

DENTAL CONDITION OF THE SHANG DYNASTY SKULLS EXCAVATED FROM ANYANG AND HUÛ-XIAN

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Part II. Anatomical and Functional Features

As mentioned in Part I, published in June, 1959, the material of our report was recovered during a series of archaeological excavations carried out from 1950—1953, at Anyang and HuÛ-Xian, Honan Province. The chronology of these sites is estimated approximately to be the late period of the Shang Dynasty (B.C. 1766—1122). Part I dealt exclusively with dental caries and periodontoclasia; in the present discussion, some anatomical and functional features will be analysed. This group of data is obtained from 80 individuals, 61 males and 19 females. The total number of teeth studied is 1197, being 591 uppers and 606 lowers; all of which are permanent teeth.

From the study of the material the following findings are presented:

1. The occlusion

Among the group of 18 individuals whose upper and lower dental arches were preserved intact, 72% had normal occlusion and 28% had malocclusion. This is distinctly different from the occlusal condition of the present people. According to a preliminary survey, about 93% of Peking citizens have malocclusion of mild or severe degrees. The majority of malocclusions in the Shang Dynasty were due to malpositions of individual teeth while most malocclusions of modern people belong to the categories of anomaly of dental arches or jaw bones.

2. The arch form

The forms of the dental arch of human beings are classified as round, ovoid, square, U-shaped and tapering. The round, ovoid and square types represent the well-developed, broad arches, whereas the tapering represents the somewhat under-developed, narrow arches. 97% of the maxillary dental arches of these ancient individuals were round or ovoid in form and none tapering. 86% of the mandibular arches were round or ovoid and 5% tapering. This is also markedly dissimilar from modern people among whom tapering arches are generally seen (Fig. 1 of Plate I).

3. The occlusal curves

(1) Both sagittal and horizontal occlusal curves were clearly displayed in most of these ancient individuals. This signifies that their dental arches were well-developed

and teeth regularly aligned. Due to malposition of teeth and maldevelopment of jaws, the occlusal curves are disturbed and blurred in many of the present-day people (Fig. 2 of Plate I).

(2) In early age, when the morphology of the occlusal surface has not been greatly altered through attrition, the horizontal occlusal curve bend downward as shown in Fig. 2. In aged people, when masticatory attrition has reduced much more of the lingual cusps than the buccal cusps of the maxillary molars and premolars, and much more of the buccal cusps than the lingual cusps of the mandibular molars and premolars, the horizontal occlusal curve tends to bend upward (Fig. 3 of Plate I). This is true with both the Shang people and the modern people, but more marked in the latter. It signifies uneven wear of the buccal and lingual cusps and is, therefore, undesirable. This undesirable functional attrition is induced by the limitation of the mandibular functional movement in protrusive and lateral directions. The limitation of the mandibular functional movement is the consequence of the refinement of food and the hindrance of certain types of malocclusion. Although this condition exists in both groups of people, it is very much worse in the modern people.

4. The functional attrition

This includes two types of attrition, occlusal and proximal.

(1) We found that both occlusal and proximal attrition were much more intensive in the Shang people than in present-day people. This is because of the coarser food used by the former. Some specimens exhibit heavy occlusal attrition perforating the pulp chambers and inducing periapical abscesses (Fig. 4 of Plate II).

(2) In most of the Shang people the abraded occlusal surface looked flatter and even, while in most of the present-day people it appears very uneven and rocky. This signifies that the protrusive and lateral mandibular excursions in the Shang people were performed with greater efficiency and latitude than in the present-day people (Fig. 5 of Plate II).

5. The third molars

In the Shang specimens, we found that over 90% of the third molars were in regular position, while in the present-day people most of the third molars are malposed, impacted, or buried unerupted in the bone.

6. The number of the cusps of the mandibular second permanent molars

According to statistical study, among the white people, all of the mandibular second permanent molars have four cusps, while among Chinese people many mandibular second permanent molars exhibit five cusps. This is a significant racial difference.

From the Shang specimens, we found that of the lower right 2nd molars 17% were 4-cusped and 83% were 5-cusped, and, of the lower left 2nd molars, 14% were 4-cusped and 86% were 5-cusped.

7. The shovel-shaped anterior teeth

The shovel-shaped anterior teeth, especially the incisors, have been proclaimed as a racial characteristic of the Mongolian races. In this study, we found that about 80—90% of the maxillary incisors were shovel-shaped and none of the maxillary canines. Among the mandibular teeth, about 20—40% of incisors and 20—30% of canines were shovel-shaped (Fig. 6 of Plate II).

