THE ATTRITION OF MOLARS IN THE ANCIENT INHABITANTS OF ANATOLIA [1]

A Preliminary Report

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It is well known that the teeth of prehistoric men and of modern primitive peoples show a marked degree of attrition. In constrast to the prehistoric and primitive peoples, consuming gritty food, the teeth of the highly civilized peoples, though subject to the same process, are worn to a lesser extent, because of the refinement of their food and food habits. It may be said however that, as has been remarked by Broca (1879), no matter how hard a tooth substance may be it tends to wear down in the long run through the grinding action of one opposing tooth against the other and the abrasive effect of the food chewed, though, as was stated above, to varying degrees in different peoples.

In view of the common knowledge that the wear increases with age, the attrition has been employed in estimating the age of crania. As has been stated by Ashley- Montagu (1938), however, in aging the skulls the greatest amount of attention has so far been devoted to the synostosis of the sutures and the relation of attrition to suture closure and age has been rather neglected. Hence, during the course of a study on the duration of life of the ancient inhabitants of Anatolia (Şenyürek, 1947) it was decided that it would be profitable to study the relation of attrition to age to see to what extent the degree of tooth-wear could be relied upon in estimating the age of a skull. As was stated in the previous study (1947), the age was determined solely by means

[1] This report was read in the Third International Congress of Anthropological and Ethnological Sciences held in Brussels, Belgium, between August 15 and 23 rd, 1948.

of the eruption stages of the teeth and the union of the sutures, excepting two specimens where epiphyses were also used. The attrition was recorded only to study the relation of its progress to age and was not used in aging.

In this study the remains of 87 individuals of known individual age, coming from various sites[2] and ranging from the Chalcolithic period to the end of the Byzantine time at Alişar höyük[3] have been examined. In addition 18 isolated adult jaws or fragmentary crania of unknown individual age have also been investigated, but these are not incorporated in the present report.

In this investigation only the occlusal attrition, affecting the masticating surfaces of the teeth, was recorded and the interproximal attrition was not studied. The degree of occlusal attrition has been recorded separately for each permanent molar, upper and lower. The classification of attrition employed has been adapted from Broca (1875 - 1879), whose system has also been used by Campbell (1925 - 1939), Drennan (1929) and Shaw (1931) and is as follows:

I — No attrition. The cusps are sharp.

II — Only the enamel is abraded and no dentine is exposed.

III — The cusps have been worn down to the extent of exposing some islands of dentine.

IV — The height of the crown is further reduced and the dentine is completely exposed.

V — The wear has extended to the neck, the crown being entirely worn off.

Tables 1 and 2 show the degree of attrition on each permanent molar and its relation to age for both sexes. It is noted that in no molar group does the total number of individuals equal 87. This is due to the fact that all three molars were not present in all the jaws. In young ones, naturally, one or two molars had

[2] The sites studied are: Ahlatlıbel, Alaca höyük, Alişar höyük, Karahöyük, Karaoğlan, Kumtepe, Kusura, Maşat höyük, Pazarlı, Samsun sites and Tilkitepe. With the exception of two, all these sites are included in the previous study on the duration of life (1947).

[3] That is, roughly from the latter part of the fourth millenium B. C. to the eleventh century A. D., when the Byzantine time ends at Alişar höyük.

not yet erupted and in some of the adult specimens one or more of the molar teeth had fallen off, before or after death.

To facilitate the presentation, we shall confine our attention in this report to the relation of attrition to age in the total series. All other pertinent questions (periods, sex) will be discussed in a fuller report on this subject which is in preparation.

We may now proceed to examine tables 1 and 2, taking the age groups separately.

7 - 12 years : Up to the 12 th year, when the second permanent molar completes its process of eruption, most of the available first molars are either unworn or only their enamel is abraded. The cases with some islands of dentine exposed appear to be rare.

13 - 20 years : While in some first molars only the enamel is abraded, it is more often the case that some islands of dentine are exposed. The second permanent molar is either unworn or only its enamel is abraded.

21 - 40 years : First molars in the majority of cases show degree III, more rarely degree IV and still more rarely degree V (one specimen only). In the second molars, either only the enamel is abraded or some islands of dentine are exposed, the latter case being somewhat more frequent. On the other hand, degree IV appears rarely. The wisdom teeth are either unworn or only their enamel is abraded. In a few some dentine is exposed, while only one shows degree IV.

