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PREVALENCE OF DIFFERENT SAGITTAL ROOT POSITIONS IN THE MAXILLARY ANTERIOR TEETH IN THE EGYPTIAN POPULATION: A RETROSPECTIVE STUDY

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ABSTRACT

Purpose: This study was carried out to examine the prevalence of different sagittal root positions in the maxillary anterior teeth by means of cone beam computed tomography.

Patients and Methods: 100 patients (50 males and 50 females) undergoing CBCT examination were included in this study. Evaluation of the CBCT images was carried out and the relation of the root to the socket was classified according to the classification into Class I, II, III, IV.

Results: Data was analysed to determine the distribution of the 4 classes and were found to be 60.7% for class I, 33% for class II, 4.7 % for class III and 1.7% for class IV.

Conclusion: Consideration of the sagittal root position provides helpful information in the treatment planning of immediate implant positioning and provisionalization for maxillary anterior teeth.

INTRODUCTION

Single tooth replacement especially in the aesthetic zone has been a growing demand since it was introduced in the mid- 1990's. [1-3]

This procedure did not only aim at reducing treatment time and preserving the surrounding tissues but also was a successful solution for missing tooth replacement. [2,4,5]

The success of immediate implant placement and provisionalization greatly depends on the amount of intact bone in the socket after tooth extraction and the lack of infection in the area. In order to achieve proper implant stability, the implant must engage the palatal wall and bone with about 4-5 mm extending beyond the apex of the root .[6,7]

In case of insufficient amount of available bone around the missing tooth, implant stability might be insufficient, and an alternative treatment plan might sometimes be needed. Cone beam computed tomography should be used prior to treatment to evaluate the root length, sagittal root position and the morphology of the bony housing which are all important factors affecting the success of the procedure.[1,3,8]

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This study is conducted in order to assess the prevalence of the classification of the sagittal root position in relation to the anterior maxillary osseous housing in the Egyptian population.

PATIENTS AND METHODS

Patient Selection

This retrospective study was conducted in the outpatient Oral and Maxillofacial Radiology clinic, Faculty of Dentistry, Cairo University.

50 male and 50 female patients with age raging from 20 to 70 were included in this study with mean age 41 years.

All maxillary anterior teeth were present (from canine to canine) and at least two posterior teeth in occlusion. Patients did not undergo any previous orthodontic treatment nor underwent any surgical procedure in the anterior region.

Data Collection

For each patient, the Sagittal root position (SRP) of each maxillary anterior tooth of the 6 maxillary anterior teeth in relation to the osseous housing was assessed using CBCT images (Planmeca ProMax 3D, Helsinki, Finland) at 90 KVp and 6 mA. The Planmeca Romexis software was used to assess the images. The cut was adjusted in the cross sectional view through the long axis of the tooth and was evaluated according to the proposed SRP classification suggested by Kan et al, 2011. [9]

SRP Classification

With reference to the osseous housing Kan et al [9] proposed the following classification

Class I: The root is positioned against the labial cortical plate (Fig 1)

Class II: The root is in the middle of the osseous housing and is neither engaging the labial nor the palatal cortical plates at the apical third. (Fig 2)

Class III: The root is positioned against the palatal cortical plate (Fig 3)

Class IV: two thirds of the root is engaging both labial and palatal cortical plates (Fig 4)

Statistical Analysis

Statistical analysis was performed using IBM® SPSS® Statistics version 20.0 (IBM Corp., Armonk, NY). The distribution of socket types was compared between right and left sides for each maxillary anterior tooth using Fisher's exact test and