8. Anomaly of the number of teeth

(1) Congenital missing of teeth is considered as a manifestation of dental degeneration occurring with the evolutionary process of the human body. In our study, this was observed among the lower incisors and premolars in Shang specimens, and it is generally the same as we see in the present-day people (Fig. 7 of Plate III).

(2) In the study of this group of specimens, we discovered one supernumerary tooth, conical in shape and situated between the maxillary central incisors. This morphology and situation are also often seen in the mouth of today's people.

9. The "submerged tooth"

During this study, we saw one so-called submerged tooth which is a left mandibular second premolar (Fig. 8 of Plate III).

10. The vestige of tooth-picking habit

Finally, we wish to present three teeth each with a smooth trough lying buccolingually in the cervical region of the distal surface, which we interpret as the vestige of tooth-picking habit (Fig. 9 of Plate III).

On the basis of the material collected from this study and some relative data from other sources, we tentatively propound a few points of our preliminary conception:

1. Dental caries has been found in the teeth of the *Paranthropus Crassidens*, *Telanthropus Capensis*, and Rhodesian Man. It is, therefore, a very old disease. However, generally speaking, it was very rare and light with the primitive human being. The caries morbidity of the Shang people, although much higher than the primitive human beings, was markedly low in comparison with the present-day people. It means that the prevalence of dental caries among the Chinese people is comparatively a recent matter occurring during the 3,000 years after the Shang Dynasty. Those peoples of today, e.g. the arctic Eskimo, the interior African inhabitants, and many island tribes who are not modernized in their living condition, still have very low caries morbidity.

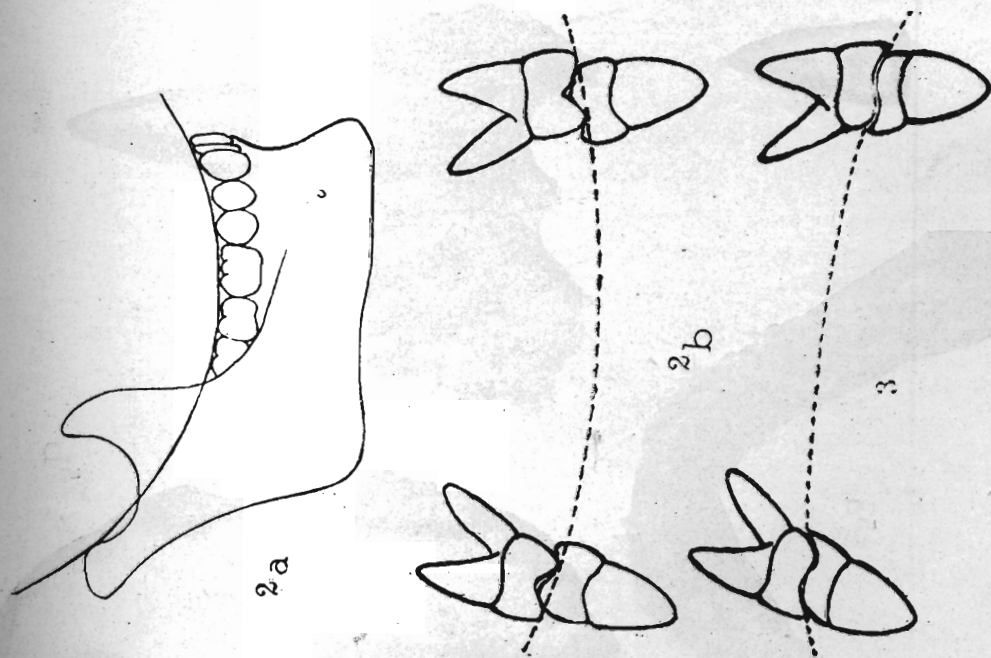
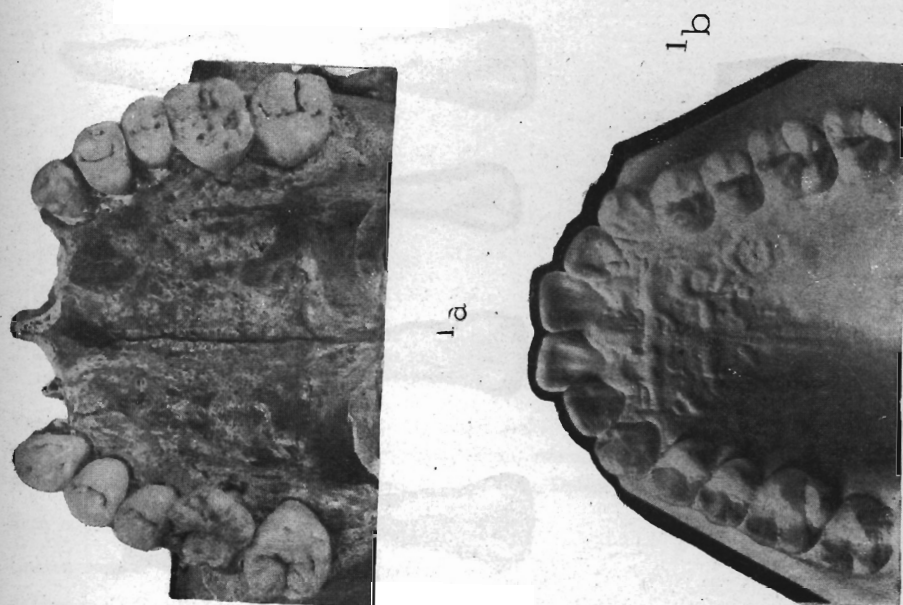
2. The vestige of periodontoclasia is observed on the jaws of the *Sinanthropus pekinensis* and the Upper Cave Man; the pathological changes were not light. This disease had developed into quite a severe degree among these Shang people, if not heavier, certainly not lighter than that of the present-day Chinese. It seems that both caries and periodontoclasia started quite early with human beings, but that periodontoclasia developed much swifter (Fig. 10 of Plate IV).

