THE THYMIC SHADOW IN INFANTS *

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Reports on this subject have been made in recent medical literature, but the number of systematic investigations have been few, therefore it was thought that a study of the thymic shadow in infants, made at definite periods of their lives, and over a prescribed time, would offer material worthy of report.

For this purpose, a total of 119 new-born infants were examined roentgenologically. The first roentgenogram was made within forty-eight hours after birth; the second, ten days later, and then monthly thereafter, up to the end of the first year of life. Owing to the difficulties which are perfectly apparent, it was not possible to follow up many of these infants after the first month in the manner planned. For various reasons, many failed to return for subsequent examinations and were lost track of entirely. The material at our disposal, however, seems of sufficient interest to warrant this report.

In making the roentgenograms, the following technic was observed: The target-plate distance was 19 inches; spark-gap, 3 inches; milliamperage, 50, and the time of exposure, $\frac{1}{10}$ of a second. Films and double screens were used. Since it is well known (Gerstenberger) that the size of the so-called thymic shadow varies with the respiratory phase, it was attempted to make exposures at the end of full inspiration. Inasmuch as there is considerable discussion in the literature as to what constitutes a thymic shadow, and as to which mediastinal shadows may be due to normal structures alone, it seemed advisable to have some means of checking interpretations. The object of this was to determine two things. First, whether an upper mediastinal shadow, of the type usually interpreted as thymus gland, was obtained in the absence of a thymus, and second, whether the roentgen ray always demonstrates the presence of a thymus gland.

In pursuance of this, a total of fifty-five children were examined with the roentgen ray before postmortem, and the results compared with the actual findings at necropsy. The ages of the subjects ranged from 2 days to 10 years. In some older children, differentiation could be made only with difficulty of that part of the shadow due to the thymus,

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Fig. 1.—Columnar type thymus.

Fig. 2.—Bulbous type thymus.

from that due to other structures, such as glands and blood vessels; and at times this differentiation was impossible.

In thirty-six of the fifty-five postmortem cases, both actual and plate measurements were made for comparison. In twenty-one of the thirty-six cases, the difference lay between 0.5 cm. either way. In seven cases the difference lay between 0.5 and 1 cm., and in eight of the thirty-six it was more than 1 cm. For nonteleoroentgenograms, this was no great discrepancy. In two instances of the original fifty-five cases, there was no suggestion of thymic shadow, yet at the necropsy this condition was found, but in both these cases, the thymus overlay the heart, and was pedicle in type.

The thymic shadows found may be classified into three general types: (1) Columnar; (2) bulbous, and (3) pedicle, all of which are illustrated in the roentgenograms. The pedicled type is eliminated from work on the living, for it is one of difficult differentiation from heart shadow, into which it merges, and can, therefore, be discovered only at necropsy.

For work with the original 119 infants, the findings were divided into three classes:

CLASS 1. *Absent Thymic Shadow*.—This means no shadow apparent in the upper mediastinum, beyond the vertebral transverse processes.

CLASS 2. *A Small Thymic Shadow*.—This was found beyond the vertebral transverse processes, and measured less than 3 cm.

CLASS 3. *A Large Thymic Shadow*.—This shadow measured more than 3 cm. transversely.

This classification was applied at birth, and used throughout investigation. These are absolute terms, used as a working basis. A small thymus may yet be a large one in a chest with small transverse measurements, and conversely, a large thymic shadow may seem small in a large chest. This distinction is important when the question of treatment arises because of size alone.

RESULTS OF EXAMINATIONS

First examination (within forty-eight hours after birth):

Class 1—Absent thymic shadow, 35 cases

Class 2—Small thymic shadow, 34 cases

Class 3—Large thymic shadow, 50 cases

Therefore, at birth, approximately 42 per cent. of the children examined showed thymic shadows measuring more than 3 cm.; that is, shadows which we would read as thymus enlargement and regard as pathologic.

Fig. 3.—Pedicle type thymus.

Fig. 4.—Class 1. Absent thymic shadow.

At the end of the first month of life, seventy-three of the original group of 119 children reported for reexamination. Of these, thirty-three were in Class 1; twenty-four in Class 2. Three of these Class 2 glands had definitely decreased in size. Sixteen were in Class 3. One of these glands had decreased in size.

