

# AN ANTHROPOMETRIC CONTRIBUTION TO THE DETERMINATION OF RECONSTRUCTION TIMING FOR HYPOPLASTIC AND APLASTIC AURICLES

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## INTRODUCTION

In congenital hypoplasia are the auricles of generally reduced dimensions, or eventually are substituted with a formation, the upper or lower part of which is reminding of a normal auricle, or at the auricle site is seen only a cutaneo-cartilaginous border, eventually one or more flap-formed formations. Total absence of an auricle is called anotia. It is the surgeon's task to create an auricle of normal shape, as far as possible, and of similar localization and shape as that one on the other side. Auricles of appropriate dimensions, corresponding to the respective age group and proportional to the skull have to be created in cases of bilateral hypoplastic auricles as well as in those of bilateral anotia.

## SUBJECTS AND PROCEDURE

There are differences of opinion concerning the age at which the surgical auricle repair has to be performed. Many authors stand for the opinion that the new auricle has to be created before the child starts going to school (O m b r é d a n n e 1950, P e e r 1955, C o n v e r s e 1958, T a n z e r 1959 and others). The parent's requirements and the possibility of a negative influence of this defect upon the patient's mental development is chiefly taken into consideration by these surgeons. There are other ones who prefer to perform this operation not sooner than after finished puberty, the auricles growing continually until this time according to their opinion (E n g e l m a n n 1947). Would this hypothesis be a correct one, a striking asymmetry of dimensions between the newly formed auricle and the non-affected side would be the unavoidable result in cases in which the auricles would be reconstructed at an age preceding puberty, conformingly to the presumption that a reconstructed auricle is no more enlarging or is growing only at a reduced rate. A series of reparative surgery interventions would be necessary in such cases.

It is the task of the contribution presented here with to demonstrate the auricle dimensions in children of pre-school age, and in the puberty, and to point at the auricle growth rate, beginning with the newborn and continuing till finished puberty age groups. These investigations were initiated with the empirical notion of course that the auricle develop-

ment takes its course preceding that of the facial skull part growth. Therefore the auricles become strikingly large at the age of eight years approximately (F a r k a š, 1959). Thereafter the auricles are enlarging only slightly — according to clinical observations. This opinion is substantiated with Brown's investigations (1951) who found only slight differences in dimensions while comparing auricles of 100 children with those of their parents.

## MATERIALS, METHODS AND RESULTS

Auricles were measured in a normal population of 857 boys and 842 girls beginning with the newborns and continuing till those of 18 years of age which material was divided into 24 age groups composed of 30 to 40 individuals. The investigations were performed in the years 1964 to 1965 at Prague and at Náchod (in the North-East of Bohemia). Besides that several other characteristics were measured: The auricle vertical dimensions [superaurale (sa) — subaurale (sba)], and the horizontal ones [preaurale (pra) — postaurale (pa)].

The collected data are presented with the Table 1 (H a j n i š — D o b i s í k o v á, in print) concerning the auricle height in boys and girls. The respective dimensions are presented at one year's intervals up

TABLE 1  
Average values of the auricle height  
(sa — sba)

Age Group of	Boys		Girls	
	Left	Right	Left	Right
Months 0—9	43,9	44,5	40,8	41,3
1 year	49,7	50,2	46,8	46,8
2 years	48,6	50,1	48,5	48,9
3 years	50,2	51,5	49,5	50,8
4 years	51,6	53,0	50,8	51,4
5 years	53,2	54,5	52,0	52,3
6 years	54,8	55,8	53,1	53,9
7 to 8 years	56,1	56,8	56,5	56,5
9 to 10 years	57,0	58,3	55,5	58,5
11 to 12 years	59,7	60,8	57,7	57,9
13 to 14 years	60,5	60,3	57,0	58,3
15 to 16 years	62,6	63,4	57,8	58,6
17 to 18 years	63,4	63,7	58,7	59,3

to the age of six years, the first group forming an exception while children up to nine months of age are condensed therein. Other premeditated groups were joined together in the above mentioned investigations owing to the fact that determined differences in average values did not exceed 3 mm within a single combined age group.

It is demonstrated with the above mentioned Table that a comparatively equal growth rate was noticed in boys and girls up to their 8<sup>th</sup> to 10<sup>th</sup> years of age, this growth being inferior to the average values in girls. It may be said roughly that the auricles are growing in the vertical dimension at a rate of one centimeter approximately in the time interval between 6 months to 6 years of age. 6 mm thereof are the growth result of a mere half year life span. The age of 8 to 10 years having been attained, the further development in the auricle vertical dimension is different in boys and girls. The auricles continue their growth in boys. This increasing makes 5 mm approximately till the age of 18 years. The growth in vertical dimensions is hardly noticeable in girls. The differences in auricle height between the eleven and eighteen years old girls attain 2 mm at the maximum. It was ascertained at the same time that the left auricles used to be a little smaller than the right ones in children of both sexes. This difference is perseverating until the time at which puberty is over, and most probably is present in adult people as well.