Fig. (1) Class I SRP

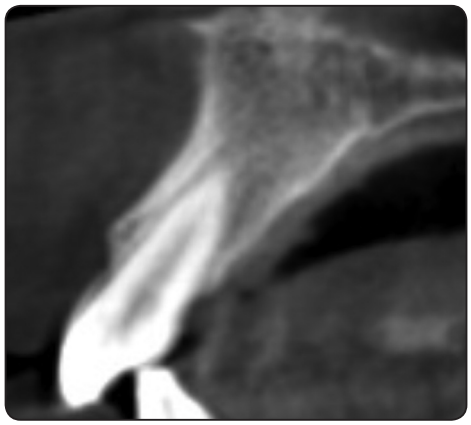

Fig. (2) Class II SRP

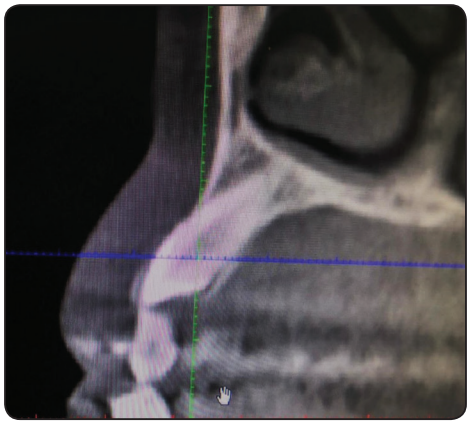

Fig. (3) Class II SRP

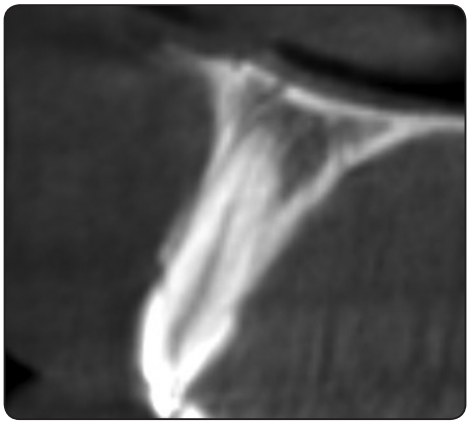

Fig. (4) Class IV SRP

there were no significant differences between the 2 sides (Figure 5), therefore, the data from both sides were combined for further analysis. Fisher's exact test was applied to evaluate the differences in socket type prevalence according to tooth and according to gender within each tooth. Significance level was set to 0.05.

RESULTS

The prevalence of socket types according to gender within each anterior tooth was evaluated independently. There was a significant difference between male patients and female patients in the prevalence of socket types in lateral incisors and canines (P = 0.009 and 0.003, respectively). For lateral incisors sockets, Type 1 was 77% in female patients and 66% in male ones, Type 2 was 17% in females and 33% in males. Meanwhile, no significant differences in the socket type prevalence were found according to gender in central incisor (P = 0.249). This could be represented in figure 6.

