

The descriptive traits of the thymus of twin fetuses

Wiesław Kurlej¹, Bohdan Gworys²

¹Department of Stomatological Anatomy, Medical Academy, Wrocław, Poland

²Department of Anatomy, Medical Academy, Wrocław, Poland

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The aim of the study is to establish formulae for the descriptive traits of twins' thymus. The formulae, apart from the fundamental types, also include numerous descriptive traits of the right and left part of the thymus and specify the nature of the joints of the parts. Devising the formulae for the thymus helped to compare pairs of twins of the same and of different sex.

key words: thymus, development, twin fetuses

INTRODUCTION

Progress in the development of each foetus from the pair of twins can vary. This also applies to monozygotic twins. Among other factors, the zygots of twin foetuses, their sex and manner of nesting in the uterine cavity has an influence on diversity in the rate of development of a pair of twins [1–4, 7, 10–12]. The different degrees of advancement in the development of twin foetuses first of all influence differences in their somatometric traits. The variability of the measurement traits of organs in the human foetal period, including that of twins, has been the subject of numerous studies [6, 8, 9]. Research so far conducted into differences in the shape of the thymus does not fully explore the issue and are restricted to formulating the basic types of the thymus [5].

The extent to which these variations in the rate of development of twin foetuses determines differences in their morphological traits (descriptive) remains an open and interesting question. On the basis of previous studies in twin fetuses has been established that the morphology of the individual organs has a unique character. Therefore, in order to compare morphological traits in pairs of twins (depending on sex) the so-called "twin method" has been used, taking into account all the distinctive descriptive traits of the thymus.

MATERIAL AND METHODS

The research was based on 144 twin fetuses (24 pairs of each group of male twins, female twins and of mixed sex) from 4 to 7 months of age. The fetuses were obtained from spontaneous abortion and show a normal process of development. Identical preparatory methods were used in all cases and the thymus was exposed *in situ*. The photographs of the thymus in the frontal plane in a fixed position were performed (Fig. 1).

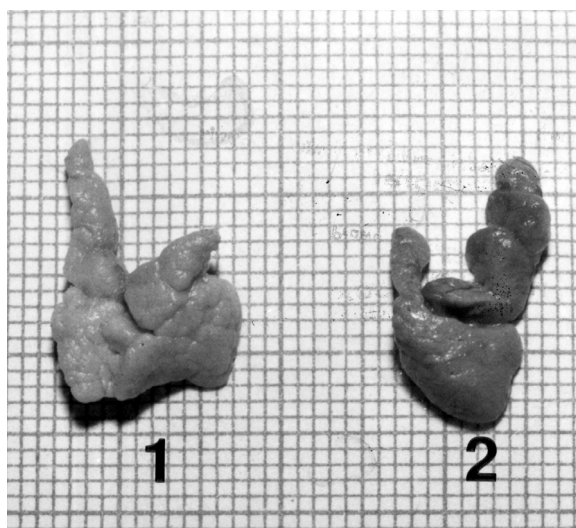


Figure 1. Comparison of descriptive traits of the thymus in a pair of twins (example).

The photographic prints were analyzed by computer. The surface area and the distance between the fixed measurement points of the thymus were measured.

RESULTS AND DISCUSSION

The thymus shape was described on the basis of patterns provided by Bożiłow et al. [5]. I — the thymus with undifferentiated horns and lobes, II — the thymus with slightly distinctive horns and wide lobes at the base, III — clearly distinguished thymus lobes ("enamoured swans"), IV — irregular thymus shapes different from those described above. Halfway types including those with differently shaped right and left parts were also taken into consideration. The varying formations of the thymus horns were examined.

The symmetry of shape and size was taken into account while determining the symmetry of the thymus structure. Both the right and the left parts were classified under the symmetrical category (S). Cases where the right and left parts of the thymus were rated as similarly shaped were also included in this category, regardless of their size and the fact that they are not mirror reflections.

The size of both thymus parts was assessed on the basis of the difference in their surface area.

In the analysis of the joints of both thymus parts the following were taken into account: the joint of the lobes (+), the joint of the lobes and the horns (++) and the joints in which the left thymus lobe overlaps the right thymus lobe (k) or inversely (k*).

The size of the thymus horns in relation to their lobes was assessed on the basis of the calculated surface areas. The horns with a surface area of less than $\frac{1}{4}$ of that of the lobe were defined as "small" (mi), those with a surface area of more than $\frac{1}{4}$ but less than $\frac{1}{2}$ of that of the lobe were defined as "medium" (me) and those with a surface area of more than $\frac{1}{2}$ of that of the relevant lobe were defined as "large" (ma).