41 - 60 years : While some of the first molars show degree III, the majority exhibit degrees IV to V. The second molars show only rarely degree II, most often degree III and again rarely degrees IV to V. In the wisdom teeth, in half or more than half of the cases only the enamel is abraded, while the rest exhibit degrees III to IV, the latter being rare.

61 - X years : It is unfortunate that there are only a few aged individuals and therefore nothing definite can be said about the intensity of attrition in this age group. As was pointed out before (Şenyürek, 1947), the average longevity of the ancient Anatolians was shorter than that of recent civilized man and only a few of them succeeded in reaching a ripe old age. The paucity of the aged individuals in this series is, therefore, not surprising. But

as far as the present material goes, it is seen that the first molars exhibit degrees IV to V, while the second molars rarely show degree III and more often degree IV. Of the three lower wisdom teeth one shows degree II and two degree III.

From the foregoing account it is apparent that while there is some overlapping between the age groups, in general, the intensity of attrition increases with age. Furthermore, it is seen that the intensity of attrition diminishes from the first to the third molar, as would be expected.

T. D. Campbell (1939) also gives two tables (Campbell, 1939, tables 1 and 2) showing the relation of attrition to age. A scrutiny of Campbell's tables also leads to the same conclusion, namely that while the intensity of attrition increases with age, there is still some individual variation and overlapping between the age groups. This individual variation and overlapping would limit the value of attrition as a precise age criterion. But this would only apply to degrees of attrition common to various age groups, while those beginning or confined to under or over certain age groups may still give us a general idea about the age of a skull. For instance, in our series a first molar showing degree II (with only the enamel abraded) would indicate an individual under 20 years, while a first molar with degree IV would indicate an individual over 20 and one with degree V would point to an individual over 20, and more probably over 40. In other words, the attrition can still be used to some extent in reaching a general estimate of the age of crania. It may especially be useful in the case of very fragmentary skulls, isolated adult jaws and isolated mature molars where no other aging criteria are available.

There is another point that must be considered in utilizing the attrition as an age criterion. It is well known that the intensity of attrition, to a very large extent, depends upon the nature of the diet. The prehistoric and primitive men consuming gritty foods tend to have strongly worn teeth, while the civilized people of today with their refined food and food habits tend to have very little wear. In other words, the degree of attrition on the teeth depends in a large measure upon the culture. The significance of this is apparent as it indicates that the criteria

established for one group of people cannot be applied universally to peoples with different cultures. As has been pointed out by the late Dr. Hrdlicka (1939), in order to utilize attrition as an age criterion, it is first necessary to study the progress of attrition in that group in relation to age, either in the living or on crania. In the case of skeletons the relation of attrition to the epiphyseal union and the eruption of the teeth in the immature specimens and to the age changes in the pubic symphysis or the synostosis of the sutures in the adults must be determined.

Summary and conclusion

Though the series studied is not large, and though the later archaeological periods in particular are represented by only a few individuals, it nevertheless gives us some useful indications.

The intensity of attrition in general increases with age. Though the individual variation and overlapping between the age groups and its dependence upon the nature of the diet consumed limit its value as a precise age criterion, nevertheless the study of attrition may give us a general idea about the age of a skull in at least some cases, provided that its relation to age has already been studied in that group.

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Table 1 — Distribution of attrition in the upper molars of ancient Anatolians, in relation to age. Both sexes.

