SOLITARY PLASMACYTOMA OF THE SPINE

From the Royal Cancer Hospital, London

The rarity of solitary plasmocytoma of bone justifies publication of this case of a solitary plasmocytoma of the spine. The opportunity is taken to review authentic cases of the disease in the literature.

CASE REPORT

A male aged fifty-six years, tent erector, was admitted to the Royal Cancer Hospital on October 15, 1947, with paraplegia.

Clinical history—On September 1, 1947, he was lifting a heavy weight and felt something give in his back. One and a half hours later he suffered abdominal pain. On September 10, 1947, he was admitted to another hospital on account of girdle pains. He noticed that his toes were numb, and later they became paralysed. The paralysis extended upwards as far as the level of the umbilicus.

Clinical examination—The general condition was good. No gross abnormality was detected in the heart and lungs. Apart from the paralysis, the abdomen was normal. Girdle pain and hyperaesthesia were present along the distribution of the sixth dorsal segment. Below this level there was paraplegia and anaesthesia. There was incontinence of urine.

Investigations—Radiographic examination of bones (Figs. 1 and 2)—Spine—Forward subluxation of the sixth dorsal vertebra with incomplete destruction of two bodies—appearances suggestive of a secondary deposit from a tumour. The rest of the spine showed no abnormality. Radiographs of the skull,
pelvis, femora and humeri showed normal appearances. Urine—Trace of albumin; moderate number of pus cells with B. coli and B. proteus. Blood—Red blood cells, 4,320,000 per c.mm. Haemoglobin, 84 per cent. White blood cells, 18,000 per c.mm. Differential leucocyte count—Polymorphs, 75 per cent.; lymphocytes, 20 per cent.; monocytes, 4 per cent.; eosinophils, 1 per cent.; basophils, 0 per cent. Plasma chlorides—341 mgm. per 100 c.c. as chlorine, or 562-7 mgm. per cent. as sodium chloride. Plasma proteins—6-75 gm. per 100 c.c.; albumin, 4-4 gm. per 100 c.c.; globulins, 1-95 gm. per 100 c.c.; fibrinogen, 0-4 gm. per 100 c.c. Blood urea—42 mgm. per cent. Serum phosphatase—Acid phosphatase, 1-5 units per 100 c.c.; alkaline phosphatase, 6 units per 100 c.c. Sternal marrow—Smears showed a normal histological picture; no evidence of a deposit of myeloma. Erythrocyte sedimentation rate—21 mm. in one hour (Wintrobe).

Operation—October 23, 1947. Laminectomy was performed with removal of the laminae of the sixth, seventh and eighth dorsal vertebrae. A soft, friable, vascular neoplasm was found eroding the laminae and extending into the erector spine muscles. The neoplasm surrounded the dura mater but did not involve its posterior aspect. The spinal cord was seen to pulsate. Part of the neoplasm was removed for microscopical study and the wound was closed. A plaster support was applied to the spine. Microscopic examination of tissue removed—The tissue consisted of compact masses of characteristic plasma cells which gave a clearly defined and typical reaction with Unna-Pappenheim methyl green pyronin. The tumour was a plasmacytoma.

Subsequent history—The general health continued to be satisfactory for several months. The urinary bladder was drained continuously with an indwelling urethral catheter until reflex micturition was established six weeks after operation. There was complete anaesthesia with paraplegia below the level of the seventh and eighth dorsal vertebrae, and five weeks after operation increasing involuntary movements developed in the legs. These were partly controlled by luminal and codeine. The patient also complained of severe girdle pains. In March 1948 his general health deteriorated and he died on April 10, 1948.
**Necropsy**—l'istera—The brain, meninges, tongue, tonsils, nasal cavities, pharynx, larynx, trachea, thyroid, heart, oesophagus, stomach, intestines, liver, pancreas, spleen, adrenals, kidneys, testes and the lymph nodes throughout the body showed no significant abnormalities. The lungs showed severe purulent bronchitis and bronchopneumonia with overlying pleurisy of the lower lobes. The bladder showed a moderate degree of cystitis. Extensive sloughing bedsores were present over the sacral region and buttocks.

