OSTEOCLASTOMA

A Study of Thirty-eight Cases

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In this paper thirty-eight cases of osteoclastoma are reviewed. The patients were treated in the Middlesex Hospital between 1929 and 1948, and the Mount Vernon Hospital between 1942 and 1948. Six other patients, with tumours that were thought to be osteoclastomata, were also treated but they have been excluded because there is doubt as to the accuracy of the diagnosis. In thirty-four of the thirty-eight cases now reported, there was histological confirmation; and in four cases the history, clinical features, radiographic appearances, and subsequent course, leave no doubt that the diagnosis was correct.

Certain problems in the diagnosis, treatment, and clinical progress of these cases will be considered, particularly with regard to the development of malignant changes and metastases. These problems have often been discussed and many diverse views have been expressed; analysis of this series, added to observations from other centres, may help to clarify disputed features in the life history of this tumour and give more definite indication the treatment that should be advised.

Sex, age and site—There were fifteen males and twenty-three females. The youngest patient was aged 8 years and the oldest 62 years. Twenty of the thirty-eight cases occurred in the second or third decade. The lower limb was involved in nineteen (50 per cent.) and in just over half of them the tumour was situated near the knee joint: femur, upper end 5; femur, lower end 4; tibia, upper end 5; tibia, lower end 3; fibula, upper end 1; patella, 1. The case in which the patella was involved has already been reported by Shorvon (1946). The upper limb was involved in six cases: humerus, upper end 5; radius, lower end 1. Other tumours were in the vertebrae 5, sacrum 4, mandible 2, scapula 1, ischium 1.

Relationship of injury to osteoclastoma—It has often been said that there is close association between injury and the development of osteoclastoma, and for this reason a careful study was made of the clinical histories in an attempt to find the number of patients in whom the development of such a tumour was preceded by injury. In seven, there was evidence of a blow causing pain and bruising and, after some months, pain and swelling at the same site which led to the diagnosis of osteoclastoma. In four, there was a less definite history of a fall or strain some months before the onset of symptoms. In the other twenty-seven patients there was no history of preceding injury although two were admitted to hospital after minor injuries which caused pathological fracture in a pre-existing but undiagnosed osteoclastoma.

DIAGNOSIS BY RADIOGRAPHY AND BIOPSY

Much has been written as to the value and limitations of radiographic examination in diagnosis. It has been said that the radiographic appearances may be so distinctive as to establish the diagnosis with certainty. Brailsford (1943) stated that radiographic examination, together with the history and clinical features, was sufficient and that biopsy was not only unnecessary but even misleading and harmful. It is perhaps true that when the lesion is a
Histological appearances of typical osteoclastoma.

Radiographic appearances of typical osteoclastoma.

slowly growing and typically expanded and trabeculated tumour, situated at the end of a long bone such as that in Figure 3, radiological without histological examination may be sufficient: but in cases such as those to which attention was first drawn by Kirklin and Moore (1932) with rapid growth, and no evidence of trabeculation or expansion of the cortex, and in which the tumour occupies an unusual site, radiographic examination alone is not sufficient to ensure accuracy of diagnosis.

Cases with atypical radiographic appearances—In this series there were many cases with atypical radiographic appearances which gave rise to difficulty in interpretation. Some of
these unusual features are illustrated in five cases, all of which proved to be osteoclastomata confirmed by histological examination.

Figure 4 shows a small osteoclastoma in the neck of the left femur of a woman aged forty-nine years. A cyst had been removed from the right breast five months before she came to hospital complaining of severe pain in the left groin. Clinical and radiographic examination suggested that the lesion might be a metastasis. After biopsy, the diagnosis of osteoclastoma was established.

Figures 5 and 6 show an extensive tumour involving the upper end of the right femur, acetabulum and adjacent part of the ilium, superior ramus of the pubis, and part of the ischium. The patient was a woman, aged twenty-six years, who gave a fifteen months' history of pain in the hip joint of gradual onset. She had been treated by short wave diathermy and traction on the limb for fifty weeks! This lesion, which apparently started in the upper end of the femur, crossed the joint space to involve the bones of the pelvis—a behaviour that is contrary to generally accepted views as to the spread of osteoclastoma but which might be explained by the bridge of the ligamentum teres. Such spread across a joint may also be seen in osteoclastomata of the sacrum which involve the ilium.

Figures 7-9 show an osteoclastoma of the lower end of the left femur with pathological fracture in a woman aged fifty-four years. Raising of periosteum at the margin of the lesion gave an appearance that resembled that of osteogenic sarcoma. Similar cases of osteoclastoma associated with periosteal elevation were described by Hilton (1945).
Fig. 5
Osteoclastoma of the head and neck of the femur involving also the ilium, ischium and pubis.