3. Light malocclusion has been found with the Neanderthal Man. Among Shang people, this anomaly became marked but very much less prevalent than in today's Peking citizens. So it seems that the prevalence of malocclusion among the Chinese people is also a comparatively recent matter occurring during the 3,000 years after the Shang Dynasty.

4. Because the occlusal attrition reduces much more of the lingual cusps of the maxillary molars and premolars and the buccal cusps of the mandibular molars and premolars, it turns the occlusal surfaces of these teeth into slant slopes. In such a case, the biting force will no longer be parallel with the long axis of the tooth but angular to it. This angular force is one of the important factors which damage periodontal tissues and so induce periodontoclasia. In anthropoids, the maxillary and mandibular canines stand protruding on the occlusal plane and prevent the mandible from lateral excursions; hinge movement plays a predominating part in the masticatory function. Under such conditions, the maxillary lingual cusps and the mandibular buccal cusps are subjected to heavy attrition which turns the occlusal surfaces into slant slopes. There is, therefore, no wonder why serious pathological vestiges of periodontoclasia are seen in anthropoids (Fig. 11 of Plate IV). The *Sinanthropus pekinensis* had neither anthropoid's protruding canines nor modern man's severe malocclusions. His mandibular functional movements were not hindered in any way; his occlusal wear was, therefore, almost perfectly even with the buccal and lingual cusps; his occlusal surfaces, instead of being slant, were made horizontal and flat by the even occlusal wear. The biting force was perpendicular to the flat, horizontal occlusal surfaces and, therefore, parallel with the long axes of the teeth. The periodontal tissues withstood much better this kind of biting force and, therefore, gave less chance for the development of periodontoclasia. Appraising from this phase, it seems that among the different evolutionary stages of the human being, the *Sinanthropus pekinensis* probably had the most desirable masticatory organ.

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- 1a. A round maxillary dental arch of the Shang Dynasty, natural size.
- 1b. A tapering (or semi-ovoid) maxillary dental arch of the modern North China people, natural size.
- 2a. Diagrammatic sketch to show sagittal occlusal curve.
- 2b. Diagrammatic sketch to show horizontal occlusal curve.
3. The uneven wear of buccal and lingual cusps converted the horizontal occlusal curve into an upward convex curvature.