**Skeleton**—The bodies of the sixth and seventh dorsal vertebrae were completely replaced by soft, grey-pink growth with collapse of the bone and free lateral mobility of the spine at this level (Figs. 3 and 4). The intervertebral disc between the two vertebrae was largely intact and lay loosely isolated in the centre of the tumour. The growth had spread anteriorly and laterally beneath the anterior common ligament and over the ribs and intercostal spaces for a distance of 3-5 centimetres on both sides of the vertebrae. It had narrowed the spinal canal and compressed the cord, but had not penetrated through the dura mater. Posteriorly there was invasion of the dorsal spinal muscles especially on the right side. No other tumours were found after careful search in other vertebrae, ribs, sternum, skull, pelvis, and shaft of right femur, all of which were sectioned. The shaft of the femur contained red marrow from which smears were taken.

**Histo-pathology**—Smears and sections of the vertebral tumour, stained by the usual haematoxylin methods and by the Unna-Pappenheim method for plasma cells, showed it to be a typical plasmacytoma with many cells of poorly differentiated, immature type but also many well-differentiated plasma cells with characteristic structure and staining properties (Fig. 5). The cells showed a moderate number of mitotic figures. A few cells were abnormally large and contained large irregular or multiple (usually only two or three) nuclei. Stromal tissue was scanty. Small blood vessels were plentiful in some parts and there were areas of haemorrhage and degeneration, especially in the central regions of the tumour. Sections and smears of the red marrow from other bones showed no evidence of plasma-cell infiltration. In sections of the kidney, a few tubules contained some brownish amorphous debris, probably of no special significance.

**Fig. 4**

Median section of the spine shows collapse of the affected vertebral bodies which had been replaced by tumour tissue. Note compression of the cord and isolation of the intervertebral discs.
DISCUSSION

Clinical aspects—The first symptoms of solitary plasmocytoma of bone may arise in consequence of pathological fracture after trivial injury, or pain may occur at the site of the lesion. The pain is often severe and, when the lesion is situated in the spine, there may be girdle pain. Paraplegia with all its accompanying features is a complication of solitary plasmocytoma of the spine. General symptoms occur later and include weakness with secondary anaemia.

The radiographic appearances may be grouped into two distinct types. In one type there is a markedly destructive lesion involving the bone, the process being well demarcated and sharply defined. In some respects it resembles a carcinomatous metastasis of the osteolytic variety or the osteolytic type of osteogenic sarcoma. The other type has a cystic and trabeculated appearance, the trabeculae being thickened and irregular. The lesion is large, situated in the medulla of the bone, often expanding the cortex.

These solitary tumours are known to be radiosensitive and after high voltage X-irradiation there may be regression with recalcification. When the tumour is situated in a site such as the spine this is the best method of treatment; pain is relieved even after vertebral collapse with paraplegia. Nevertheless, although irradiation may control the disease for a time there is no evidence that it is curative. Surgical treatment has been undertaken for certain tumours situated in accessible sites. Thus curettage of the tumour has been performed and subsequent bone grafting undertaken. In other cases amputation has been performed. If the tumour is situated in the spine, and pressure paraplegia supervenes, laminectomy may be required to relieve pressure on the spinal cord.

Pathological aspects—In 1941, one of us (R. A. W.) reported a necropsy case of solitary plasmocytoma of the second cervical vertebra and reviewed examples of solitary plasmocytoma of bone that had been reported previously. Of these, thirteen were accepted as truly solitary, namely those described by Shaw (1923), Walthard (1924), Zdansky (1927), Martin et al. (1928), Rogers (1930), Stewart and Taylor (1932), Harding and Kimball (1932), Rutishauser (1933), Chesterman (1936), Cutler et al. (1936, Nos. 17 and 18), Leedham-Green et al. (1938) and Willis (1941). It was emphasized that a precocious lesion of generalised myelomatosis might appear clinically to be solitary for some months. A tumour can be accepted as truly solitary, therefore, only if no further tumours appear and careful radiographic examination...
of the rest of the skeleton remains negative for at least one year thereafter. Alternatively, adequate necropsy examination may prove the solitary nature of the growth, as in the present case and the one reported earlier. Several reported cases that failed to fulfil these requirements were rejected as not being certainly solitary.