Fig. 6
The same tumour as shown in Fig. 5, two years after deep X-ray treatment.
Osteoclastoma with pathological fracture into the knee joint; periosteal reaction is seen (Fig. 7). One month after deep X-ray treatment there was increased decalcification (Fig. 8). Sixteen months after treatment the tumour is smaller, the fracture is healed and there is sclerosis of the bone (Fig. 9).

Osteoclastoma of the upper end of the tibia with involvement of the knee joint.

Secondary deposit of adenocarcinoma of the rectum in the upper end of the tibia.
Figure 10 shows an osteoclastoma in the proximal end of the right tibia of a man aged thirty-eight years. There was a six months' history of gradual onset of pain. The knee was swollen and tender; there was local increase of temperature, oedema of subcutaneous tissues and limitation of movement. Radiographs showed that the tumour had broken through the articular cartilage as well as the cortex of the bone.

*Tumours resembling osteoclastoma*—In addition to these patients, in whom the radiographic appearances of osteoclastomata were atypical, there were others with tumours which proved not to be osteoclastomata although the radiographic resemblances were very close. Figure 11 shows a tumour of the upper end of the tibia in a patient aged sixty-four years. In March 1948, after knocking his right leg, there was bruising and pain; the limb swelled and pain increased. In July 1948 he was referred to Mount Vernon Hospital. Drill biopsy showed that the lesion was an adenocarcinoma of the tibia; he was found to have an inoperable carcinoma of the rectum.

![Figure 12](image)

*Fig. 12*

Plasmacytoma of the pubis.

Figure 12 shows a destructive, expanding bone lesion of the left pubis. The patient gave a history of injury twelve months before the onset of symptoms. Three weeks before the radiograph was taken he complained of pain in the left thigh and knee. The history and radiographic findings were consistent with the diagnosis of osteoclastoma except that the site was unusual. Drill biopsy showed that the lesion was a plasma cell myeloma and this was confirmed by sternal marrow puncture.

**HISTOLOGICAL EXAMINATION BY BIOPSY**

In this series of thirty-eight cases, histological verification of the diagnosis was secured in thirty-four. The other four patients were treated by X-ray therapy without biopsy because the clinical and radiographic features were typical. Analysis shows that histological reports on the basis of biopsy were accurate and reliable. The similarity of the histological picture
Fig. 13
Osteoclastoma of the fifth lumbar vertebra causing lateral distortion of the fourth lumbar vertebra.

Fig. 14
Same case as in Fig. 13, four months after deep X-ray treatment.
of osteoclastoma with that of osteitis fibrosa is unlikely to give rise to erroneous diagnosis if the clinical as well as the radiographic features are taken into consideration.

Drill biopsy was carried out only in a small number of cases because it was thought that it might not be reliable and a representative part of tumour might not be obtained. In fact, however, reliable results were secured in those cases in which it was used. Incisional biopsy was performed in most cases. In some, this consisted of the removal of a small piece of tissue from the margin of the tumour. In others a large wedge of tumour tissue was removed. It has been found however, that all the information obtainable from a large piece of tumour tissue can be obtained equally well from a small piece, and the first method is free from some of the disadvantages of the second. When wide removal was made there were some cases of breaking down of the wound, infection of the cavity and the development of a sinus.

**TREATMENT AND RESULTS**

**Surgical treatment**—Nineteen patients were treated surgically, nine without post-operative X-ray treatment and ten with. Amputation was performed in two: of these one with osteoclastoma of the lower end of the femur is well eighteen years after amputation through the thigh; the other died three years after interscapulo-humeral amputation with metastases in the lungs.

Two patients were treated by local excision. One, previously reported by Shorvon (1946), is well two years after excision of the patella. The other had excision of a tumour of the lower end of the radius with replacement by the upper end of the fibula and arthrodesis of the wrist joint; there was recurrence after four years which was treated by X-ray therapy; three years later, the patient is well.

Five patients were treated by curettage. Three are still well fourteen, nine, and eight years after operation respectively. One, who had a tumour of the upper end of the humerus, developed a recurrence which was treated by irradiation. After this he worked for six years as a labourer; then there was further recurrence. The limb was amputated because it was thought that malignant change had occurred. Three years after amputation he is well. One patient developed recurrence of an osteoclastoma of the upper end of the humerus eighteen months after curettage and was treated by X-ray therapy; he died two years later from metastases in the lungs.

