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Alveolar dehiscence and fenestration in dried South African Negro maxillae

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alveolar dehiscence; alveolar fenestration

SUMMARY

One hundred adult South African Negro skulls having a complete maxillary dentition were examined for the presence of dehiscence and fenestrations of the labial or buccal alveolar plate. The defects were diagnosed according to the definition in the Journal of Periodontology, Glossary of Terms (1977). It was found that 8,4 per cent of teeth had either dehiscences or fenestrations and 28,5 per cent of the maxillary first molars had a defective alveolar covering and that this tooth was the most common tooth in the mouth to have fenestrations and dehiscences. It is postulated that the proximity of the maxillary first molar to the zygomatic pillar could play a role in the occurrence of these bony defects.

OPSOMMING

Een honderd skedels van volwasse Suid-Afrikaanse negers met 'n volledige maksillêre gebit is vir die teenwoordigheid van labiale of bukkale alveolêre beensplete en fenestrasies ondersoek. Die defekte is volgens die definisie in die Tydskrif van Periodontologie se woordelys (1977) gediagnoseer. Dit is gevind dat 8,4 persent van die tande óf beensplete óf fenestrasies getoon het en dat 28,5 persent van die maksillêre eerste molare 'n gebrekkige alveolêre-beendekking gehad het. Hierdie tand is die een wat fenestrasies en beensplete die meeste getoon het. Die stelling word gemaak dat die nabyheid van die maksillêre eerste molaar aan die sigomatiese pilaar 'n rol in die voorkoms van hierdie beensplete speel.

The maxillary canine and first molar have been shown to be common sites for the occurrence of dehiscences and fenestrations in Egyptian and Mexican skulls. Abdelmalek and Bissada (1973) defined a dehiscence as the absence of alveolar cortical plate, resulting in a denuded root surface and fenestration as a circumscribed defect in the cortical plate which exposes the facial or lingual root surface. They examined 61 Egyptian maxillae and found 17 dehiscences and fenestrations associated with the first molar (7,8 per cent). Larato (1970) did not describe the definitions he used in a study of these defects in Mexican skulls. Of the 108 skulls examined, he noted 26 defects on the mesio-buccal and 17 on the disto-buccal root of the first molar and 48 canine defects.

The Journal of Periodontology Glossary of Terms (1977) defined dehiscence as "a condition in which the buccal and less often the lingual aspect of the root of a tooth is without all or a portion of its bony covering". The definition continues "such defects are most often associated with the roots of teeth in prominent positions in the arch". A fenestra is defined as a window-like aperture or opening, often found over the roots of teeth covered with thin bone.

Prichard (1966) explained that the presence of these defects in the maxillary first molar region was due to the cortical plate of the alveolar process often being thin. The greater the prominence of the tooth, the more likely that a defect in the bone overlying the root will be present. In view of the inadequate evidence concerning the prevalence of dehiscences and fenestrations, a study was carried out on dried skulls of South African Negroes to compare these with Egyptians and Mexicans. A second objective of the study was to confirm or refute the observation that the maxillary first molar is the most common tooth to display fenestrations or dehiscences.

MATERIALS AND METHODS

South African Negro skulls from the Raymond Dart collection, Department of Anatomy, University of the Witwatersrand, Johannesburg were viewed sequentially. One hundred adult skulls with a complete maxillary dentition were selected. Preference was given to those skulls with a complete dentition over the need for tribal definition. After selection, the skulls were specifically examined for the presence of either fenestrations (Fig. 1) or dehiscences (Fig. 2) of the labial or buccal alveolar plate, using the criteria described in the Journal of Periodontology, Glossary of Terms (1977). Great care was taken to ensure that the defects recorded were not artefacts or due to post-mortem damage. Fig. 3 illustrates the type of defect recorded, while the dehiscence on tooth 24 in Fig. 5 was seen as an artefact, the



Fig. 1 A fenestration on the disto-buccal root of a maxillary first molar.

