



Highlights

- ❖ The aim of this study was to establish a classification system of fresh extraction sockets in maxillary premolars for immediate implant placement
- ❖ Using CBCT imaging, Type I, II and III premolar root morphologies were established. The average internal angle formed between long axis of the crown and palatal roots was 11 degrees
- ❖ Type I root form in maxillary first premolar site may provide stability and appropriate prosthetic location for an immediate implant

Introduction

The aim of this study was to establish a classification system for use in immediate implant placement via a thorough examination of fresh extraction sockets in maxillary premolars and evaluation of the varying morphologies using CBCT imaging. These guidelines may provide a simplified approach to assist in the clinical decision of immediate implant placement.

Materials & Methods

Selection criteria included patients ages 15-85 with exclusions applied for subjects with a history of dentoalveolar surgery, trauma, root resorption in the maxillary arch.

Materials & Methods continued

A total of 200 maxillary premolars were classified by their alveolar housing as Type I (two-rooted premolar with interradicular bone), II (fused roots with mesiodistal alveolar constriction) or III (single blunted root with no interradicular bone). All premolars were also classified as buccal (<1mm of buccal bone), centered (equal width of buccal and palatal bone) or palatal (greater width of buccal compared to palatal bone) in relation to the alveolar housing. The internal angle formed between the long axis of the crown and long axis of the palatal root was measured for all Type 1 maxillary first premolars ($n=40$), as well as interradicular septal bone height. Descriptive and distribution statistics were used to evaluate each measurement.

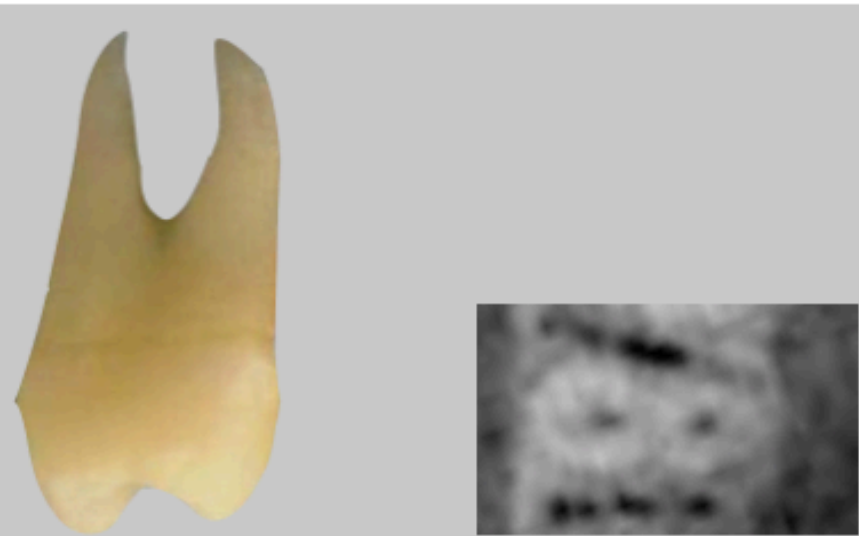
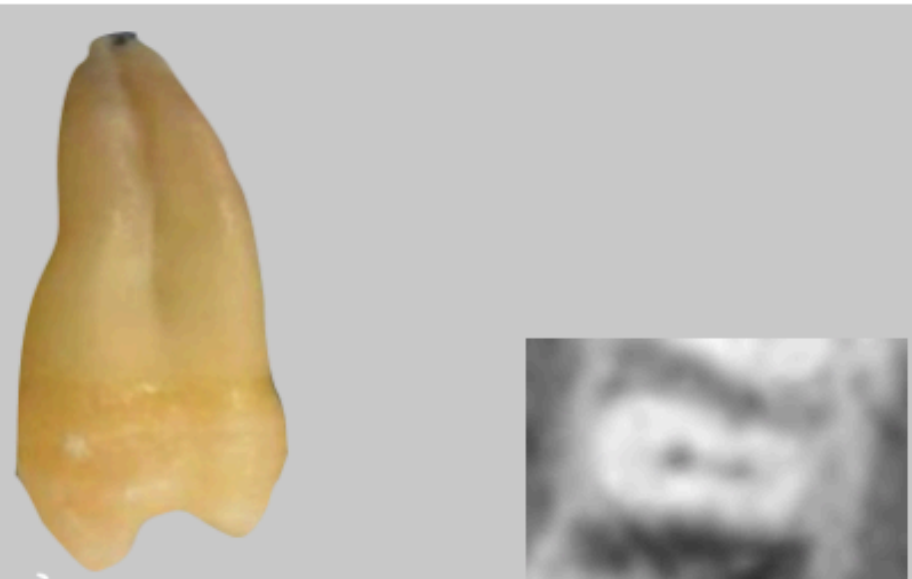
TYPE 1	TYPE 2	TYPE 3
 <ul style="list-style-type: none">Two rooted premolar with intraseptal bone visible on CBCT 3 mm below CEJFigure 8 socket	 <ul style="list-style-type: none">Fused rooted premolar with defined DG visible on CBCT 3 mm below CEJKidney socket	 <ul style="list-style-type: none">Single rooted premolar with blunted root end and no defined DGOval socket