Review of recent reports in the literature—Certain relevant reports have appeared, or have come to our notice since the 1941 review was made. Pasternack and Waugh (1939) reported a solitary plasmocytoma of the upper end of the humerus in a man forty-six years old: the tumour had been present for six years; radiographs of the whole of the rest of the skeleton were negative; there was no Bence-Jones proteosuria; and the patient remained well fifteen months after resection of the growth.

King (1940) described an instructive case in which a large, apparently solitary, plasmocytoma of the femur proved to be the forerunner of generalised myelomatisis four years later. Paul and Pohle (1940), under the title "solitary myeloma of bone," described five cases which however had little claim to that designation: two of them showed multiple lesions six and eight months later; and the total periods of observation of the other three were only nineteen, four and eight months respectively. Kirsch (1941) reported a plasma-cell tumour of the femur in a man aged forty-six years in whom radiographs twelve years later showed a lesion in a rib; although this was not proved to be a plasmocytoma, its existence prevents us from regarding the femoral tumour as solitary. Brehanf (1941) reported as a case of "plasmocytome solitaire du tibia" a patient who showed Bence-Jones proteosuria, whose other bones were not examined radiographically, and whose history included no follow-up. Esposito's (1943) diagnosis of "solitary myeloma of the skull" applied to a man aged sixty-nine years who was under observation for only five months.

Gootnick's (1945) Case 1 was a man aged forty-eight years, in whom a plasmocytoma of the ilium was treated by curettage and irradiation; there was no radiographic evidence of generalisation over four years later. Gootnick's Case 2 was a man aged sixty-eight years with a plasmocytoma of the ilium treated by irradiation; the patient died of prostatic carcinoma nearly five years later without evidence of myelomatisis (but there is no mention of radiographic examination of the rest of the skeleton).

Schwartz's (1945) paper is mentioned here only as a warning against confusion of nomenclature that should now be extinct: in his paper, entitled "solitary myeloma of the frontal bone," he cited previously reported cases of plasmocytoma, and then reported a case of giant-cell tumour. Tennent (1945) described a large plasmocytoma of the ilium in a male patient aged fifty years in whom radiographs of the rest of the skeleton showed no other lesion, but who was readmitted two years later with generalised myelomatisis and Bence-Jones proteosuria. Blum's (1947) case of "solitary myeloma" has no claim to that title; the patient died five days after hemipelvectomy for a plasmocytoma of the ischiium.

The recent paper by Lumb and Prossor (1948) is a useful review of the subject of plasma-cell tumours, and includes three cases of interest in the present connection. One of these, number 6, showed the first signs of multiple lesions four years after the first symptoms of a large spinal plasmocytoma. Case 7 was a man aged forty-eight years who had a plasmocytoma of the upper end of the femur treated by irradiation, who showed no sign of any other tumours radiographically, and remained well for over two years after the first onset of symptoms. Case 8 (also published by Lumb, 1948) was of special interest in that a large solitary plasmocytoma of the sacrum in a man aged seventy-two years (proved solitary by later necropsy) was accompanied by Bence-Jones proteosuria and protein blockage of the renal tubules, a complication hitherto described only in cases of myelomatisis.

From the foregoing review it will be evident that too many cases of plasmocytoma are still being claimed as "solitary" on unsubstantial grounds. This diagnosis can be accepted only if, after the onset of the supposedly solitary growth, there is a long period of freedom from clinical and radiographic evidence of myelomatisis, or if thorough necropsy proves
that no other tumours are present in the skeleton. The length of time that must elapse before a patient with an apparently solitary growth can be declared free from risk of generalisation is uncertain. While most cases of myelomatosis show their multiple character within a year of the onset of a seemingly solitary tumour, there are occasional cases (such as those of King, Tennent, Lumb and Prossor, Case 6, and possibly that of Kirsch) in which evidence of myelomatosis does not appear for several years. In spite of these exceptional cases, there is no doubt from available records that truly solitary plasmocytoma of bone is an entity distinct from myelomatosis, and that it can be cured by adequate local treatment. To those cases accepted as solitary by Willis in 1941, may be added those of Pasternack and Waugh (1939), Gootnick (1945, Case 1), Lumb and Prossor (1948, Cases 7 and 8), and the present case. This would bring the total number of accepted cases up to eighteen. Of these, five had vertebral tumours (Walthard, Cutler et al., Willis, Lumb, Raven and Willis). It is noteworthy that fifteen of the total eighteen cases, including all those with spinal tumours, were men.

