

# Neonatal and Adult Tongue Dimensions

G. B. HOPKIN, Ph.D., D.D.O.\*

*Edinburgh, Scotland*

The tongue is of major interest to phoneticians, linguists, speech therapists and orthodontists, but as Brosnahan<sup>1</sup> remarks it has been much neglected by comparative anatomists. There is little recorded information about variations in its size, shape and internal structure. The only figures that could be found for the dimensions of the tongue were those of Hopf and Edzard<sup>2</sup> and Kunitomo<sup>4</sup> as quoted by Brosnahan.

## MATERIAL AND METHODS

Thirty-two neonatal tongues (16 male, 16 female) and thirty adult tongues (14 male, 16 female) were measured postmortem. The ages of the neonatal tongues ranged from birth to fifteen days. The ages of the adult specimens varied from twenty-nine to eighty-five years. The adult specimens were measured in the fresh state and the neonatal ones after an interval in ten per cent formalin solution. One neonatal tongue was available for measuring in the fresh state and on remeasuring after three months in formalin showed a shrinkage of approximately seven per cent in all dimensions.

All the neonatal dimensions have therefore been increased by seven per cent for comparison with the adult figures.

Length was measured from the tip of the epiglottis to the apex of the tongue. Breadth was measured at the widest part of the tongue. A measure of the thickness of the tongue was obtained by measuring the thickness of the free edge of the tongue at its widest part. The measurements were made with

sliding calipers to the nearest millimetre. The mean, the standard error of the mean and standard deviation were determined for each dimension.

## RESULTS

The results are given in Table 1 and show that the mean dimensions of the adult tongue are double those of the neonatal. The mean length increases from 39.9 mm to 79.8 mm. Breadth increases from 25.4 mm to 51.9 mm and thickness from 8.7 mm to 16.1 mm.

## DISCUSSION

Kunimoto<sup>4</sup> using the same measuring points found mean lengths of 73.0 mm and 72.0 mm in fifty male and fifty-four female Japanese specimens, respectively. The figures given by Hopf and Edzard<sup>2</sup> related to only 6 negroes and one Japanese. Their measuring points were not defined so that comparisons with their figures are not possible.

Kunimoto did not give the ages of his specimens nor did he say whether they were measured when fresh or after preservation. Kunimoto's mean length of 73.0 mm for males is approximately 91.5% of the mean length of the present adult sample (79.8 mm). If his specimens were preserved and had shrunk as much as the neonatal specimens (i.e., about 7%) they would have had in the fresh state a mean length similar to that of the present adult sample. Kunimoto's means for length showed a sex difference of 1.0 mm. To see if there was a significant sex difference separate means were determined for length for males and females in both the neonatal and the adult

\*From the Orthodontic Department, University of Edinburgh Dental School.

TABLE 1  
MEAN DIMENSIONS IN MM OF NEONATAL AND ADULT TONGUES

	NEONATAL			ADULT				
	N = 32	$\bar{x}$	S.D.	S.E.	N = 30	$\bar{x}$	S.D.	S.E.
Length		39.91	4.25	0.76		79.83	7.57	1.40
Breadth		25.43	2.58	0.46		51.90	4.24	0.78
Thickness		8.76	0.98	0.17		16.13	2.51	0.46

$\bar{x}$  = mean S.D. = standard deviation; S.E. = standard error of mean

TABLE 2  
MALE AND FEMALE MEAN TONGUE LENGTHS IN MMS.

	NEONATAL				ADULT			
	N	$\bar{x}$	S.D.	S.E.	N	$\bar{x}$	S.D.	S.E.
Male	16	41.05	4.26	1.10	14	80.50	9.28	2.57
Female	16	38.77	4.05	1.04	16	79.25	5.96	1.53

$t = 1.50$   
 $t = 0.42$   
Significance level  $t = 2.0$  (5%)

$\bar{x}$  = mean; S.D. = standard deviation; S.E. = standard error of mean

samples. (Table 2) In both groups the means for males were slightly larger than those for females but the differences were not statistically significant. On the present limited evidence it appears that the size of the tongue is independent of the bony structures with which it is associated since a sex difference in bone size is commonly reported. Larger samples might of course show a significant difference between the sexes.

As the standard deviations indicate there was a wide range of tongue length in both the neonatal and adult samples. This varied from 30 to 46 mm in the neonatal and from 68 to 98 mm in the adults. The ranges for breadth were also large, being 20 to 31 mm and 44 to 59 mm respectively.

The significance of these dimensional variations in relation to tongue movement and posture in speech and in relation to the development of occlusion are at the moment conjectural. Hopkin<sup>3</sup> found no relationship between the height of the tongue and the width of the upper arch. The relationship

between the growth of the mandible and the growth of the tongue is at present under investigation.

#### SUMMARY

A comparison of the mean dimensions of thirty-two neonatal and thirty adult tongues (post mortem) suggests that the length, breadth and thickness of the tongue doubles between birth and adulthood.

31 Chambers Street

#### REFERENCES

1. Brosnahan, L. F.: *The Sounds of Language*. W. Heffer and Sons, Cambridge, P. 182, 1961.
2. Hopf, K. and Edzard, D.: Beobachtungen über die Verteilung der Zungenpapillen bei Verschiedenen Menschenrassen. *Zs.f. Morphologie u. Anthropologie* 12:545-557. 1910.
3. Hopkin, G. B.: Tongue level in Angle's Class I, Class II and Class III Malocclusions. *Trans. Europ. Orthodont Soc.* 399-403, 1963.
4. Kunitomo, K.: Über die Zungenpapillen und die Zungengröße der Japaner. *Zs.f. Morphologie u. Anthropologie* 14:339-366, 1912.