SEPTIC ARTHRITIS OF THE SHOULDER AFTER
MASTECTOMY AND RADIOThERAPY FOR
BREAST CARCINOMA

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We report five patients who developed septic arthritis of
the shoulder after cancer of the ipsilateral breast had been
-treated by surgery and radiotherapy. Lymphoedema was
present in all cases. The infections were not obvious, having
subacute onsets, and delays in diagnosis led to destruction
of the joint in all but one patient.

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Breast cancer, the most common malignancy in women,
may be treated by surgery, radiotherapy, chemotherapy
and endocrine therapy (Henderson et al 1989). Musculo-
skeletal symptoms are usually suspected to be metastatic
in origin.

We present five patients with cancer of the breast
who developed septic arthritis in the ipsilateral shoulder.
In four of these the diagnosis was delayed because of the
unusual presentation and the belief that the pain was due
to metastatic disease or a complication of the radio-
otherapy treatment. Prompt diagnosis of this previously
unreported complication of breast cancer is important
since it can be cured by early treatment.

CASE REPORTS

Detailed case histories are given; they are summarised
in Tables I and II.

Case 1. In 1978 at the age of 48, a diagnosis was made of
-infiltrating adenocarcinoma of the right breast; clinical
stage T₂N₁M₀. After radical mastectomy, wound healing
was delayed by a Staphylococcus aureus infection. Radio-
therapy was given later to the internal mammary chain,
chest wall and supraclavicular lymph nodes of the
affected side, and chemotherapy with LACT (a combi-
nation of chlorambucil, methotrexate, 5-fluorouracil and
thiotepa) for 12 months, followed by melphalan for six
months. The patient had persistent lymphoedema of the
right arm which a lymphovenous anastomosis was
attempted two years after the mastectomy.

In February 1981, the patient was admitted to
to a painful right shoulder. Radiographs were
normal, but a ⁹⁹mTc bone scan showed an increased
uptake over the right humerus and clavicle. Aspiration
of the right shoulder produced a brown fluid which
revealed no organisms on Gram staining, but grew
Staphylococcus aureus on indirect culture: this was
thought to be a contaminant. Pain continued with
progressive loss of range of movement of the right
shoulder. She remained afebrile, with no lymphaden-
pathy or involvement of any other joint. She was
readmitted six months later and at open biopsy there was
frank pus in the shoulder, containing Staphylococcus
aureus. Radiographs showed gross destruction of the
humeral head (Fig. 1) and treatment was by intravenous
fluoxacin for six weeks and physiotherapy. A radiog-
ograph in 1988 showed complete loss of the humeral head
(Fig. 2).

Case 2. At the age of 47, this patient had a modified
radical mastectomy for right-sided adenocarcinoma, followed by radiotherapy and tamoxifen 10 mg/day. More details are not available, but 13 years later she was admitted with a four-year history of recurrent, intermittent pain and progressive loss of movement of her right shoulder. She gave a history of three episodes of discharge of pus from that shoulder, treated with oral antibiotics.

On admission there were no discharging sinuses or scars to suggest underlying osteomyelitis or abscess. Radiographs showed patchy osteoporosis, sclerotic changes and erosion of the humeral head (Fig. 3) and a CT scan confirmed irregularities on the articular surface and a mottled appearance of the bones (Fig. 4). The possibility of secondary deposits was considered and a 99mTc bone scan showed increased uptake (Fig. 5). A Craig needle biopsy revealed no malignancy, but grew streptococcus group B. The patient responded well to intravenous flucloxacillin and physiotherapy, and was pain-free six months later.

**Case 3.** At the age of 57, a left radical mastectomy had been performed for a tumour at stage T2N,M,. Radiotherapy had been given to the affected internal mammary chain and chest wall, with sparing of the axilla. Two-and-a-half years later she developed pain and stiffness of the left shoulder, but a radiograph showed no bony abnormality, no osteoporosis and no loss of joint space. A 99mTc bone scan suggested an inflammatory arthritis or septic arthritis. Arthroscopy showed adhesions and a small amount of pus was obtained. Gram staining showed no organisms but culture grew a group C streptococcus.

The patient responded well to intravenous flucloxacillin 12 g/day for two weeks, followed by oral cephalixin.

