

# The arching of the palate in twin foetuses

Marek Pużyński, Hanna Wielgosz-Lesińska, Wiesław Kurlej

Department of Stomatological Anatomy, Medical Academy, Wrocław, Poland

[Received 27 May 2003; Revised 10 October 2003; Accepted 10 October 2003]

*The aim of the study is to examine the process of change with age of hard and total palate arching. Differences were compared in the arching of the hard and total palate in pairs of twins of the same sex and in pairs of twins of opposite sexes aged between 4 and 7 months of foetal life. On the basis of the results obtained it may be stated that: 1. There is some delay in the process of development of twin foetuses in comparison with ones from a single pregnancy; 2. There are no substantial differences between male and female twins and between twins from heterosexual pairs; 3. Much greater differences take place in older twins with regard to the features under examination.*

**Key words:** palate, hard palate, development, twins foetuses

## INTRODUCTION

There is no information in the available literature concerning the features of hard and total palate arching examined here in twins in the foetal period [4, 5, 7]. The aim of the work was to determine the variability in these features in foetuses from single and twin pregnancies so that the results obtained may enable differences between the two groups to be determined.

## MATERIAL AND METHODS

The research was conducted on 72 pairs of twin foetuses (24 of male sex, 24 of female sex and 24 of mixed sex) from 4 to 7 months of age. The results obtained from the research on the twin foetuses were compared to analogous research on 329 foetuses [4, 5] from unifoetal pregnancies (168 of male sex and 161 of female sex). The material analysed comes from spontaneous abortion and shows the normal process of development. The changes in arching of the palate were studied on the basis of the quotient of the total palate length, hard palate length and height, the length of the arch (the outline of the arch being in the sagittal plane) and the height-

length index of the hard and total palate. The dimorphic differences and the process of changes with age were considered in the research. The analysis of the traits within twins was carried out with provision for the intra-pair (twins of mixed and of the same sex) and inter-pair (the comparison of chosen pairs of twins) processes of change.

## RESULTS AND DISCUSSION

The height and the length of the palate in adults vary greatly depending on race and the measuring techniques which are used (measurements are carried out on all kinds of teeth) [3]. What is more, the height and length index of the palate also demonstrates significant racial variables and some individual ones. The very value of this index oscillates from 16 to 64 in adults [1] and, because of constant changes in development, it is difficult to compare this with any parallel index in embryos.

The height of the palate is affected not only by a series of developmental disorders, by genetic make-up and by environmental conditioning [1, 3, 4, 6, 7, 9, 10, 11], but also by a number of non-pathological factors such as the development of the

alveolar process that comes with age (in directly proportional interdependence) and the size of maxillary sinus (in inversely proportional interdependence). The young person's palate is much flatter than that of an adult mainly because of the very formation of the alveolar process. On the basis of pre-natal examination it may be suggested that [4, 5] the rate of palate growth in height is faster than the rate of its growth in length and width. The height — length index tends to increase in the embryonic period from the 4<sup>th</sup> to the 7<sup>th</sup> month. This has been confirmed by our research into twin embryos. No significant dimorphic differences have been found

within the observed differences of the palate arch in twins.

The differences in the selected features between twins of one pair (d) were, according to the variant given by Bergman et al. [2], expressed in relation to the arithmetical mean value of the feature in both twins. The following formula was used:

$$d = (x_1 - x_2) / [(x_1 + x_2) / 2].$$

On the basis of the research conducted, the arching of the hard and total palate was found to change significantly with age during the foetal period, as evidenced by the features and indices analysed (Table 1–3).

**Table 1.** Statistical characteristics of the measured features of the palate in fetuses from single pregnancies (m — male, f — female)

Age (days)	Sex	n	Hard palate length		Hard palate height		Length of palate sagittal arch		Total palate length	
			x	s	x	s	x	s	x	s
98.5	m	24	8.7	1.4	2.3	0.5	14.8	2.8	12.7	2.5
	f	27	8.9	2.1	2.4	0.5	15.3	3.8	13.1	3.4
114.5	m	28	9.7	2.1	2.7	0.6	16.3	2.9	14.3	2.6
	f	24	10.1	1.0	2.7	0.5	17.0	1.6	14.8	1.4
130.5	m	30	12.6	2.2	3.4	0.7	21.2	2.5	18.3	2.3
	f	21	11.9	2.1	3.3	0.8	19.6	3.2	17.0	2.8
146.5	m	32	13.7	1.0	3.7	0.8	22.4	3.2	19.9	2.7
	f	25	13.7	1.2	3.7	0.6	22.7	1.5	19.8	1.4
162.5	m	29	15.6	1.8	4.5	0.9	26.0	2.9	22.3	2.5
	f	38	15.4	1.4	4.5	0.8	25.3	2.1	21.9	1.5
178.5	m	25	17.1	2.1	4.9	0.8	27.8	2.3	24.3	2.0
	f	26	16.8	1.7	4.9	0.9	27.4	2.4	23.8	2.1

