GYNECOMASTIA IN PARAPLEGIC MALES

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GYNECOMASTIA in young adult males rendered paraplegic by trauma to the spinal cord has been reported by Cooper and Hoen,2 who found an incidence of 22 per cent in a small series of cases. The occurrence of mammary hypertrophy in paraplegic patients has also been noted by Bors,1 Moehlig3 and Freeman.4 The pathogenesis of enlargement of the male breast following injury of the spinal cord has not been elucidated. In order to gain further insight into this syndrome a series of 16 consecutive male paraplegic patients has been investigated. Fifteen of these patients had been rendered paraplegic by trauma to the spinal cord; the remaining patient was completely paraplegic following subtotal spinal cordectomy for an extensive intramedullary glioma.5 Of these 16 patients, 4 demonstrated bilateral mammary enlargement at some time during the period between time of trauma and time of observation. In 2 additional cases pain and tenderness of the breasts, but no enlargement, developed.

This investigation has been concerned with hormone excretion and other metabolic variations in those paraplegic subjects demonstrating gynecomastia. The 4 cases in which gynecomastia developed are herein briefly reported.

REPORT OF CASES

Case 1. A man, aged 28 years, was rendered paraplegic below the 9th thoracic segment following trauma to the spinal cord incurred in an automobile accident. Bilateral enlargement of the breasts appeared 11 months after injury and gradually lessened during the ensuing 4 months. Hormone determinations during the period when the gynecomastia was regressing revealed the urinary excretion of the 17-ketosteroids to be reduced to 2.2 mg. in 24 hours (normal value 6 to 20.8 mg.) and the urinary corticosteroid excretion to be 0.30 mg. in 24 hours (normal value 0.91 to 1.16 mg.). Neither prolan nor estrogens could be demonstrated in the urine. The BMR was −21 per cent and the serum protein was 6.0 gm. per 100 cc. with an albumin-globulin ratio of 1:1. The testicles measured 4 by 2 cm. (normal measurement 4 to 5 cm. by 2.5 to 3 cm.).

Case 2. A man, aged 44 years, experienced an injury of the spinal cord and consequent paraplegia below the 6th thoracic segment when a vehicle in which he was riding overturned on Sept. 1, 1948. In January, 1949, bilaterally enlarged painful, tender breasts developed. The mammary enlargement and discomfort regressed

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in 1 month. The urinary excretion of 17-ketosteroids was 1.5 mg. in 24 hours; that of corticosteroids was 0.40 mg. Prolan could not be demonstrated in the urine. There were 16 rat units of urinary estrogens in 24 hours (normal value 5 to 25 rat units daily). The serum protein was persistently recorded between 4.5 and 5.1 gm. per cent with an albumin-globulin ratio of 0.6:1 to 1.0:1. The testicles measured 3.5 by 2 cm.

Case 3. A male, aged 17 years, experienced a transection of the spinal cord at the 5th cervical segment when he struck his head while diving into shallow water. Twelve months after injury painless enlargement of both breasts developed but this disappeared in 3 to 4 weeks. Daily urinary excretion of 17-ketosteroids was 5.0 mg. while that of corticosteroids was 0.40 mg. Neither prolan nor estrogens could be demonstrated in the urine. Serum protein concentration was 6.0 gm. per 100 cc. with an albumin-globulin ratio of 1:1. The testicles measured 3.5 by 2.5 cm.

Case 4. A man, aged 27 years, underwent thoracic, lumbar and sacral spinal cordectomy because of the cephalad progression of an intramedullary glioma. Three months after the surgical procedure bilateral gynecomastia was noted (Fig. 1). Hormone determination revealed the excretion of urinary 17-ketosteroids to be 1.9 mg. in 24 hours and that of corticosteroids to be 0.32 mg. Neither prolan nor estrogens could be recovered from the urine. The serum protein totaled 5.8 gm. with an albumin-globulin ratio of 1:1. The BMR was −22 per cent. The testicles measured 4 by 2.5 cm. This patient died from multiple intracranial gliomas. Postmortem examination revealed gynecomastia and atrophy of the testicular tubules with aspermatogenesis as well as atrophy of the pituitary gland, adrenal cortices and prostate. The metabolic variations in this patient following spinal cordectomy are reported in detail elsewhere.

**Fig. 1. Mammary enlargement present in a man, aged 37 years, 3 months after subtotal spinal cordectomy.**

**COMMENT**

The incidence of gynecomastia in 16 consecutive cases of hospitalized paraplegic patients was 25 per cent. Examination of these patients revealed each to have abnormally low urinary excretion of the 17-ketosteroids with the excretion of corticosteroids in the low normal range. Hypoproteinemia with reversal of the albumin-globulin ratio was present in each case. The basal metabolic rate was obtained for 2 of the 4 patients and was −21 and −22 per cent in these patients. Testicular atrophy was grossly or microscopically evident in each case. The significant findings are summarized in Table 1.
Speculation regarding the pathogenesis of gynecomastia in traumatic paraplegic patients has been considered elsewhere\(^2,3\) and will not be repeated here. Decreased excretion of the 17-ketosteroids, hypoproteinemia and lowered basal metabolic rate have been observed in traumatic paraplegic patients without gynecomastia, and the degree of abnormal variation of these

<table>
<thead>
<tr>
<th>Time of appearance of gynecomastia, months after injury</th>
<th>Case</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinary 17-ketosteroids, mg. in 24 hours (normal value 6-20.8 mg.)</td>
<td>11</td>
<td>5</td>
<td>12</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Urinary corticosteroids, mg. in 24 hours (normal value 0.21-1.16 mg.)</td>
<td>2.2</td>
<td>1.5</td>
<td>5.0</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td>Basal metabolic rate, per cent</td>
<td>0.30</td>
<td>0.40</td>
<td>0.40</td>
<td>0.22</td>
<td></td>
</tr>
<tr>
<td>Urinary prolactin</td>
<td>Negative for normal amounts</td>
<td>Not obtained</td>
<td>Negative for normal amounts</td>
<td>Negative for normal amounts</td>
<td>Negative for normal amounts</td>
</tr>
<tr>
<td>Urinary estrogens</td>
<td>Negative for normal amounts</td>
<td>16 rat units in 24 hours</td>
<td>Negative for normal amounts</td>
<td>Microscopically evident</td>
<td></td>
</tr>
<tr>
<td>Testicular atrophy</td>
<td>Grossly evident</td>
<td>Grossly evident</td>
<td>Grossly evident</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serum protein level, gm. per 100 cc.</td>
<td>6.0</td>
<td>4.5-5.1</td>
<td>6.0</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td>Albumin-globulin ratio</td>
<td>1.0:1</td>
<td>0.6-1.0:1</td>
<td>1.0:1</td>
<td>1.0:1</td>
<td></td>
</tr>
</tbody>
</table>

findings usually appears directly proportional to the severity of injury of the spinal cord.

**SUMMARY**

Gynecomastia has been observed in 4 young men after severe trauma to the spinal cord. In each instance there was decreased urinary excretion of the 17-ketosteroids and hypoproteinemia. Each of these men presented some degree of testicular atrophy. The basal metabolic rate was obtained in 2 of these cases and was significantly decreased in each instance. The observed gynecomastia, decreased excretion of the 17-ketosteroids, lowered basal metabolic rate, testicular atrophy and hypoproteinemia are considered to be sequelae of injury to the spinal cord.
REFERENCES

1. Boes, E. Personal communication to the authors.
6. Moehlig, R. G. Personal communication to the authors.