INTRATHYMIC PARATHYROID TISSUE IN MAN: 
CLINICAL SIGNIFICANCE AND REPORT OF A CASE 
OF INTRATHYMIC PARATHYROID ADENOMA

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Very little attention has been paid in the past to the intrathymic parathyroid tissue in man.

Accessory parathyroid within thymic tissue has already been reported in such mammals as monkeys (Forsyth), sheep (Mayer), dogs (Marine), rabbits (Haberfeld et al), cats (Farner et al), and rats (Van Dyke, Togofuku) as well as in reptiles (Dustin et al). Only a small number of cases have been reported in humans by Erdheim, Dupéric, Brewer, Gunn et al, Tsuchiya et al, Kurtay et al, and Kirschner et al.

The authors devised a procedure to extirpate the thymic tissue via a suprasternal notch in order to study the significance of the thymus in such "autoimmune diseases" as Hashimoto's thyroiditis, myasthenia gravis, SLE and autoimmune hemolytic anemia. Following this procedure thymectomy has been performed on 113 cases and the intrathymic parathyroid tissues within the thoracic thymus has been encountered in 18 cases (15.9%).

The authors wish to emphasize that the incidence of the parathyroid tissue within the thymus is higher than what has appeared in the literature and to report a very rare case of hyperparathyroidism due to an intrathymic parathyroid adenoma.

CASE REPORTS

Cases of intrathymic parathyroid tissue experienced at the Keio University Hospital and the pertinent laboratory data of these cases before and after
Table 1
Alteration of laboratory findings before and after the thymectomy

<table>
<thead>
<tr>
<th>Patient (Sex)</th>
<th>Age</th>
<th>Before</th>
<th></th>
<th></th>
<th></th>
<th>After</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>T.P.</td>
<td>Ca</td>
<td>P</td>
<td>A.P.</td>
<td>%TRP</td>
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<tr>
<td></td>
<td></td>
<td>g/dl mEq/L mEq/L U</td>
<td></td>
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<td>g/dl mEq/L mEq/L U</td>
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<tr>
<td>(♂) 17</td>
<td>17</td>
<td>7.6</td>
<td>5.0</td>
<td>2.5</td>
<td>5.2</td>
<td>%</td>
</tr>
<tr>
<td>(♀) 21</td>
<td>21</td>
<td>8.3</td>
<td>5.2</td>
<td>3.1</td>
<td>3.1</td>
<td>%</td>
</tr>
<tr>
<td>(♂) 22</td>
<td>22</td>
<td>7.1</td>
<td>5.2</td>
<td>1.1</td>
<td>24.8</td>
<td>71</td>
</tr>
<tr>
<td>(♂) 24</td>
<td>24</td>
<td>6.8</td>
<td>5.2</td>
<td>2.0</td>
<td>3.5</td>
<td>%</td>
</tr>
<tr>
<td>(♂) 25</td>
<td>25</td>
<td>7.8</td>
<td>5.4</td>
<td>2.2</td>
<td>12.1</td>
<td>82</td>
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<tr>
<td>(♂) 36</td>
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<td>7.0</td>
<td>4.9</td>
<td>2.6</td>
<td>81</td>
<td>%</td>
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<tr>
<td>(♀) 38</td>
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<td>7.7</td>
<td>4.1</td>
<td>2.3</td>
<td>8.3</td>
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<tr>
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<td>38</td>
<td>6.7</td>
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<td>2.0</td>
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<td>(♂) 40</td>
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<td>6.8</td>
<td>4.6</td>
<td>2.2</td>
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<td>4.7</td>
<td>2.3</td>
<td>6.4</td>
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<tr>
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<td>66</td>
<td>7.6</td>
<td>4.5</td>
<td>1.8</td>
<td>9.7</td>
<td>%</td>
</tr>
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<td>2.5</td>
<td>79</td>
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<tr>
<td>(♀) 67</td>
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<td>5.2</td>
<td>1.9</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>(♂) 16</td>
<td>16</td>
<td>7.2</td>
<td>5.2</td>
<td>2.4</td>
<td>8.2</td>
<td>92</td>
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<tr>
<td>(♀) 28</td>
<td>28</td>
<td>7.0</td>
<td>5.1</td>
<td>2.4</td>
<td>4.1</td>
<td>98</td>
</tr>
<tr>
<td>(♂) 24</td>
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<td>7.4</td>
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<td>5.7</td>
<td>91</td>
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<tr>
<td>(♀) 52</td>
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<td>7.6</td>
<td>5.1</td>
<td>2.9</td>
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<td>77</td>
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<tr>
<td>(♀) 55</td>
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<td>8.8</td>
<td>5.0</td>
<td>2.5</td>
<td>22.7</td>
<td>97</td>
</tr>
</tbody>
</table>