### Table I. Clinical features of five patients with septic arthritis after treatment for carcinoma of the breast. All had surgery and radiotherapy followed by lymphoedema

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age at diagnosis of breast carcinoma (yr)</th>
<th>Breast carcinoma</th>
<th>Onset of septic arthritis (yr)</th>
<th>Chemotherapy</th>
<th>Delay before septic arthritis diagnosed</th>
<th>Treatment</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>48</td>
<td>Infiltrating adenocarcinoma T2N1M0</td>
<td>51</td>
<td>LACT*</td>
<td>7 mth</td>
<td>Intravenous flucloxacillin Physiotherapy</td>
<td>Destruction of shoulder</td>
</tr>
<tr>
<td>2</td>
<td>47</td>
<td>Adenocarcinoma</td>
<td>60</td>
<td>Tamoxifen 10 mg/day</td>
<td>4 yr</td>
<td>Intravenous flucloxacillin Physiotherapy</td>
<td>Destruction of shoulder</td>
</tr>
<tr>
<td>3</td>
<td>57</td>
<td>Intraductal adenocarcinoma T2N1M0</td>
<td>60</td>
<td>No</td>
<td>11 days</td>
<td>Intravenous flucloxacillin</td>
<td>Almost complete recovery</td>
</tr>
<tr>
<td>4</td>
<td>71</td>
<td>Poorly differentiated adenocarcinoma T3N1M0</td>
<td>74</td>
<td>No</td>
<td>4 mth</td>
<td>Intravenous flucloxacillin</td>
<td>Marked restriction of movement</td>
</tr>
<tr>
<td>5</td>
<td>59</td>
<td>Scirrhous carcinoma T2N1M0</td>
<td>65</td>
<td>No</td>
<td>15 days</td>
<td>Intravenous Keflin followed by oral erythromycin</td>
<td>Marked restriction of movement</td>
</tr>
</tbody>
</table>

* combination chemotherapy consisting of chlorambucil, methotrexate, 5-fluorouracil and thiopeta

### Table II. Laboratory findings in five patients with septic arthritis after treatment for carcinoma of the breast

<table>
<thead>
<tr>
<th>Patient</th>
<th>Haematology</th>
<th>Radiology</th>
<th>Bone scan</th>
<th>Microbiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hb: 11.3 g/100 ml, WCC: 7700/mm³, ESR: 114 mm/hr</td>
<td>Normal shoulder at onset. Seven months later, destruction of humeral head</td>
<td>99mTc increased uptake humerus and clavicle. Gallium scan: moderate nonspecific uptake</td>
<td>Delayed growth of Staphylococcus aureus. Seven months later, <em>Staphylococcus aureus</em></td>
</tr>
<tr>
<td>2</td>
<td>Hb: 12.6 g/100 ml, WCC: 5100/mm³, ESR: 10 mm/hr</td>
<td>Patchy osteoporosis and sclerotic changes. Erosive defect. CT scan: irregularities of humeral head, mottled appearance of bones</td>
<td>Increased 99mTc uptake of shoulder</td>
<td>Craig needle biopsy: streptococcus group B</td>
</tr>
<tr>
<td>3</td>
<td>Hb: 13.3 g/100 ml, WCC: 9000/mm³, ESR: 125 mm/hr</td>
<td>No bony abnormalities, no loss of joint space, no osteoporosis</td>
<td>99mTc scan highly suggestive of inflammatory arthritis consistent with septic arthritis</td>
<td>Aspirate: inconclusive. Arthrotomy: drainage of pus; Gram stain negative indirect growth of streptococcus group C</td>
</tr>
<tr>
<td>4</td>
<td>Hb: 11.6 g/100 ml, WCC: 11000/mm³, ESR: 111 mm/hr</td>
<td>No bony abnormality. After fall while in hospital: radiograph showed fracture of humeral head. No evidence of septic arthritis</td>
<td>Increased 99mTc uptake in shoulder capsule</td>
<td>Aspirate: blood, no pus, negative culture. Arthrotomy: <em>Staphylococcus epidermis</em></td>
</tr>
<tr>
<td>5</td>
<td>Hb: 13.1 g/100 ml, WCC: 11000/mm³, ESR: 115 mm/hr</td>
<td>At onset of symptoms: normal shoulder. One month later: destruction of humeral head</td>
<td>Ill-defined increase of 99mTc uptake in upper humerus. Gallium scan: increased accumulation in shoulder suggesting an abscess</td>
<td>Arthrotomy: <em>Staphylococcus aureus</em> Blood culture: <em>Staphylococcus aureus</em></td>
</tr>
</tbody>
</table>
1 g/day for six months. With intensive physiotherapy she recovered a full range of movement.

**Case 4.** At the age of 71, the diagnosis of a T3N1bM0, poorly differentiated, adenocarcinoma of the left breast was made and treated by modified radical mastectomy and radiotherapy. Three years later the patient gave a four-month history of pain and restriction of movement in the left shoulder, but had no pyrexia, weight loss, or lymphadenopathy. There was some wasting of the shoulder girdle with lymphoeuroma of the arm. Radiographs were normal, but a bone scan showed an increased uptake at the left shoulder. Aspiration produced blood but no pus, and a provisional diagnosis of capsulitis was made.

While in hospital the patient fell and fractured her left shoulder, and arthrotomy revealed septic arthritis and osteomyelitis. Cultures grew *Staphylococcus epidermidis* and there was no evidence of malignancy on histopathological examination of biopsy specimens.