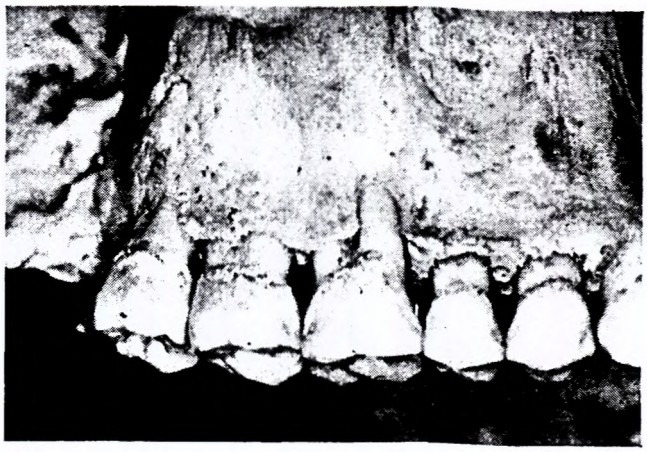


Fig. 2 A dehiscence on the maxillary right first molar.

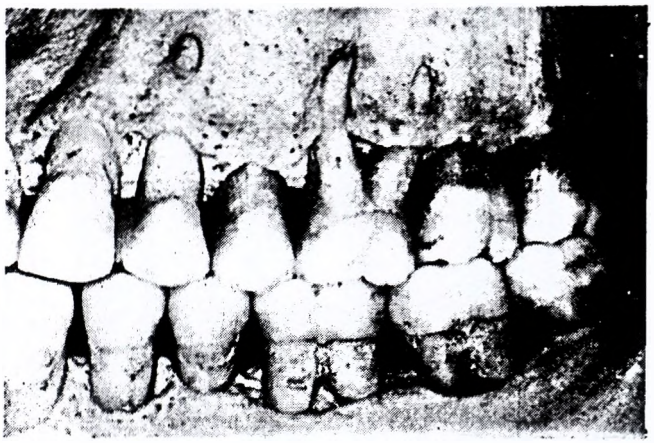


Fig. 3 An illustration of the types of defects recorded. Fenestration on tooth 24, and a dehiscence on the mesial root and a fenestration on the distal root of tooth 26.

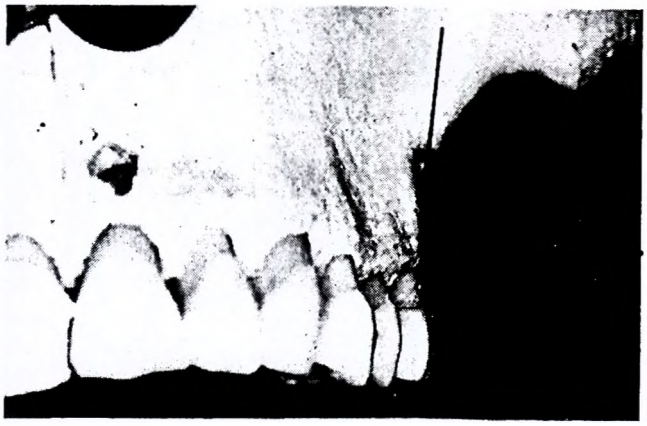


Fig. 4 An antero-posterior view of a maxilla showing the position of the first molar in relation to the zygomatic arch and zygomatic pillar, (arrowed).

bone margin being irregular and residual bone being present over the root surface.

Whenever a fenestration or dehiscence was observed, it was recorded on a chart. Secondly, a notation was made of whether or not the roots of the maxillary first molar continued in the line of the zygomatic pillar. Fig. 4 illustrates the proximity of the molar root to the zygomatic pillar (arrowed), while Fig. 5 shows the apex of the disto-buccal root of a first molar in a continuous line with the pillar (arrowed).



Fig. 5 Side view of the maxilla showing a dehiscence of the disto-buccal root of a first maxillary molar, which extends to the zygomatic pillar. The defect on tooth 24 is considered to be an artefact or damage.

RESULTS

Table 1 lists the frequencies of the bony defects, seen on visual examination of the labial and buccal aspects of the maxillae. A total of 93 fenestrations and 25 dehiscences were noted on the 1400 teeth examined. Seventy six of these defects were associated with the first molars and 21 with the canines. The other maxillary teeth showed insignificant numbers of dehiscences or fenestrations. The frequencies of these observations are compared to those of Larato (1970) in Table 1.

Table 2 compares our percentage observations to those of Abdelmalek and Bissada (1973). The highest percentages of fenestrations and dehiscences in the present study were on the first molars and the canine teeth, while Abdelmalek and Bisada found the second molars to have percentage values similar to that of the canines.