T.P. = Total Protein
Ca = Serum Calcium
P = Serum Phosphate
A.P. = Alkaline Phosphatase (K.K. unit)
%TRP = % Total Protein

Thymectomy are summarized in Table 1.

The case of an intrathymic parathyroid adenoma is presented in some detail and only brief summaries of the other are given.

Case 1: A 22-year-old Japanese male suffering from atrial septal defect was admitted to Keio University Hospital in June, 1964. His chief complaint was difficulty in walking. Three years before, he began to feel a lumbar pain while riding a motor bike.

Physical examination on admission revealed a somewhat emaciated young male in passive supine position. The blood pressure was 120/80. Neither band keratopathy nor brown tumor was found. The thorax was asymmetric, depressed in the right and slightly bulging in the sternal and precordial region. No tenderness was noted on the sternum and along the intercostal nerves. Marked pulsation was found in the precordium. The cardiac dullness extended 2 fingerbreadths beyond the right edge of the sternum and to the left anterior axillary line. Al-
intrathymic parathyroid tissue

though no thrill was felt, grade 2 ejection type systolic murmurs were noted both at the apex and Erb’s point. There was a marked accentuation without split. Lungs were clear to percussion. No rales were audible. The abdomen was not remarkable. No pitting edema was found. Marked muscle atrophy was noted in both legs without fasciculation or sensory disturbances. Deep tendon reflexes were accentuated without laterality. There was no clonus or pathologic reflex. Chvostek’s and Trousseau’s signs were not present.

Laboratory findings: The red blood cell count was $560 \times 10^4$, haemoglobin 1.2 g/dl, haematocrit 50%, reticulocytes 1%, thrombocytes $10 \times 10^4$ and white cells count 3000. The protein was 7.1 g/dl, albumin 4.5 g/dl, $\alpha$-glob. 0.5 g/dl, $\beta$-glob. 0.5 g/dl and $\gamma$-glob. 1.5 g/dl. Liver function tests were within normal limits except for elevated alkaline phosphatase level (14.0 K.K. units). Blood chemical analysis revealed hypophosphatemia (0.88 mEq/L); but the calcium level was within normal range. There was no elevation of NPN nor creatinine. Urinary output of calcium and phosphate were 0.094 g/day and 0.924 g/day, respectively. The urine volume was between 1000–2000 ml/day, with an acid reaction and a specific gravity of 1.012–1.024.

X-ray findings: X-ray examination of the chest revealed cardiac enlargement and the typical syndrome of “grosse pulmonaire, petite aorte.” Bone survey revealed atrophic and coarse changes in almost all bones, especially in the pelvic vertebra, the femur and the humerus. There were scars of a pathologic fracture in the left rib, and fibrocystic changes in both humeruses and the left femur. Pneumomediastinography revealed a large shadow of the thymus (Photo 1). Intravenous pyelogram demonstrated no calculus.

Parathyroid function tests: There was a little rise in the serum phosphate six hours after an intravenous injection of calcium, although the alteration of the phosphate excretion in the urine was within normal limits. %TRP was 71% and TRPT 0.84, both being markedly low as in primary hyperparathyroidism.

Kidney function: GFR was 73 ml/min in Dec., 1964 and 62 ml/min in Feb., 1965. PSP, however, was 60% in 60 min. and Fishberg concentration test was normal.

