608-615.
- 16 Al Wazzan KA. The visible portion of anterior teeth at rest. J Contemp Dent Pract 2004; 5:53-62.
- 17 Brisman AS. Esthetics: A comparison of dentists' and patients' concepts. J Am Dent Assoc 1980;100:45-52.
- 18 Harrison A. Prosthodontic techniques and the timing of complete denture procedures: A survey. J Prosthet Dent 1977;37:274-279.
- 19 Frush JP, Fisher RD. Introduction to dentogenic restorations. J Prosthet Dent 1955;5:586-595.
- 20 Krajcick DD. Natural appearance for the individual denture patient. J Prosthet Dent 1960; 10:205-214.
- 21 Zarb GA, Bolender CL, Carlsson GE. Boucher's prosthodontics treatment for edentulous patients. 11<sup>th</sup> ed. St. Louis, MO, Mosby, 1997, pp 231-261.
- 22 Gomes VL, Gonçalves LC, do Prado CJ, Junior IL, de Lima Lucas B. Correlation between facial measurements and the mesiodistal width of the maxillary anterior teeth. J Esthet Restor Dent. 2006;18(4):196-205.
- 23 Engelmeier RL. Complete denture esthetics. Dent Clin North Am 1996;40:71-84.
- 24 Al Wazzan KA. The relationship between intercanthal dimension and the widths of maxillary anterior teeth. J Prosthet Dent. 2001; 86:608-612.
- 25 Varjão FM, Nogueira SS. Nasal width as a guide for the selection of maxillary complete denture anterior teeth in four racial groups. J Prosthodont 2006 ;15:353-358.
- 26 Kapur KK, Soman S. Masticatory performance and efficiency in denture wearers. J Prosthet Dent 1964;14:687-694.
- 27 Brewer AA, Reibel PR, Nassif NJ. Comparison of zero degree teeth and anatomic teeth on complete dentures. J Prosthet Dent 1967;17:28-35.