In the present study the number of fenestrations were far greater than dehiscences; 57 fenestrations as opposed to 19 dehiscences for the first molars and 18 fenestrations to 3 dehiscences for canines. Nineteen of the first molar roots with either of the defects were found to be in line with the zygomatic pillar and 58 roots with defects were alongside the line of the pillar.

Statistical analysis was not undertaken as there was insufficient information in the comparative studies.

Table 1. Distribution of alveolar plate fenestrations and dehiscences. Number of each tooth type = 100. Larato's (1970) prevalences are indicated in parentheses — his number of each tooth type are unknown but 100 skulls were examined.

Tooth	17	16	15	14	13	12	11	21	22	23	24	25	26	27
Fenestrations			2(1)	3(8)	11(23)	1(12)	2(0)	1(1)	4(8)	7(10)	4(6)	1(1)		
Mesial root		7(15)											11(11)	
Distal root	5	12(8)											12(8)	5
Mesial and Distal roots		8(0)											7	
		27(23)											30(19)	
Dehiscences			(1)	(2)	1(9)	(0)	1(5)	1(3)	(3)	2(7)	1(0)	(0)	(0)	
Mesial root		6											7	
Distal root		2(1)											2	
Mesial and Distal roots		1											1	
		9(1)											10	

Table 2. Percentage distribution of alveolar plate dehiscences and fenestrations. Left and right hand sides combined. Abdelmalek and Bissada's (1973) figures are indicated in parentheses.

Tooth	Total number of teeth	Defects %
Central incisor	200 (113)	1,5 (1,8)
Lateral incisor	200 (116)	2,5 (2,1)
Canine	200 (116)	9,0 (5,3)
1st premolar	200 (116)	3,5 (3,0)
2nd premolar	200 (111)	1,5 (1,3)
1st molar	200 (109)	28,5 (7,8)
2nd molar	200 (100)	5,0 (5,0)

DISCUSSION

The prevalence of fenestrations and dehiscences have not been extensively documented. Carranza (1979) states that these bony defects occur on 20 per cent of teeth. In the present study 8,4 per cent of teeth were found to have either fenestrations or dehiscences, whilst 28,5 per cent of the maxillary first molars were affected.

In an early study of mandibular defects by Volchansky and Cleaton-Jones (1978), it was found that 19 per cent of the canines and first premolars had fenestrations and 11,8 per cent and 12,9 per cent respectively had dehiscences. Abdelmalek and Bissada (1973) found 6,15 per cent of the maxillary and 6,46 per cent mandibular teeth to have defects, with the maxillary first molar having the highest prevalence (7,8 per cent). Larato (1970) found 26 defects on the mesio-buccal and 17 on the disto-buccal root of first maxillary molars, but as no percentages were given in this study, it is difficult to compare his findings to those in the present study. It would therefore, appear that the maxillary first molar is the tooth in the South African Negro which most commonly displays these defects. The reason for this occurrence is not clear. Prichard (1966) has suggested that root prominence could be the cause of these defects. In defining fenestrations and dehiscences, the Glossary of Terms (1977) states that "such defects are most often associated with the roots of teeth in prominent positions in the arch".

Elliot and Bowers (1963) were quoted by Carranza (1979) as saying that these defects occur in teeth with prominent root contours, in malpositioned teeth and in labially positioned teeth with thin bony plates. These were also the observations of Stahl, Cantor and Zwig (1963), Prichard (1966), Larato (1970), Goldman and Cohen (1973) and Pennel and Keagle (1977), and would imply that these anatomical conditions predispose to either fenestrations or dehiscences.

No mention had been made in the literature of the possible relationship of the maxillary first molar to the zygomatic pillar as a factor in these defects. Sicher and Du Brul (1970) wrote that the zygomatic pillar originates in the region of the upper first molar as the zygomatic alveolar crest which continues in a laterally concave curve into the zygomatic process of the maxilla and then into the zygomatic bone. De Villiers (1968) quotes Sergi's (1974) description of the "inframolaris frontalis" as a naturally occurring anatomical landmark. In this study approximately 75 per cent of the defects were found alongside the zygomatic pillar. Since the demarcation of the pillar is not clear, this may only be considered as an estimate. The maxillary first molar has been shown to be the most common tooth in the maxilla to have fenestrations and dehiscences. It is possible that the zygomatic pillar may play a role in the occurrence of these defects, although the reason for this remains obscure.

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