		Years 7 — 12					Years 13 — 20					Years 21 — 40					Years 41 — 60					Years 61 — X				
		I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V
First Upper Molar	Chalcolithic - Copper	2	—	1	—	—	—	1	5	—	—	—	—	12	1	—	—	—	1	4	1	—	—	—	—	—
	Early Bronze	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
	Hittite Empires	—	—	—	—	—	—	—	1	—	—	—	—	4	3	—	—	—	—	1	—	—	—	—	—	—
	Post - Hittite - Phrygian	1	—	—	—	—	—	2	—	—	—	—	—	1	1	—	—	—	1	1	—	—	—	—	—	—
	Medo-Persian-Hellenistic	1	1	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—
	Roman-Byzantine	1	—	—	—	—	—	1	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—
	Total	5	1	1	—	—	—	4	8	—	—	—	—	21	5	—	—	—	2	6	2	—	—	—	1	—
Second Upper Molar	Chalcolithic - Copper	—	—	—	—	—	2	3	—	—	—	—	7	4	1	—	—	—	5	—	1	—	—	—	—	—
	Early Bronze	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
	Hittite Empires	—	—	—	—	—	—	1	—	—	—	—	2	3	—	—	—	—	—	—	—	—	—	—	—	—
	Post - Hittite - Phrygian	—	—	—	—	—	1	—	—	—	—	—	—	2	—	—	—	1	—	—	—	—	—	—	—	—
	Medo-Persian-Hellenistic	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—
	Roman-Byzantine	—	—	—	—	—	2	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—
	Total	—	—	—	—	—	6	4	—	—	—	—	10	11	1	—	—	1	5	1	1	—	—	—	1	—
Third Upper Molar	Chalcolithic - Copper	—	—	—	—	—	—	—	—	—	—	3	5	—	—	—	—	2	1	—	—	—	—	—	—	—
	Early Bronze	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Hittite Empires	—	—	—	—	—	—	—	—	—	—	2	3	1	—	—	—	—	—	—	—	—	—	—	—	—
	Post - Hittite - Phrygian	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	1	—	—	—	—	—	—	—	—
	Medo-Persian-Hellenistic	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—
	Roman - Byzantine	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—
	Total	—	—	—	—	—	—	—	—	—	—	5	12	1	1	—	—	3	1	1	—	—	—	—	—	—

Table 2 — Distribution of attrition in the lower molars of ancient Anatolians, in relation to age. Both sexes.

		Years 7 — 12					Years 13 — 20					Years 21 — 40					Years 41 — 60					Years 61 — X				
		I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V
First Lower Molar	Chalcolithic - Copper	2	1	1	—	—	—	—	6	—	—	—	—	15	2	—	—	—	2	4	3	—	—	—	—	1
	Early Bronze	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
	Hittite Empires	—	—	—	—	—	—	—	1	—	—	—	—	6	2	—	—	—	—	—	—	—	—	—	—	—	—
	Post - Hittite - Phrygian	2	—	1	—	—	—	1	1	—	—	—	—	2	2	—	—	—	2	1	—	—	—	—	—	—	—
	Medo-Persian-Hellenistic	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Roman-Byzantine	1	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	1	—
	Total	5	3	2	—	—	—	2	9	—	—	—	—	23	6	1	—	—	5	5	4	—	—	—	1	1
Second Lower Molar	Chalcolithic - Copper	—	—	—	—	—	1	5	—	—	—	—	6	7	1	—	—	—	9	1	1	—	—	—	1	—
	Early Bronze	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
	Hittite Empires	—	—	—	—	—	—	1	—	—	—	—	3	5	1	—	—	—	—	—	—	—	—	—	—	—
	Post - Hittite - Phrygian	—	—	—	—	—	2	1	—	—	—	—	1	2	1	—	—	1	2	—	—	—	—	1	—	—
	Medo-Persian-Hellenistic	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
	Roman-Byzantine	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	1	1	—	—	—	—	1	—
	Total	—	—	—	—	—	4	8	—	—	—	—	10	16	3	—	—	1	13	2	1	—	—	1	2	—
Third Lower Molar	Chalcolithic - Copper	—	—	—	—	—	—	—	—	—	—	4	8	—	—	—	—	3	3	—	—	—	1	2	—	—
	Early Bronze	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—
	Hittite Empires	—	—	—	—	—	—	—	—	—	—	3	3	2	—	—	—	—	—	—	—	—	—	—	—	—
	Post - Hittite - Phrygian	—	—	—	—	—	—	—	—	—	—	—	5	—	—	—	—	1	—	—	—	—	—	—	—	—
	Medo-Persian-Hellenistic	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
	Roman - Byzantine	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	1	—	1	—	—	—	—	—	—
	Total	—	—	—	—	—	—	—	—	—	—	7	17	5	—	—	—	5	4	1	—	—	1	2	—	—