The Incidence of Ear Exostoses in the Hopewell People of the Illinois Valley

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It was observed almost two decades ago by Dr. Don Dickson of Lewistown, Illinois, that in the Illinois valley the existence of ear exostoses was almost entirely limited to crania from Hopewellian mounds. Recently the senior author measured and collected morphological observations on all available Hopewellian crania and included this anomaly in his list of observations. In the present paper this data, as well as that from a number of non-Hopewellian series is analyzed and discussed by both authors.

The ear exostoses, which form the subject of this paper are bony growths usually located on the posterior superior margin of the tympanic ring. In some cases—not observed in the series discussed here—this thickening may be located at the anterior upper termination of the open ring. Often it is large enough to occlude most of the external auditory meatus. Most of them have a solid eburnized appearance unlike the less dense bone of the rest of the ring. As a whole this anomaly is rather rare, its exact cause and nature are not known.

According to Hrdlicka,[1] who collected extensive data on this subject, the incidence of ear exostoses varies considerably according to racial groups. He found it absent in 267 skulls of African Negroes; relatively rare in Europeans, the anomaly being reported in only 1.1% in over 40,000 individuals; in less than 1% in native Australians; more frequent in Melanesians, in 10% of a series of 20 skulls; and most frequent both in Polynesians—around 25.7% in a series of 167 skulls—and in some American Indian groups.

The data compiled by Hrdlicka on American Indian series is summarized in Table 1, according to the percentage of occurrence of exostoses in nineteen groups. Unfortunately these percentages are not of equal significance, for a high frequency of the anomaly in a small inbred group may be entirely obscured in the pooling of crania from a wide area or in a large series of crania from a circumscribed locality, but representing material from a number of archeological horizons. Nevertheless, the list includes a number of percentages that represent inbred family lines. This applies especially to the last three groups.

In order to indicate the true significance of the data, we present the series from the Illinois valley according to archeological populations as well as a pooled group in Table 2.

The time element is furthermore indicated by a chronological arrangement of these units—the earliest being at the bottom, the historic Illinois tribal data at the top of the table. The most obvious fact shown

[1] Hrdlicka, Ales. *Ear Exostoses.* Smithsonian Miscellaneous Collections, Vol. 93, No. 6, Publication No. 3296, 100 pp. Washington, D. C., 1935.

in Table 2 is, on the one hand, the absence of ear exostoses in three of the groups, and on the other, the relatively high incidence of the feature among crania from Hopewell mounds. In fact, this bony growth shows a more frequent occurrence among these Hopewellians than in any of the groups listed by Hrdlicka.

Table 3 shows an analysis of the Hopewellian material according to class, racial classification and artificial deformation, and Table 4 gives detailed information about each case. It is of considerable interest that the exostoses occur only in Hopewell skulls from the mounds; they

TABLE 1. Comparative Data on American Indian Series (Hrdlicka, 1935)

Group	Skulls	Skulls with exostoses	Per-cent
Northwest Coast (undeformed)	112	0	....
New England	64	0	....
Karankawa	18	0	....
Eskimo	1000	2	0.2
Vancouver Island (deformed)	260	5	1.9
Old Pueblo	500	12	2.4
California	816	38	4.7
North Dakota	29	2	6.9
Florida	395	35	8.9
Northeastern states	112	13	11.6
Tennessee and Ohio	459	71	15.5
Virginia	65	14	21.5
Louisiana	61	15	24.6
Northwest coast, Chinook	94	24	25.5
Arkansas	173	47	27.2
South Dakota	109	30	27.5
South Dakota, Mowbridge	76	23	30.3
Coahuila	22	7	31.8
Kentucky	90	29	32.2

TABLE 2. New Series from the Illinois Valley

Group	Skulls	Skulls with exostoses	Per cent
Kaskaskias (Iliniwek)	10	0	....
Maples Mills, Woodland	32	3	9.4
Spoon River, Middle Miss.	45	0	....
Hopewell, village graves	8	0	....
Hopewell, mounds	41	14	34.1
Black Sand, Early Woodland	8	0	....
Total: Illinois valley	144	17	11.8

are entirely lacking in individuals from graves along the bluffs which overlook the tumuli in the river bottom. In each of the eight instances the flexed burials from the village sites had typical Hopewellian potsherds in the grave fill. The only conclusion which can be drawn from this high incidence of exostoses is that the burials in the log tombs of the mounds represent a caste—a ruling group or priest class. And this assumption is strengthened by the profuse inclusion of grave goods of high artistic workmanship and the care that must have been lavished in burial arrangements.