Of a total of forty cases showing thymic shadow, small and large, four had undergone retrogression to smaller dimensions within the period of one month. This was a spontaneous change, for the single roentgen-ray exposure could be eliminated as a causative factor. Of forty-six children, the findings were:

END OF SECOND MONTH OF LIFE:

- Class 1—15 cases
- Class 2— 6 cases (one had grown smaller)
- Class 3—25 cases (no decrease in size)

THIRD MONTH OF LIFE, 39 CHILDREN:

- Class 1—13 cases
- Class 2— 4 cases (no decrease in size)
- Class 3—22 cases (no decrease in size)

FOURTH MONTH OF LIFE, 38 CHILDREN:

- Class 1—13 cases
- Class 2— 4 cases (no decrease in size)
- Class 3—21 cases (two had decreased in size)

FIFTH MONTH OF LIFE, 31 CHILDREN:

- Class 1— 8 cases
- Class 2— 4 cases (no decrease in size)
- Class 3—19 cases (no decrease in size)

SIXTH MONTH OF LIFE, 30 CHILDREN:

- Class 1— 8 cases
- Class 2— 4 cases (in one the thymus was confused by glands)
- Class 3—18 cases (no decrease in size)

SEVENTH MONTH OF LIFE, 28 CHILDREN:

- Class 1— 8 cases
- Class 2— 2 cases (no decrease in size)
- Class 3—18 cases (no decrease in size)

EIGHTH MONTH OF LIFE, 25 CHILDREN:

- Class 1— 7 cases
- Class 2— 2 cases (no decrease in size)
- Class 3—16 cases (one had decreased in size)

NINTH MONTH OF LIFE, 22 CHILDREN:

- Class 1— 6 cases
- Class 2— 2 cases
- Class 3—14 cases (no decrease in size)

TENTH MONTH OF LIFE, 17 CHILDREN:

- Class 1— 5 cases
- Class 2— 2 cases (no decrease in size)
- Class 3—10 cases (one had decreased in size)

Fig. 5.—Class 2. Small thymic shadow.

Fig. 6.—Class 3. Large thymic shadow.

ELEVENTH MONTH OF LIFE, 11 CHILDREN:

Class 1—4 cases

Class 2—2 cases (one had decreased in size)

Class 3—5 cases (one was confused with gland shadow)

TWELFTH MONTH OF LIFE, 6 CHILDREN:

Class 1—1 case

Class 2—1 case

Class 3—4 cases (one had decreased in size, and one assumed the shape of the pedicled type)

Some of the Class 1 cases were not reexamined after two successive examinations had shown no change. There were two known deaths in the original group of 119. The first was that of an infant assigned to Class 1, and the second of an infant in Class 3. At necropsy the findings confirmed the classification in both instances. The thymus of the second infant weighed 13 gm.

DISCUSSION

The striking revelation in this study was the fact that in a group of average "normal" infants at birth, 42 per cent. showed the presence of a shadow suggesting a thymus measuring more than 3 cm., and this without gross symptoms. As the work progressed, retrogression in size of the shadow took place, the greatest change within the first few months, a steady change as the year went by, so that with our limited material spontaneous disappearance of this shadow took place in the majority of cases. Some, however, persisted to the second year.

As a rule, the children with large thymic shadows were well nourished, some were large chested, with thick and short neck, and without physical stigmata. The general impression was, that the larger thymic shadows were present in the thick and short necked infants.

CONCLUSIONS

1. Thymic shadows can easily be determined in the new-born and in infancy.
2. Transversely, enlarged shadows are present in a strikingly high percentage of new-borns.
3. This shadow may be present without symptoms or physical stigmata.
4. There is a definite tendency for a spontaneous retrogression of this structure during the first year, but some glands persist beyond this period.
5. There is a type of thymic shadow cast by a pedicle-shaped organ, the mass of which lies on the heart, from which it cannot be differentiated.

6. In the later months of infancy, the presence of large paratracheal glands and prominent blood vessels presents some difficulty in differential diagnosis, but differentiation is possible.

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