**Table 2.** Statistical characteristics of palate indices of fetuses from single pregnancies (m — male, f — female)

Age (days)	Sex	n	Indices					
			Hard palate height/ hard palate length		Hard palate length/ length of palate		Length of palate sagittal arch/total palate length sagittal arch	
			x	s	x	s	x	s
98.5	m	24	27.0	4.2	58.8	5.2	18.6	3.4
	f	27	27.0	3.9	58.2	5.4	18.3	2.8
114.5	m	28	27.8	3.5	55.8	5.3	18.9	3.4
	f	24	25.2	3.7	59.4	5.2	18.2	3.4
130.5	m	30	27.0	4.2	59.4	5.5	18.6	3.1
	f	21	27.7	3.7	60.7	5.4	19.4	3.0
146.5	m	32	27.0	3.6	61.2	5.4	18.6	3.3
	f	25	27.0	3.5	60.4	5.2	18.7	4.0
162.5	m	29	28.9	3.8	60.0	5.2	20.2	3.5
	f	38	29.2	4.4	60.9	5.3	20.6	3.3
178.5	m	25	28.7	4.5	61.3	5.5	20.2	3.1
	f	26	30.3	4.5	60.9	5.4	21.2	3.4

**Table 3.** Indices and differences (d) between individual indices of hard palate height and total palate length in fetuses of twin pregnancies (example)

Age	Palate indices: height of palate/total length of palate											
	Male twins				Female twins				Opposite sex twins			
	n	x age	x m <sub>1</sub>	x m <sub>2</sub>	n	x age	x m <sub>1</sub>	x m <sub>2</sub>	n	x age	x m <sub>1</sub>	x m <sub>2</sub>
91–106	2	96.5	19.1	19.4	3	101.2	17.9	17.9	1	94	18.0	17.3
107–122	3	117.1	18.9	18.7	3	120.3	18.0	18.2	4	120.5	18.5	18.4
123–138	3	126.3	18.6	18.7	1	138.0	18.1	18.2	6	132.2	18.9	18.8
139–154	9	146.4	18.5	18.4	12	145.2	19.0	19.2	8	145.8	19.5	19.6
155–170	5	162.0	20.1	20.2	3	157.3	20.6	20.7	5	164.0	20.5	21.1
171–186	2	180.0	20.7	20.2	2	172.0	21.1	21.2	–	–	–	–
Total	24	141.7	19.1	19.1	24	140.4	19.1	19.2	24	139.8	19.3	19.4
Σd/n	0.15%				0.59%				0.52%			

The process of change in the hard and total palate arching during the foetal period clearly reflects the stages of human phylogenetic development (Table 1, 2) [8]. The total palate arching was found to differ between twins and the fetuses from unifoetal pregnancies [4, 5] during the analogous period of development (Table 2, 3), which can indicate a delay in the progression of the development of twin fetuses compared to the fetuses from unifoetal pregnancies. The shape of the total palate in twin pairs of the same sex and in those of mixed sex does not differ much statistically ( $d = 0.15\text{--}0.59\%$ ).

## REFERENCES

1. Aleksiejew A, Debiec W (1964) Anthropometric characteristics of the hard palate. *Compt Rend Ac Bulg Sci*, 117: 168–174.
2. Bergman P, Sawicki K (1988) Zarys metody bliźniąt. In: Bergman P (ed.). *Bliźnięta wrocławskie I. Materiały i Prace Antropologiczne*, 108: 11–50.
3. Jordanov J (1972) Anatomical and anthropological characteristics of the human hard palate. *Awtoreferat*, Sofia.
4. Kurlej W (1979) Zmienność cech opisowych i pomiarowych podniebienia twardego i miękkiego w rozwoju prenatalnym człowieka. *Akademia Medyczna, Wrocław*.
5. Kurlej W, Boryśławski K (1983) Zmienność cech metrycznych podniebienia twardego i miękkiego. *Materiały i Prace Antropologiczne*, 103: 47–56.
6. Laatkainen T (1999) Etiological aspects on craniofacial morphology in twins with cleft lip and palate. *Eur J Oral Sci*, 107: 102–108.
7. Lavelle CLB, Moore WJ (1970) Proportional growth of the human jaws between the fourth and seventh months of intrauterine life. *Arch Oral Biol*, 15.
8. Martin R (1962) *Lehrbuch der Anthropologie*. G. Fischer, Stuttgart.
9. Moriyama K, Motohashi N, Kitamura A, Kuroda T (1998) Comparison of craniofacial and dentoalveolar morphologies of three Japanese monozygotic twin pairs with cleft lip and/or palate discordancy. *Cleft Palate Craniofac J*, 35: 173–180.
10. Singh GD, Kutcipal E, McNamara JA (2003) Deformations of the midfacial complex in twins with orofacial clefts. *Cleft Palate Craniofac J*, 40: 403–408.
11. Shapiro BL (1969) A twin study of palatal dimensions partitioning genetic and environmental contributions to variability. *Angle Orthod*, 39: 139–151.