The horns that exceeded $\frac{1}{2}$ the length of the relevant lobe were defined as "long" (l) and the horns that exceeded $\frac{1}{2}$ the width of the relevant thymus lobe were defined as "wide". Other horns were defined as "short" (s) and "narrow" (n).

The division of the thymus lobes and horns (most frequently into 2 or 3 parts) was analysed. The divisions were assessed regardless of the degree of mutual joint of the two parts of the thymus. The thymus horns were frequently clearly separated from the lobes (s). In cases of difficulty in establishing the

border between the thymus lobes and the horns, they were categorised separately.

The mutual location of the right and left thymus on a vertical axis was studied in two categories, i.e. when one of the lobes was clearly placed above the other (s) and, inversely, when one of the lobes extended much lower than the other (i).

All the analysed descriptive traits of the thymus were recorded in formulae. For example, the formula: III S Rs mi nl (s) +k+ = Li mi nl (s) r.r. signifies: — the right (R) and left (L) part of the thymus (type III) are symmetrical (S) and have similar surface areas (=);

- the horns of both thymus lobes go divergently upward (r.r.);
- the left and right thymus horns have much smaller surface areas (mi) than the parallel lobes and the horns are narrow (n) and elongated (l) in relation to the relevant thymus lobes;
- the right part of the thymus extends on a vertical axis higher than the left part of the thymus (Rs) and at the same time the left part of the thymus extended on a vertical axis lower than its right part (Li);
- the horns of the thymus are clearly separated from its relevant lobes (s);
- symmetrical thymus parts are joined in the area of the horns and lobes (++), and the nature of the joint is characterised by the fact that the right lobe overlaps the left lobe of the thymus (k).

On the bases of the conducted research, only the types and surface areas of the lobes and horns of the thymus of twin foetuses were found to change significantly with age during the foetal period (Table 1).

The formulae constructed in this way turned out to be unique due to the great diversity of the traits that make up the formulae. For this reason, the comparison of the formulae within the pairs of twins was limited to defining the number of similar traits in the analysed combinations of pairs. 24 traits were compared in each pair of twins i.e.: similarity of the pattern types of the thymus (2 traits), symmetry of the thymus (1 trait), the way of the thymus horns (1 trait), the size of the right and left thymus parts (1 trait), the proportionate area, width and length of the thymus horns and lobes (6 traits), separation of the thymus horns and lobes (2 traits), the joints of the right and left part of the thymus (3 traits), the division and number of the thymus lobes and horns (4 traits) and mutual location of the right and left thymus on a vertical axis (4 traits). The rank of particular traits and their mutual correlation was not

Table 1. Correlation of descriptive features of thymus and age of the fetuses (χ^2 value of the testing function)

Features		χ^2 Male	χ^2 Female	γ	$\chi^2; \alpha = 0.005$
Types		45.4	26.7	9	16.9
Divergence of horn		4.1	7.4	3	7.8
Symmetry of structure		3.8	7.3	3	7.8
Joint of lobes and horns		5.8	5.8	6	12.6
Proportion:	Side				
— surface of lobes and horns	r	14.9	14.8	6	12.6
	l	12.8	13.6	6	12.6
— width of lobes and horns	r	7.0	4.6	3	7.8
	l	3.1	2.8	3	7.8
— length of lobes and horns	r	3.1	0.4	3	7.8
	l	2.9	2.1	3	7.8
Separation of lobes and horns	r	5.6	5.1	3	7.8
	l	7.4	7.1	3	7.8
Mutual location of the right and left thymus on a vertical axis	r	13.0	10.2	9	16.9
	l	11.1	12.9	9	16.9

taken into account while comparing the traits. In cases of inequality in the number of lobes and horns in both foetuses from pairs of twins, the formulae for the thymus were normalised by totalling those for the structures distinguished.

The similarity of the descriptive traits of the thymus (the quotient of the total of the same traits and the total of all the traits) was as follows:

- in the pairs of twins of mixed sex — 0.66;
- in the pairs of twins of male sex — 0.67;
- in the pairs of twins of female sex — 0.68.

Therefore, no significant difference was found in the similarity of the analysed traits in pairs of mixed and single sex. The result obtained shows a slight genetic determination of the thymus development in the human foetal period. The result also reveals a developmental similarity in cases in which similar environmental conditions existed during the period of development analysed.

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