When the skulls are classified according to morphological types the data is too meager to allow us to draw any specific conclusion. The exostoses are found in each of the three varieties, and perhaps most

TABLE 3. Incidence of Exostoses in Hopewellian Crania.

	Male present	Male absent	Female present	Female absent
Crania from mounds	11	18	3	9
Crania from graves	0	8	0	0
Otamid variety	2	5	0	3
Lenapid variety	3	16	3	4
Walcolid variety	1	2	0	0
Variety unknown	5	3	0	2
Undeformed crania	3	6	2	6
Deformed crania	6	9	1	2
Unobservable	2	11	0	1
Hopewellian totals	11	26	3	9

TABLE 4. Hopewellian Skulls with Ear Exostoses.

No.	Sex	Age	Variety	Deformation	Amount of Exostoses
A 4771	M	48	Otamid	....	Rt. and Lt. med.
F 60-4	F	47	Lenapid	undeformed	Bilaterial
F 188-11	M	46	Lenapid	....	Trace, bilateral
F 191-3	M	Adult	....	occip. def.	Rt. present, L. none
F 191-4	M	Adult	....	occip. def.	Rt. none, L. present
F 191-5	M	Adult	....	occip. def.	Rt. present, L. none
F 191-7	M	Adult	....	bifronto-occip. def.	Rt. small, L. small
F 191-12	F	45	Lenapid	occip. def.	Rt. small, L. large
F 191-13	M	46	Lenapid	none	Bilateral
Mn 9-2a	M	65	Otamid	undeformed	Bilateral, trace
Mn 9-8a	M	Adult	....	....	Med. size
Mn 9-12	M	40	Walcolid	deformed	Bilateral
P 477-3	M	Adult	Lenapid	deformed	Bilateral
P 478-le	F	65	....	undeformed	Present in one side

frequently in skulls that have been classed as Lenapid (Sylvid or Algonkin type), but it must be kept in mind that this variety also seems to be the most commonly represented one. Another study definitely indicates that the more ancient Otamid variety continued into the Hopewellian period, but the individuals which seem to belong to this type may merely represent a resegregation in a number of morphological characteristics. The Walcolid variety (Centralid or Gulf type), which appears to indicate a late intrusion of a southern group into developed Hopewellian is represented by no more than 8% of the Hopewell population considered here.

A number of writers, who noted that ear exostoses may appear in high frequencies in American Indian crania with artificial deformation, have been inclined to attribute the abnormality to head deformation. Others have denied this, and Hrdlicka (p. 70) has definitely shown that the syndrome of these growths exists independently of cranial deformation, and that there exists many large series of greatly deformed skulls without a trace of exostoses. The data from the Illinois valley crania in Table 3 seems to substantiate this as the exostoses are found in 33% of the undeformed and in 39% of the deformed Hopewell crania. Piercing of the lobes of the ear, their extension, and the wearing of heavy ear ornaments have been thought to act as the exciting causes for the development of bony growths in the canal. We know that the Hopewell people from the Ohio mounds wore ear-spools and it is probable that the Hopewell people of the Illinois valley did the same, but so far no ear spools have been discovered in the tombs. But even if the wearing of ear-spools could be definitely correlated it is unlikely that this practice would be the only causative factor. In this connection it should be noted that European physicians have made the observation that the condition seems to be limited to people belonging to the economically more privileged classes—an observation that tends to point to some environmental causes as exciting factors in individuals in which there exists a predisposition to the formation of this anomaly.

A more likely explanation, which is also held by the writers, is that ear exostoses have an hereditary basis, that is, that there exists a predisposition for this thickening of the upper limits of the tympanic ring in some family-lines and that the high incidence of the exostoses is due to a combination of a highly inbred group with the predisposition and some external factor such as artificial deformation or the wearing of ear-spools.