**Case 5.** At the age of 59 this patient had a T3N1bM0 scirrhous carcinoma of the left breast treated by radical mastectomy and radiotherapy to the left supraclavicular nodes, internal mammary chain, chest wall and axilla. She also had one cycle of LACT (see case 1), which was not continued because of bone-marrow suppression.

Six years later she was admitted with a one-week history of pain and stiffness of the left shoulder. There was gross swelling of the left arm and a low-grade fever which later spiked to 39°C. A provisional diagnosis of left axillary venous thrombosis was made, but radiographs including digital subtraction angiography and venography were all normal. A $^{99m}$Tc bone scan showed increased uptake in the left upper humerus which was thought to be of doubtful significance. Dynamic and

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**Fig. 1**

Case 1. Figure 1 – Radiograph of the right shoulder six months after the onset of pain showing a severely damaged humeral head. Figure 2 – Radiograph of the right shoulder seven years after the onset of shoulder pain. The humeral head is completely destroyed.

**Fig. 2**

**Fig. 3**

**Fig. 4**

**Fig. 5**

Case 2. Figure 3 – Radiograph of the right shoulder showing patchy osteoporosis and sclerotic changes in the humeral head. Figure 4 – A CT scan of the same shoulder showing irregularities of the articular surface of the glenoid and humeral head. Figure 5 – A $^{99m}$Tc bone scan showing grossly increased uptake in the right shoulder.
blood pool scans showed mildly increased tracer uptake 2.5 hours after injection. A gallium scan showed increased accumulation in the left shoulder with a 'halo' effect in the proximal humeral region suggesting an abscess. At arthroscopy, an abscess was drained, and the pus grew *Staphylococcus aureus*. The same organism was isolated from blood cultures two weeks later. Despite high dose parenteral and oral antibiotics for several months, the patient continued to have stiffness and pain which necessitated arthrodesis of the shoulder eight months later.

**DISCUSSION**

All our five cases of septic arthritis of the shoulder occurred in women with breast cancer on the same side, all treated by both surgery and radiotherapy. Four of the five patients had destruction of the joint, and in all four the diagnosis had been delayed by the failure to recognise that sepsis was a possible cause of symptoms, and the failure to perform the correct investigations. The attending clinicians could be criticised for these failures, but the subacute onset, the presence of lymphoedema and the lack of significant fever in three of the five cases made the initial diagnosis difficult (Goldenberg and Cohen 1976).

In several cases, metastatic breast disease was thought to be the cause of the pain, but continued follow-up has revealed no sign of tumour recurrence in any of them. In all five patients, radionecrosis was thought to be contributing to the pain, thereby making any invasive investigation seem more hazardous because of poor skin healing after irradiation (Brady, Binnick and Fitzpatrick 1987; Dalinka and Neustadter 1988). Although radionecrosis may occur in up to 3% of patients irradiated for breast cancer the incidence is falling as a result of better techniques (Howland et al 1975; Dalinka and Neustadter 1988). Radiation necrosis of the humerus may be detected at 7 to 10 years after therapy, but associated findings in the ribs, clavicle and scapula are frequent and may help in the diagnosis (Dalinka and Neustadter 1988). There were no such changes in the ribs, clavicle or scapula in any of our patients.

Infection is widely recognised as a complication of malignancy but we have not been able to find any reports of septic arthritis after the treatment of carcinoma of the breast. It has been reported in association with leukaemia (Appelbaum and Dossett 1982), multiple myeloma (Miller, Hoppmann and Pisko 1988) and colonic carcinoma (Lyons and Nevins 1979), but all these cases either had an active tumour or were undergoing chemotherapy when septic arthritis developed. Only two of the five patients in our study had had any form of chemotherapy and this was adjuvant only. None of the patients developed infection at other sites, indicating that they were unlikely to have generalised immunological compromise. None of them had had an intra-articular injection of steroid or any underlying systemic disorder such as diabetes.

We cannot be certain that the breast neoplasia or its treatment were causally related to the development of the septic arthritis, but this seems likely, particularly as septic arthritis of the shoulder is unusual in elderly women (Goldenberg 1989). A number of mechanisms can be postulated. The radiotherapy notes of three of the five patients recorded that the shoulder was included in the field of treatment, and in the other two patients this was likely but could not be confirmed since the notes were not available. Radiotherapy may have damaged the tissues of the joint although the characteristic features of radionecrosis were absent (Dalinka and Neustadter 1988), and these damaged tissues may have provided a site for colonisation following bacteraemia. In addition, host-defence mechanisms may have been compromised by irradiation-induced damage and by the lymphatic stasis of lymphoedema.

We present these cases to draw attention to the clinical importance of the association between breast cancer and sepsis. We acknowledge the difficulties of diagnosis and management, and in particular the reluctance to perform invasive investigations in a region exposed to radiotherapy. The early detection and treatment of septic arthritis in these patients are important, since prompt treatment can effect a cure.

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**REFERENCES**


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