**Surgical treatment with post-operative X-ray treatment**—Ten patients were treated surgically with post-operative radiotherapy. In one, excision of a tumour of the upper end of the fibula treated after operation by X-rays, is well fourteen years later. The others had incomplete removal or curettage with post-operative radiation. Three have been lost from follow-up, one and two years after treatment, when they were apparently well. Four are still well five to ten years after treatment. Of the other two patients, one, with a tumour of the lower end of the femur, developed recurrence with extension into the knee joint; it was excised and the patient died from post-operative pulmonary embolism. In the other there was recurrence of a tumour of the upper end of the tibia; malignant change was diagnosed; the limb was amputated through the thigh but the patient died.

**Treatment by radiotherapy alone**—Nineteen patients were treated by radiotherapy alone: three were treated by interstitial radium or radon; sixteen were treated by X-ray therapy, with preliminary biopsy in twelve. One, with an osteoclastoma of the upper end of the femur, treated by incomplete removal and insertion of radium tubes, is free from recurrence eighteen years later but still has a discharging sinus. One patient with a tumour of the scapula, treated by radium needle implantation with surface radium application, is free from recurrence seventeen years after treatment but has marked scarring and telangiectasis of the skin. One
Fig. 15
Case 1. Osteoclastoma of the sacrum, invading the ilium, previously treated by the insertion of radon seeds but with an abscess and sinus formation.

Fig. 16
Case 1. The abscess was drained and fifty-eight radon seeds were removed. Treatment was given by a one gramme telecobalt unit. More radon seeds were discharged until only three remained. The wound healed except for one sinus. The patient now plays badminton, enjoys all recreations, and leads a normal life.
patient, who had been treated by the insertion of radon seeds to an osteoclastoma of the sacrum had a discharging sinus and an expanding tumour; after removal of the seeds, teleradium was given; the patient is still well fifteen years later but he has a discharging sinus.

Of the sixteen patients treated by X-rays one has been lost from follow-up. Two have been treated recently and the results cannot yet be assessed. One died of bronchitis and heart failure two years after treatment for a large tumour with pathological fracture of the lower end of the femur; apart from a stiff knee joint which prevented him from carrying on his occupation as a cab driver he had no symptoms referable to the lesion. One patient with an osteoclastoma of the lower end of the femur confirmed by biopsy had X-ray treatment; after initial improvement the tumour fungated through the skin; a diagnosis of local malignant change was made and the limb was amputated three months ago. Eleven patients remain well and free from recurrence for periods of from one to ten years. The period of observation since treatment is not long enough in all of them to be sure that they will remain free from recurrence, but in every case there is evidence of sclerosis of the lesion and no sign of activity.

Technique of X-ray therapy of osteoclastoma—The technique of X-ray therapy has been fairly uniform throughout the last twelve years. X-rays generated at 200 or 220 kilovolts, with half value layer of 1.1 or 2.1 mm. copper respectively, were used. The dose given to the tumour in a single course, lasting from twenty to thirty days, varied between 2000 and 3000 roentgens. A second course of treatment was usually given about three months after the initial course. The typical reaction after such treatment, which has often been described, is a preliminary stage of increased decalcification with apparent extension of the tumour. After about two months, recalcification begins and increases. The final result from X-ray therapy, which may not be achieved for many months, is diminution in size of the tumour with replacement of the thinned cortex by dense sclerotic bone; trabeculae become thick and dense but the bone does not regenerate entirely and cystic spaces remain.

Case Report—A girl aged fifteen years gave a four months’ history of pain in the right leg and lumbar region. Radiographs showed a trabeculated tumour involving the right side of the fifth lumbar vertebra, extending outwards above the right sacro-iliac joint, with lateral dislocation of the fourth lumbar vertebra (Figs. 13 and 14). Biopsy showed that the tumour was an osteoclastoma. A single course of deep X-ray therapy was given; the tumour dose was 2000r. After one month pain was relieved; and after the second month there was complete freedom from symptoms and there were no abnormal physical signs. Radiographs four months later showed reduction in the size of the tumour, sclerosis of bone, and accurate apposition between the fourth and fifth lumbar vertebrae. The patient remains well eighteen months after treatment.

Seven of the cases described warrant more detailed consideration. In two, there were unusual clinical and radiological features; and in five, malignant changes supervened.