Figure 1. Classification of maxillary premolars sockets Type 1-3



Materials & Methods continued

Fifty-two CBCT datasets were analyzed for a total of 101 maxillary first premolar teeth and 99 maxillary second premolar teeth.

Results

Overall, Type 1 premolar socket is present in 32% of the sampled maxillary first and second premolars. The incidence of Type 1 root form in maxillary first premolars was 51%. Type 2 socket was present in 29% of maxillary first premolars and type 3 socket was present in 16% of maxillary first premolars.

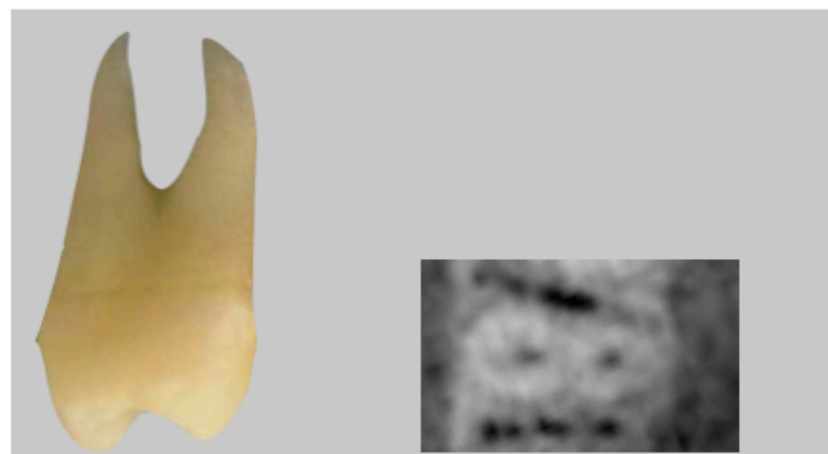
TYPE 1	TYPE 2	TYPE 3
 <ul style="list-style-type: none"> Two rooted premolar with intraseptal bone visible on CBCT 3 mm below CEJ Figure 8 socket 	 <ul style="list-style-type: none"> Fused rooted premolar with defined DG visible on CBCT 3 mm below CEJ Kidney socket 	 <ul style="list-style-type: none"> Single rooted premolar with blunted root end and no defined DG Oval socket

Figure 1. Classification of maxillary premolars sockets Type 1-3

Results continued

In the maxillary second premolar the incidence of a Type 3 root form was 89%.

The measurements also demonstrated that 92% first and second maxillary premolars will be buccal in the alveolar ridge. The internal angle formed between the long axis of the crown versus the long axis of the palatal root was averaged at $11 \pm 4.35^\circ$ (range 4° to 20.7°). The interradicular septal bone height was an average of $7 \text{ mm} \pm 1.6 \text{ mm}$ (range 3.28mm to 9.61mm).