<table>
<thead>
<tr>
<th>Author</th>
<th>Sex</th>
<th>Age</th>
<th>Site of Tumour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaw</td>
<td>M</td>
<td>29</td>
<td>Humerus (shaft)</td>
</tr>
<tr>
<td>Walthard</td>
<td>M</td>
<td>55</td>
<td>Spine (C7 and T1)</td>
</tr>
<tr>
<td>Zdansky</td>
<td>F</td>
<td>68</td>
<td>Femur (upper third)</td>
</tr>
<tr>
<td>Martin et al.</td>
<td>F</td>
<td>56</td>
<td>Femur (upper third)</td>
</tr>
<tr>
<td>Rogers</td>
<td>M</td>
<td>34</td>
<td>Femur (shaft)</td>
</tr>
<tr>
<td>Stewart and Taylor</td>
<td>M</td>
<td>34</td>
<td>Humerus (upper third)</td>
</tr>
<tr>
<td>Harding and Kimball</td>
<td>M</td>
<td>69</td>
<td>Femur (upper third)</td>
</tr>
<tr>
<td>Rutishauser</td>
<td>F</td>
<td>62</td>
<td>Femur (upper third)</td>
</tr>
<tr>
<td>Chesterman</td>
<td>M</td>
<td>39</td>
<td>Tibia (shaft)</td>
</tr>
<tr>
<td>Cutler et al. (Case 17)</td>
<td>M</td>
<td>58</td>
<td>Pelvis</td>
</tr>
<tr>
<td>Cutler et al. (Case 18)</td>
<td>M</td>
<td>52</td>
<td>Spine (L2)</td>
</tr>
<tr>
<td>Leedham-Green et al.</td>
<td>M</td>
<td>56</td>
<td>Pelvis</td>
</tr>
<tr>
<td>Willis</td>
<td>M</td>
<td>45</td>
<td>Spine (C2)</td>
</tr>
<tr>
<td>Pasternack and Waugh</td>
<td>M</td>
<td>46</td>
<td>Humerus (upper third)</td>
</tr>
<tr>
<td>Kirsch</td>
<td>M</td>
<td>46</td>
<td>Femur</td>
</tr>
<tr>
<td>Gootnick (Case 1)</td>
<td>M</td>
<td>48</td>
<td>Pelvis</td>
</tr>
<tr>
<td>Lumb and Prossor (Case 7)</td>
<td>M</td>
<td>48</td>
<td>Femur (upper third)</td>
</tr>
<tr>
<td>Lumb and Prossor (Case 8)</td>
<td>M</td>
<td>72</td>
<td>Sacrum</td>
</tr>
<tr>
<td>Raven and Willis</td>
<td>M</td>
<td>56</td>
<td>Spine (T6 and 7)</td>
</tr>
</tbody>
</table>

It should be added that in cases such as the one now reported, in which after a brief history careful necropsy reveals only one tumour, there is no certainty that, had the patient survived longer, the tumour would have remained solitary. Only one tumour is present now, but multiple lesions might have developed subsequently, since myelomatosis is a multifocal systemic disease. In such cases, then, we cannot know whether the tumour is merely the precocious forerunner of the systemic disease or a true instance of the distinct entity solitary plasmocytoma. The second alternative is perhaps the more probable.

**SUMMARY**

1. A case of solitary plasmocytoma of the thoracic part of the spine, verified by necropsy, is described.
2. A brief review is given of eighteen acceptable cases of solitary plasmocytoma of bone.
3. Of the eighteen patients, fifteen were men; the five spinal tumours were all in men.
4. Diagnosis requires: a) biopsy identification of plasmocytoma; b) exclusion of the possibility of generalised myelomatosis by complete radiography of the skeleton, repeated if necessary at intervals during the ensuing two or three years or longer.
5. A tumour of brief duration, proved to be solitary by careful necropsy, cannot be placed with certainty in the group of truly solitary plasmocytomas; it might have been a precocious first lesion of myelomatosis.
REFERENCES

Shaw, A. F. B. (1923): Journal of Pathology and Bacteriology, 26, 125.

We are indebted to Miss Irving-Gass for photographs of the specimen and to Mr Cowles for the photomicrograph.