INTRODUCTION

The alveolar process, that portion of the maxilla and mandible that forms and supports the sockets of the teeth, consists of 2 parts.

The first part is lamellar bone that surrounds the tooth root and gives attachment to the periodontal ligament. The second part is the supporting alveolar bone, made up of both the outer and inner cortical plates and the trabecular, or cancellous, bone that fills the space between these plates. Radiographically the trabecular bone is thought to manifest itself as striae.

Radiographic changes in the striae pattern occur in a number of disease states. The radiographic appearance of bone striae is classically thought to reflect the trabecular pattern of cancellous bone. Results of a 1999 study by Calvanti et al contradicted this paradigm and the authors suggested that the intra oral radiographic image of trabecular pattern in mandible reflects the morphology of the endosteal surface of the cortical bone rather than that of cancellous bone. The aim of this study was to test whether the cortical bone has an influence on trabeculation pattern on periapical radiographs made with the paralleling techniques of dry mandibles.

MATERIALS & METHODS

This is an experimental research. We studied 15 areas of 7 dry human mandibles. We used no broken
mandibles, not related to mixed and deciduous period, nor to any existing lesion like fenestration, dehiscence. We used Degotzen x-ray unit (10 mA, 70 KVP, 2.5 mm equivalent filtration and 8 inch cone), time exposure was 0.22 second.

The radiographic films were of size 2 Kodak insights (Eastman Kodak Co, Rochester, NY). The films were processed in Velopex automatic processor, using Champion developer and fixer (X-ray Company, England). We used 10 fissure carbide bur and high speed handpiece & chisel for the removal of the bone.

We used Rose wax for stabilizing mandibles and 7 mm for soft rectangular region of interest tissue equivalents. We selected 0.5 cm in molar x-area in each mandible. A standardized parallel periapical radiographs centered in area of interest was obtained of dry human mandible. Standard parallel periapical from 7 dry human mandible on the same region from 15 area prepared.

The radiographs were acquired before, after removal of buccal, then lingual plate together with endosteal cortical-trabecular bone interface. We acquired 45 parallel periapical radiographs and processed under the same conditions. The buccal cortical plate, together with the endosteal cortical — trabecular bone interface were removed from the region of interest, using a high speed diamond carbide bur, and chisel and a second standardized radiograph was acquired. The lingual plate was removed from the region of interest in a similar manner and a third standardized image was taken.

We mounted radiographs by random. We gave a number to each radiograph. The radiographs were analysed by 3 experts trained observers (radiologist) who were blinded to the procedure applied to the specimens. The intra observer reliability score was acceptable between observers.

Images were scored as trabeculation pattern showed changes or not. 3 radiographs about one area of interest were mounted close together in the same mount. Three maxillofacial radiologists assessed the presence or absence of bone striations on acquired image and whether a difference in trabeculation pattern existed. Answers were scored 0 (exist changes), 1 (no changes). Data were analyzed by Chi square and Freedman statistical analysis.

RESULTS

Changes in trabeculation pattern in three procedures was not visible.

<table>
<thead>
<tr>
<th>Stage 1 (no removal of bone)</th>
<th>Stage 2 (removal buccal cortical bone)</th>
<th>Stage 3 (removal buccal &amp; lingual cortical bone)</th>
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<tbody>
<tr>
<td>78%</td>
<td>78%</td>
<td>52%</td>
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</table>

TABLE 1: TRABECULATIONS PATTERN CHANGES IN 3 STAGES

DISCUSSION

Intra oral radiographs are widely used to assist the dentist in diagnosing pathosis involving osseous structures, establishing a treatment plan, and assessing outcomes. Although many articles and books have been written about the findings of various disease states involving bone, there has been little scientific study to determine whether the radiographically seen bone pattern that is assumed to be the result of the trabecular (cancellous) bone is indeed created by the trabecular bone. Much of what we interpret has been predicated on this assumption.

It is assumed that removal of the cancellous trabeculae results in decreased attenuation of the x-ray beam, which in turn results in an increased density and a decreased trabecular pattern on the radiograph. Trabecular bone is an important component of this appearance3,4.

Colosi found that artificial lesions produced in bone were radiographically visible as a change in the trabecular bone pattern only when the area where trabecular bone and cortical bone was involved. He also showed, in an unblended, single observer experiment involving long bone segments, that the loss of trabecular bone did not change the appearance of the bone pattern on radiographs5.

Cavalcanti et al concluded that the removal of trabecular bone alone did not change the appearance of the bone pattern radiographically: they determined
that the pattern interpreted as trabecular bone is actually the result of interaction of the radiation with the bone pattern on the endosteal surface of the cortex\textsuperscript{3,2}.

In contrast to this conclusion, we find that, in the absence of both buccal and lingual cortical plates, cancellous bone produces a characteristic image of striae. Similar to that seen on periapical radiographs of the same area of bone is a substantive contributor to the image of bone striae seen on periapical radiographs\textsuperscript{3,5}.

Several pathologic conditions detected radiographically reflect the appearance of the activity of cancellous bone. Osteoporosis results in a radiographic image of decreased number and density of trabecular striations. Anemia results in compensatory enlargement of marrow, detected radiographically as enlarged bone marrow spaces with trabecular bone. A more in depth understanding of how the image of fine bone structure is acquired and displayed during image formation would contribute to more precise interpretation of the pathophysiologic mechanisms of bone involvement in diseases that are characterized by altered trabecular patterns\textsuperscript{2,5,6}.

**CONCLUSION**

Cancellous bone is the principal contributor to the trabecular patterns seen on periapical radiographs of dried mandibles.

**REFERENCES**

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