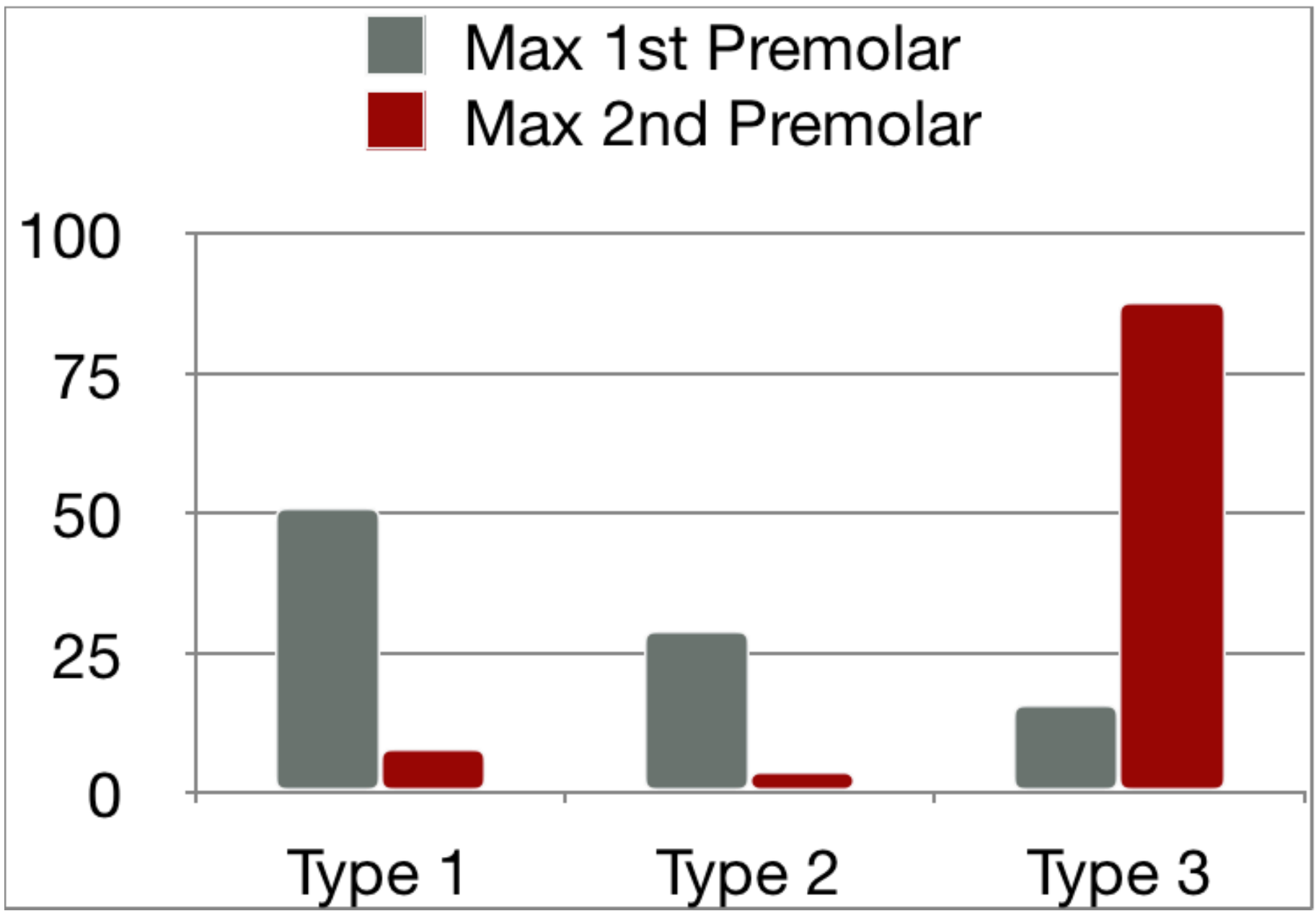


Figure 2. Percentage of premolars represented in Y-axis. Socket Types 1-3 represented by X-axis.