It is to be noticed on the Table 1, too, that the auricle vertical dimensions are larger in eighteen years old boys as compared to those in girls of the same age. A difference of statistical significance is found between the values registered in boys and girls which differences are present in less important degree before puberty as well.

The dimensions presented with this Table are pertaining to the same age groups as those in Table 1. It may be judged according to the Table 2 that the auricles are growing at a slower rate in the horizontal direction since the end of the child's first year of life. The most prominent is the auricle growth in the

horizontal direction in the second half year of his life. The auricle is increasing in this short time interval of 5 mm approximately. In the whole growth course are the boys' auricles always somewhat wider than those of girls. The auricles are growing gradually till the puberty while this increase in horizontal direction in boys is amounting to 3 mm approximately as compared to the dimensions at 6 to 7 years of age. This growth in horizontal direction is very slow in girls preceding their puberty, and shortly before the onset thereof the growth stops in this direction. The differences in the auricle width in the 6 to 7 years old girls and in the older ones are very slight. The differences between the left and right side in horizontal auricular dimensions are insignificant in boys and girls of various age groups as compared to those in vertical direction (see Table 1).

The auricle alterations being less conspicuous in the horizontal direction as compared to the vertical one in the developmental period between the first half year of life and the age of eighteen years, the proportion of the vertical dimension to the horizontal one is changing as well, and the auricle outline too. In the initial post-natal period the auricles appear comparatively lengthened (while their width is comparatively more pronounced in girls than in boys as related to the height thereof). Inquiring into the differences in the average values of the auricle height and width has verified the statistically significant difference in these characteristics between girls and boys, as corresponding to the t-test results.

There are contributions (Schwabe 1897, Imhofer 1906) in which larger auricular dimensions than those present in our oldest groups, are specified in people the age of whom is exceeding eighteen years. The increase of auricular dimensions in the vertical and horizontal direction in older people is not attributed in our experience to results of active growth but to a sign resulting of degenerative alterations in the auricular tissue. It is the cartilaginous base, in the first row, the elasticity of which is decreasing, the auricle becomes levelled next, and more flat and enlarged. May be that a certain degree of elongation of the auricle is induced with the weight action upon the part thereof inferior to the junction with the head (in women with the action of earrings weight).

## DISCUSSION AND CONCLUSIONS

It is demonstrated with the Tables 1 and 2 that the auricle may be considered to have its growth developed satisfactorily at the age of 8 to 10 years approximately, and that in both the sexes. Subsequent enlargement of the auricles till eighteen years of age is so slight that practically the total esthetic impression cannot be impaired after the new auricle reconstruction on one side at the age of 8 to 10 years.

In bilateral aplasia (anotia) the auricle reconstruction may be performed already at 8 years of age approximately. An auricle asymmetry may be corrected before the end of puberty. As demonstrated

TABLE 2  
Average values of the auricle width  
(pra — pa)

Age Group of	Boys		Girls	
	Left	Right	Left	Right
Months 0 to 9	26,2	27,7	24,8	25,0
1 year	31,0	31,9	28,8	29,4
2 years	31,5	32,4	30,2	31,3
3 years	31,9	32,5	31,1	31,5
4 years	30,8	32,4	31,3	31,5
5 years	33,4	33,2	31,9	32,0
6 years	32,9	33,7	32,4	32,7
7 to 8 years	33,3	33,8	32,8	32,9
9 to 10 years	34,8	35,1	32,1	33,0
11 to 12 years	34,6	35,2	33,1	33,3
13 to 14 years	34,6	36,3	33,2	34,3
15 to 16 years	36,7	36,8	32,3	33,9
17 to 18 years	34,6	36,0	31,7	33,2

with our investigations, a small asymmetry may exist even with normal conditions. It is proved in our experience that differences in auricle height and width, not exceeding 5 mm, are not disturbing the impression in practical life, under the condition that the angle of auricle junction with the head is approximately equal on both sides.

#### SUMMARY

An anthropometric study of healthy population of Bohemia was performed, in the course of which (besides other data) was followed-up the auricle development in the vertical and horizontal dimensions thereof in 1699 subjects of both the sexes beginning with the newborns up to eighteen years of age. It was demonstrated that the auricle, at the age of 8 to 10 years, is developed to such a degree that a reconstruction thereof may be performed in cases of unilateral or bilateral aplasia. The numerical data registered for the 8 to 10 years old age groups may serve for planning auricle dimensions in bilateral anotia, these data being presented with the Tables 1 and 2.

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