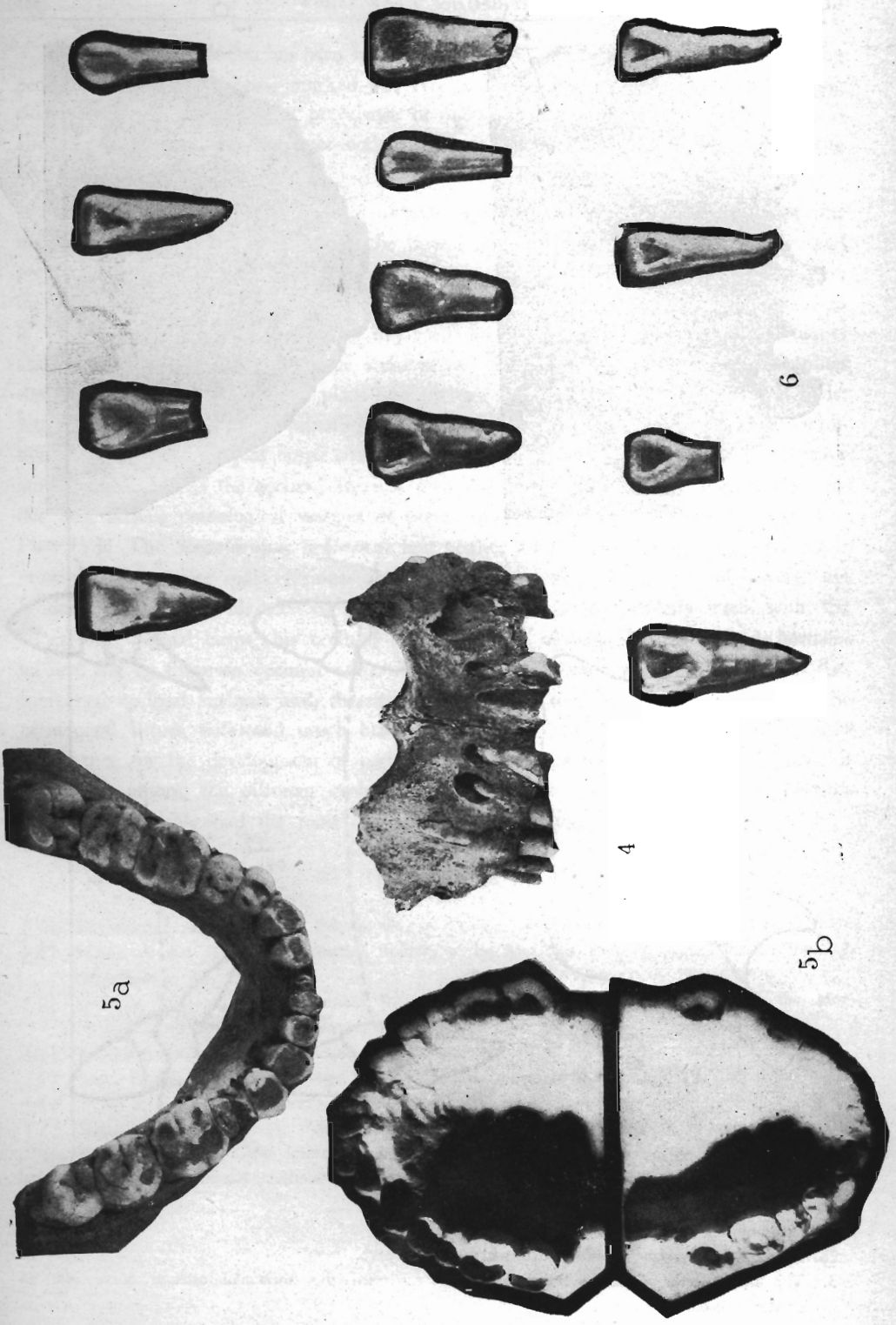


PLATE II

4. Vestiges of periapical abscesses are shown as round holes on the alveolar wall in periapical region. These abscesses were induced through pulpal infection subsequent to occlusal attritional perforation of the pulp chamber. Specimen of the Shang Dynasty, natural size.
- 5a. Even occlusal wear in a Shang specimen, natural size.
- 5b. Uneven occlusal wear in a present-day people.
6. Specimens of shovel-shaped incisors.

PLATE III

7a. "Submerged tooth". The photograph shows the "sub-mergence" of a lower left 2nd premolar. Shang specimen, natural size.

7b. "Submerged tooth". The radiogram shows the "sub-mergence" of a lower left 2nd premolar. Shang specimen, natural size.

Remarks: Hollow depressions are seen on both the mesial and distal alvolar crests of the "sub-merged tooth" which looked like vestiges of a recently shed deciduous tooth. Should this be true, the sub-mergence would have been caused by the overtime retained deciduous tooth.

8a. Congenital missing. The photograph shows the absence of a lower left 2nd premolar, natural size.

8b. Congenital missing. The radiogram reveals the congenital missing of the tooth germ of the lower left 2nd premolar. Shang specimen, natural size.