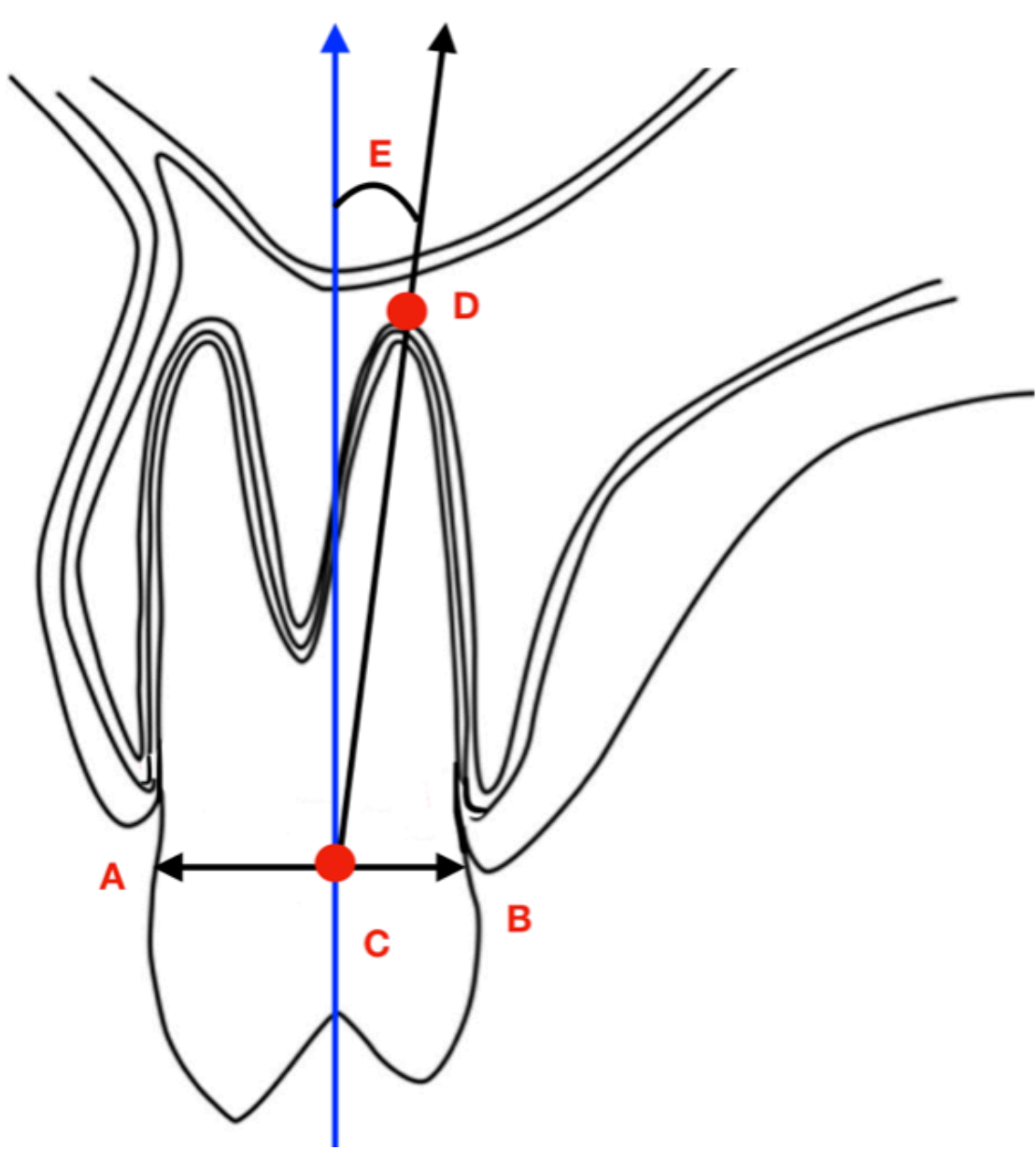


Figure 3. Measurement of the internal angle in coronal cross section

Assessment of Alveolar Housing in Maxillary Premolars in Preparation for Immediate Implant Placement: A CBCT Analysis

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Conclusions

Maxillary premolars present a clinical challenge for immediate implant placement because of their variability in root morphology, anatomical landmarks and the availability of alveolar bone to support primary stability for an immediate implant. Type I root form had the highest incidence at maxillary first premolars sites and has the highest amount of interradicular bone available, thus having a higher probability for primary stability. The type III root form is most common in the maxillary second premolar site and has the least amount of alveolar support for immediate implant placement. The angulation and alveolar bone support provided by the palatal root in Type I root form maxillary first premolar sites may provide the stability necessary and therefore may be a more feasible site for an immediate implant placed at an appropriate prosthetic position.

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