TWO CASES WITH UNUSUAL FEATURES

Case 1. Female, aged 28 years—In March 1933 an osteoclastoma of the sacrum was partly excised and treated by X-rays. Pain continued and the tumour increased in size. In October 1933, radon seeds were inserted. In January 1934 an abscess developed. She was admitted to the Middlesex Hospital in February 1934. Radiographs showed masses of radon seeds in a cystic area in the left side of the sacrum (Fig. 15). There was extension of the growth into the left ilium. On March 7, 1934, the cavity was opened by the late E. Pearce Gould; necrotic material, with fifty-eight radon seeds, was removed. In April 1934, treatment was given by one gramme teleradium unit to the whole tumour. During the next year the margins of the tumour became sclerosed. The sinus persisted. More radon seeds were
extruded until only three remained. The pain subsided and by June 1935 the patient was able to walk without a stick. In 1936 she played badminton. From 1941 to 1945 she worked in the Civil Nursing Service. There was still a sinus which she dressed regularly. In August 1945 copious leakage from the sinus was reported and the patient complained of persistent headache, more severe when standing erect. The discharge reduced Fehling’s solution and was found to be cerebro-spinal fluid. The wound was cleaned and packed with fibrin foam. Pyrexia and severe headache persisted, with retention of urine. A cell count of the cerebro-spinal fluid showed: 630 cells per cubic millimetre, 83 per cent. polymorphonuclear cells, 12 per cent. lymphocytes, 5 per cent. erythrocytes. Penicillin and sulphonamide were given; the symptoms of meningitis abated within a week. The wound became dry and she was discharged from hospital on October 3, 1945. Since that time she has had no exacerbation of symptoms. There is still a sinus but she is able to lead a normal life. Figure 16 shows the condition in August 1947.

This case illustrates the disadvantages of treatment of osteoclastoma by interstitial irradiation and particularly by the insertion of radon seeds. There is risk of infection with persistent discharging sinuses. Moreover, it is almost impossible to ensure adequate irradiation of the whole lesion.

Case 2. Female, aged 38 years—In 1942 an osteoclastoma of the lower end of the right radius was treated by the late Mr Rowley Bristow by excision of the lower end of the radius, replacement by part of the fibula, and arthrodesis of the wrist joint. In January 1946, a tumour appeared on the volar surface of the limb, proximal to the wrist, and biopsy showed that it was a recurrent osteoclastoma. After X-ray therapy the swelling diminished. There is still a hard lump but there are no symptoms and the patient is in good health. This case illustrates invasion of a bone graft by recurrent tumour (Fig. 17).
CASES IN WHICH MALIGNANT CHANGES OCCURRED

Case 3. Male, aged 31 years—In February 1932 this patient was admitted to the Middlesex Hospital complaining of pain and swelling of the ankle joints, knee joints and right wrist joint. The left upper limb had been amputated three years previously for what was said to be a sarcoma of the humerus. No histological details were available. He was found to have marked hypertrophic osteoarthropathy involving nearly all the long bones. There was a tumour in the left lung. Lobectomy, performed by Mr Vaughan Hudson, gave immediate relief of pain and improvement in the swelling of joints, but the patient died in September 1932 from lung metastases. The histological picture shows an atypical osteoclastoma (Fig. 18). There are giant cells of the osteoclast type, and a cellular stroma which differs from the normal appearance in that the cells are less regular in size and are spheroidal rather than spindle shaped.

![Fig. 18](image)

Case 3. Metastases in lung (× 250).

Case 4. Male, aged 33 years—For one year complained of increasing pain in the left shoulder extending down the arm. A diagnosis of osteoclastoma of the upper end of the left humerus was made and after curettage the pain was relieved. In July 1941 pain recurred and radiographic examination showed extension of the lesion. Treatment by X-rays was given in July 1941 and in November 1941. Pain was then relieved and the bone became sclerosed. After one year there was recurrence of pain. In June 1943 the patient was found to have metastases in the lung, and he died in August 1943. Autopsy showed extensive pulmonary metastases of sarcoma.

Case 5. Male, aged 38 years—In 1935, after minor injury, sustained a pathological fracture through an osteoclastoma in the head of the left humerus. The lesion was treated by curettage and bone grafting. In August 1937 and December 1937 he was given X-ray treatment because of recurrence. After this he remained well and was able to work as a labourer until July 1944 when pain recurred. He was given a further course of X-ray treatment at another hospital. In June 1946 the limb was amputated because it was thought that the lesion had become malignant. The diagnosis of sarcoma was confirmed histologically after amputation. In January 1949 there was no sign of recurrence.
Case 7. Radiographic appearances of an osteoclastoma of the tibia in February 1948, shortly after X-ray therapy (Fig. 19), and in July 1948 when there was ulceration over the tumour from the pressure of a splint (Fig. 20).