Parathyroidectomy: Exploratory operation was performed following the method mentioned above on May 5, 1965. A transverse linear incision was made under general anaesthesia in the suprasternal notch. Examination of the parathyroid at the thyroid region was done at first, but neither parathyroid adenoma nor hyperplasia was noted in frozen sections. Accordingly, thymectomy was performed, because of the presence of enlarged thymic shadow demonstrated with
Pneumomediastinography suggesting the possibility of an intrathymic parathyroid adenoma. Two masses of parathyroid tissue measuring $3.5 \times 2.5 \times 2.5$ mm ($P_1$) and $2.2 \times 1.5 \times 1.5$ mm ($P_2$) in size, respectively, were found within the right lobe of the thymus, as shown in Fig. 1. These pieces of parathyroid tissue were well circumscribed and partially encapsulated by fibrous tissue (Photo 2). Histologically, the parathyroid tissue designated as $P_1$ in Fig. 1 was composed mainly of normal-sized fairly uniform chief cells placed compactly with absence of fat.

![Fig. 1. A: Follicular adenoma of thyroid
$P_1$: Parathyroid adenoma
$P_2$: Hyperplastic parathyroid](image)

High magnification revealed cuboidal cells in acinus-like clusters and vacuolated clear cells. Some of them were larger and binucleated. Occasionally larger nuclei were encountered. The cell outlines were not too distinct. No mitotic figures were observed. Histological features were compatible with those of parathyroid adenoma (Photo 3). The other parathyroid tissue ($P_2$) showed some evidence of hyperplasia with compact cells and scanty fat cells.

Lymph follicles with germinal center were noted in the extirpated thymic tissue as seen in many of the “autoimmune diseases” already reported by the authors.

Postoperative course: Following the extirpation of the thymic tissue including parathyroid adenoma, signs and symptoms of hyperparathyroidism, such as
lumbago and impaired walking, disappeared and laboratory data became normal as shown in Fig. 2; namely, low serum phosphorus level was improved promptly but it took over 3 months for a drop in the alkaline phosphatase level.

**Case 2:** A 17-year-old Japanese female with myasthenia gravis and Hashimoto’s thyroiditis. The intrathymic parathyroid tissue was that of a normal variety (Photo 4, 5). Two intrathymic parathyroids, measuring 2.3×1.5mm and 3.5×2.5mm in size, were noted.

**Case 3:** A 21-year-old Japanese female with systemic lupus erythematosus. Parathyroid tissue encapsulated with thin fibrous tissue was found within the thoracic thymus inside the thymic capsule. It was 1.0×5.0mm in size. Histologically this was a variety of normal parathyroid tissue although fat was relatively scanty. It was composed of chief cells with clear and/or dark cytoplasm, the former predominating. No oxyphilic cells were observed (Photo 6 and 7).

**Case 4:** A 28-year-old Japanese male with Gargoylism associated with hyperimmunoglobulinemia. Well demarcated parathyroid tissue fairly densely packed with mainly dark cells was observed within involuted thymic tissue. The parathyroid tissue was 3.0×2.5mm in size (Photo 8).

**Case 5:** A 38-year-old Japanese female with idiopathic myxedema. Parathyroid tissue was also found within the thoracic thymus. It was composed
mainly of oxyphilic cells in contrast to the previous 3 cases of adolescent or younger patients. Another characteristic of this case was the absence of a capsular substance which was observed in the rest of the cases (Photo 9).

**Case 6**: a 67-year-old Japanese female with adenomatous goiter. The intrathyrmic parathyroid tissue showed relatively abundant fat, aggregates of oxyphilic cells mainly in the peripheral portion and clear cells as well as dark cells in equal ratio in the central portion (Photo 10 and 11). This parathyroid tissue measured $3.9 \times 2.1$ mm in size.