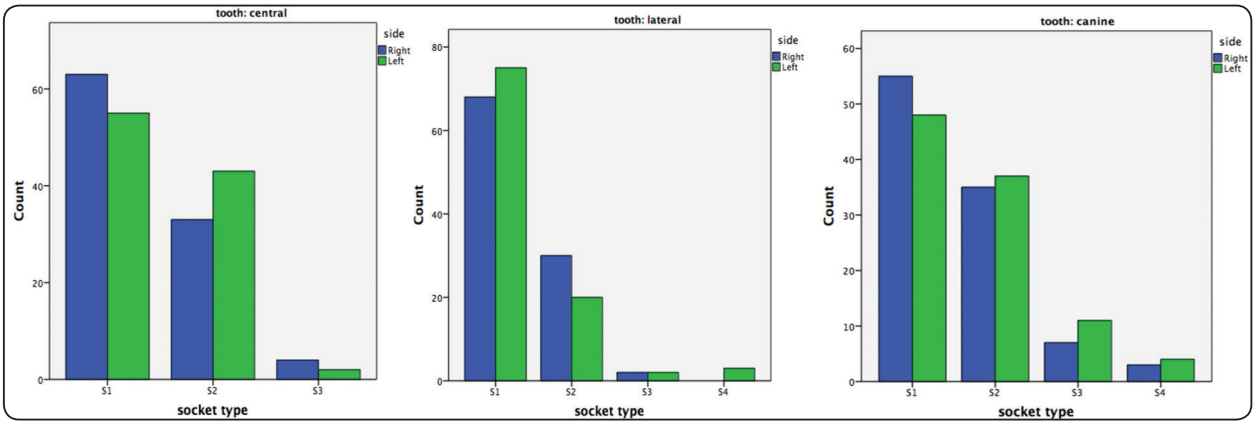

Fig. (5) Distribution of socket types in maxillary anterior teeth

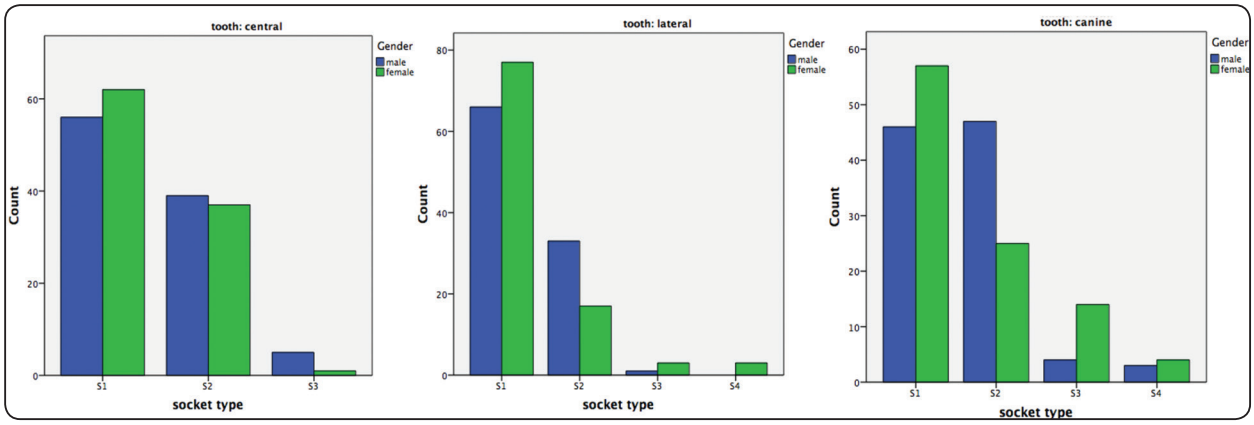

Fig. (6) Prevalence of socket types according to gender within each anterior tooth independently.

DISCUSSION

Due to anatomical consideration, the palatal portion of an extraction socket of the maxillary anterior teeth, being thicker and more cortical in nature represents a better support for implant placement than the labial counterpart.[8,10] In class I SRP there is large amount of bone palatally that is sufficient to properly engage the implant thus achieving proper stability. This also contributes in the integrity of the labial bone since any possible gap between the socket and the implant can be filled with a grafting material.

In the current study 60.7 % of the 600 samples were Class I SRP suggesting that the majority of the teeth included in the study would be good candidates for immediate implant placement and provisionalization. In a similar study carried out on Chinese people, it was also found that the labially positioned root of maxillary anterior teeth was predominant with 95%.[11]

33% was the percentage of Class II SRP in which the root is in the centre of the bony housing and is neither engaging the labial nor the palatal aspect resulting in less amount of bone than in Class I. The immediate implant placement in such cases could result in implant instability and the amount of bone available beyond the apex should be properly assessed as it greatly determines the implant stability.[6,8,11] This Class was significantly less in other studies such as Kan et al who found it 0.7% but this may be attributed to ethnic variations between Egyptians and other populations.

Class III SRP frequency was 4.7%. In this class since the root is engaging the palatal cortical plate, the labial one will be responsible for stabilizing the implant. The labial bone is usually liable to resorption and this could cause perforation or fenestration when relying on labial bone wall for support.[8,13]

In Class IV SRP comprises 1.4% of the total sample. In this class the available bone is occupied by the whole root so after tooth extraction a small amount of bone remains and will eventually greatly affect implant stability. Grafting should be considered before implant placement.[8,14] Class IV was not encountered at all in central incisors, its percentage for lateral incisor was 1.5% and 3.5 % for the canine. This is significantly less than the study carried out by Kan et al who found the percentage of this Class for the central incisor, lateral incisor and canine 8 %, 14% and 13% respectively.

CBCT was the modality of choice rather than CT since it has been designed to produce high resolution image of maxillofacial structures in a short scan time and with less radiation dose to the patient than when using CT.[15, 16]

We can also conclude from this study that CBCT examination prior to implant treatment is valuable and can demonstrate the sites that are more suitable for implant placement (Class I), sites that are less suitable and require extra precautions (Class II and III) and sites that need grating material prior to implant treatment (Class IV).[17,18]

CONCLUSION

The increasing demand for implant treatment in particular for immediate implants in the aesthetic area makes it mandatory to understand the importance of proper treatment planning. Thorough preoperative examination including radiographic examination of the implant site and obtaining the maximum information about the available bone considering the sagittal root position will lead to improved treatment planning in case of immediate implant placement in the maxillary anterior region.

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