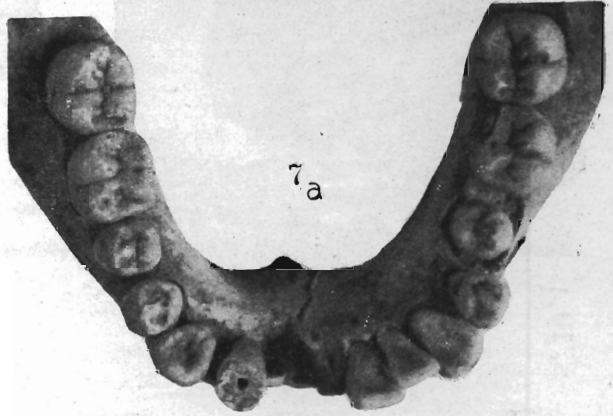
9a. 9b. 9c. Tooth-picking vestiges. Shang specimens, natural size. As described in the text, these vestiges were very particularly characterized in morphology and could not be mistaken for erosion lesions.



9c



7b



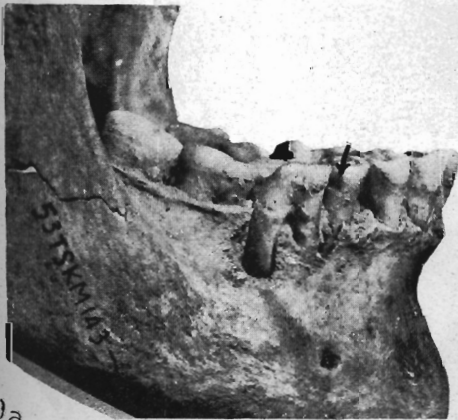
7a



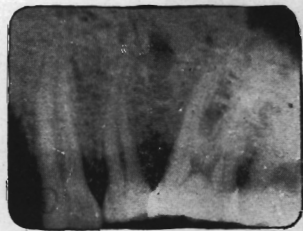
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8a



9a



8b

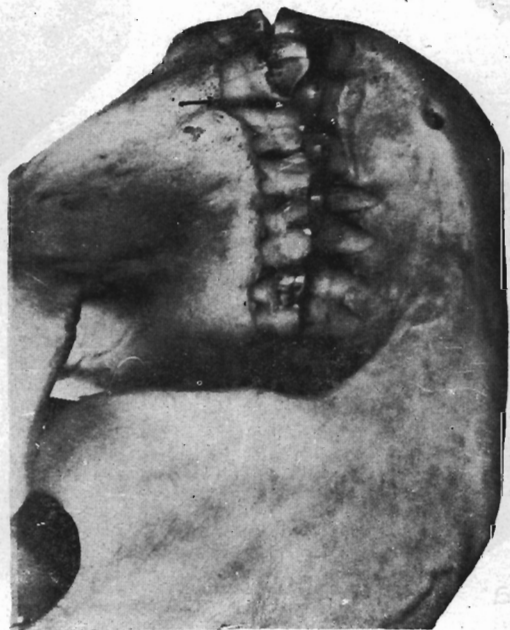
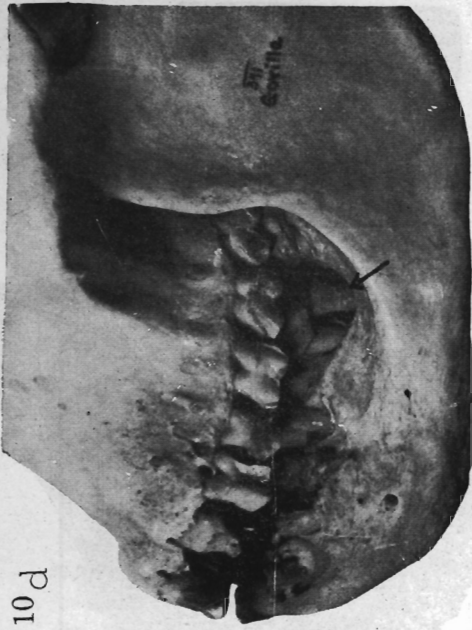


PLATE IV

- 10a. Slant occlusal surfaces of a modern chimpanzee.
- 10b. Slant occlusal surfaces of the molars of the *Gigantopithecus* of Kwangsi.
- 10c and 10d. Serious periodontal pathological vestiges in a modern chimpanzee, especially notable in right maxillary canine and left mandibular 2nd molar regions, all natural size.
11. The mandibular 1st molar of *Sinanthropus pekinensis* shows distinctly the vestige of periodontoclosia.