The other cases were as follows, a 24-year-old Japanese male with seminoma, a 36-year-old Japanese female with myasthenia gravis, a 38-year-old Japanese female with rheumatoid arthritis associated with a focal lymphoid thyroiditis, a 40-year-old Japanese male with idiopathic myxedema, a 50-year-old Japanese female with myasthenia gravis, a 66-year-old Japanese female with myasthenia gravis, a 66-year-old Japanese female with aortitis syndrom, a 50-year-old Japanese female with Hashimoto's disease, a 55-year-old Japanese female with thymic hypertrophy and chronic hepatitis, a 23-year-old Korean girl with myasthenia gravis, a 16-year-old Japanese girl with myasthenia gravis and a 24-year-old Japanese male with Behçet's disease. These cases all revealed a parathyroid tissue with a thin fibrous capsule inside the capsule of the thoracic thymus. Histological findings of these cases demonstrated a normal variety corresponding to their age.

**COMMENT**

The parathyroid glands originate in the common branchial pouches with the thymus and thyroid glands embryologically. The lower parathyroid glands develop from the third branchial pouches along with the thymus and thyroid. The fact that the parathyroid tissue develops from the third branchial pouch would lead to some possibilities of coexistence with the thymus as already mentioned by Cope. However, this is a matter of much debate.

Although the coexistence of parathyroid with thymic tissue has occasionally been reported in children, the reported cases in the adult are very rare. The authors could find out only 2 adult cases of intrathyrmic parathyroid tissue which were reported by Brewer. The authors have already noted a relatively high incidence of intrathyrmic parathyroid tissue even in adults, and reported 9 such findings in 33 thymectomized cases in 1967.

Recently, Kurtay and his co-workers reported 13 cases of the ectopic parathyroids in or adjacent to the thymus in 48 extirpated thymuses, and Kirschner also
noted 3 cases out of 21 investigated. The authors have found 18 cases of intra-thymic parathyroids in 113 thymectomized cases up to date. No remarkable functional changes, as indicated by serum calcium, phosphorus, alkaline phosphatase and %TRP, were noted before and after thymectomy in cases with intrathymic parathyroids except for one, of the intrathymic parathyroid adenoma that showed a marked clinical improvement after thymectomy. The possibility of the presence of the functioning parathyroid tumor even within the thymus must be born in mind in medical practice.

In fact, cases of intrathymic parathyroid adenoma are very rare. Mimpriss reported at first a case of intrathymic adenoma in 1934. Since then, 6 other cases have been described; namely, 3 cases by Cope, one case by Hellström, one case by Fontaine et al and one case by Kinnaird et al. The authors' cases would be the 8th report of intrathymic parathyroid adenoma resulting in hyperparathyroidism.

As mentioned in the present paper, intrathymic parathyroid tissue is not uncommon. If, in case of hyperparathyroidism, parathyroid adenoma or hyperplasia is not found anywhere, intrathymic parathyroid tissue should be suspected.

**SUMMARY**

The presence of parathyroid tissue within the thoracic thymus is not rare even in human beings. The authors have encountered such a finding in 18 out of 113 (15.9%) thymectomized adult cases via supra clavicular notch by Yoshimatsu's method. The intrathymic parathyroid tissue is well defined and encapsulated in most cases. However, on occasions, it is poorly defined or scattered and intermingled with thymic tissue thus being difficult to recognize. If, in case of hyperparathyroidism, parathyroid adenoma or hyperplasia is not found anywhere, intrathymic parathyroid tissue should be suspected. The authors experienced one such rare case, which is reported in the present paper.

**REFERENCES**


EXPLANATION OF PLATES

Photo 1. Pneumomediastinostratigram showing a prominent thymic shadow (arrow).

Photo 2. Case 1: Intrathymic parathyroid adenoma (P1), almost no fat cells. H. & E. stain.


Photo 4. Case 2: Parathyroid tissue (arrow) within involuted thymic tissue. H. & E. stain.
Photo 6. Case 3: Parathyroid tissue (arrow) within involuted thymic tissue. H. & E. stain.
Photo 9. Case 5: Parathyroid tissue without demarcation. It is composed mainly of oxyphil cells. H. & E. stain.