Case 7. Clinical appearance of the limb at the time of amputation.
Case 6. Female, aged 18 years—Pain in the left knee began in June 1939 and gradually became worse. The diagnosis of osteoclastoma was established by radiographic examination and biopsy. Curettage was performed in April 1940, the cavity being filled with bone chips. After operation there was a discharging sinus. X-ray therapy in July and September 1940 gave rise to considerable improvement; the sinus became smaller. In June 1941 the condition was thought to have undergone malignant change and the limb was amputated. The patient died in August 1943. The difficulties of follow-up in time of war have made it impossible to secure further pathological details.

Case 7. Female, aged 47 years—Three years previously this patient fell and injured her left ankle; it was oedematous for some time. In June 1947 she complained of aching pain and swelling of the left ankle. Biopsy was performed on December 15, 1947; a large piece of tissue was removed with a spoon and reported as osteoclastoma. Double below-knee irons were fitted. She was given X-ray therapy in January 1948 to a total tumour dose of 2100r., and in May 1948 to a total tumour dose of 2200r. Radiographic examination on July 19, showed increased sclerosis but at that time it was noted that there was superficial ulceration over the medial malleolus, in the region of the biopsy scar, where the splint had been pressing. This did not heal and a tumour mass fungated. The limb was amputated below the knee by Mr P. H. Newman on November 25, 1948. Figures 19 and 20 show the radiographic appearances of this tumour in February and July 1948. Figure 21 shows the clinical appearance at the time of amputation, and Figure 22 is an illustration of the specimen.

It is unfortunate that more detailed documentation is not available in all the five cases in which malignant changes have been presumed. In Case 3 the primary tumour had been
treated in another institution but histological findings support the evidence that metastases from an osteoclastoma can occur with little alteration in the histological picture from that of the primary lesion. In 1905 Gordon Taylor reported a similar case with a primary tumour of the femur and metastases in the lungs, and concluded: "the case is therefore of value in two ways: firstly, it proves clearly that giant-cell sarcomata do form metastases; and secondly, that giant-cells are reproduced in the secondary deposits." The case reported by Finch and Gleave (1926), with their review of several others, has also shown quite definitely that this may occur. In Case 4 there was alteration in the character of the tumour and the metastases were typical of sarcoma. In Cases 5 and 6 there was a definite histological report of malignant transformation but the micro-sections were not examined personally. In Case 7 there is clear evidence of local malignancy but whether or not this will lead to the development of metastases must, for the moment, remain problematical.

![Image](image-url)

**Fig. 23**

Case 7. Osteoclastoma of the tibia with local malignant change.

All five tumours in which it is presumed that malignant change has occurred were in the long bones. Three were in the humerus. This is a high proportion, considering that in only five was the humerus involved out of the total number of thirty-eight cases reported. An attempt has been made to examine the conditions or methods of treatment that might have predisposed to the development of malignant change. It appears that in Case 3 the only treatment was amputation. In Cases 4, 5, and 6, treatment was by curettage followed by X-ray treatment—given in Cases 4 and 5 by reason of recurrence and in Case 6 as a post-operative measure. In Case 7, after wide biopsy and subsequent X-ray therapy, there was the additional factor of trauma from the rubbing of the double leg iron on the site of the biopsy scar.

**CONCLUSIONS**

1. In this series of thirty-eight cases of osteoclastoma, twenty-five occurred at the end of a long bone. Nineteen were in the lower limb and half of these were near the knee joint; six were in the upper limb; of the remainder, nine occurred in the vertebrae or the sacrum.
2. More cases occurred in females than males, the ratio being twenty-three females to fifteen males. Just over half the cases occurred in the second and third decades.
3. In seven there was a definite history of injury preceding symptoms by several months.
4. It is often difficult to arrive at a diagnosis on clinical and radiographic findings alone. Histological information is usually necessary before a certain diagnosis can be made. A limited biopsy is safe and reliable.
5. Malignant change with the development of metastases occurs in a small proportion of cases, regardless of the particular treatment that has been employed. This is illustrated in Case 3 of this series, in the case reported by Gordon Taylor, and in the case reported by Finch and Gleave.
6. The methods of treatment used in the patients here reported included curettage or local excision, with or without radiation, and radiation alone.
7. The patients treated by curettage or excision were dealt with during an earlier period than those treated by irradiation alone, and an exact comparison of results is not possible. The follow-up of patients treated by radiotherapy alone is too short to exclude the possibility of recurrence; but the immediate results appear to show definite improvement upon those of surgical treatment.
8. In this limited series it is to be noted that malignant change occurred in a higher proportion of cases treated by curettage and radiotherapy than in those treated by radiotherapy alone.
9. It appears that, in the treatment of osteoclastoma of bone, radiotherapy alone is the treatment of choice.

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