AMPUTATION IN OSTEOSARCOMA

Disarticulation of the Hip or High Thigh Amputation for Lower Femoral Growths?

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Most osteosarcomas of the long bones occur around the knee, two out of three in the lower part of the femur. In the United Kingdom about three-quarters of such tumours are treated by amputation, often preceded by radiotherapy. When the time comes for amputation, the surgeon is faced with a difficult decision. At what level should he amputate? With upper tibial growths there is almost unanimous agreement that it should be through the thigh. There is no such agreed level in tumours of the lower femur. Many surgeons favour a high thigh amputation, leaving a short but useful stump (Dahlin and Coventry 1967). Almost as many others feel that the whole of the involved bone should be removed and advocate disarticulation of the hip in order to ensure complete local eradication of the tumour (Lee and Mackenzie 1964).

There are many other and some more important problems in the treatment of a patient with osteosarcoma, but the level of amputation is of fundamental importance, yet seldom discussed in the literature. One usually searches in vain for any reference to recurrence in the stump and I know of no series correlating survival with the level of amputation. In this paper I shall discuss in more detail the reasons I have already expressed (Sweetnam 1969) for supporting Cade (1955) in favouring disarticulation at the hip for lower femoral osteosarcoma in spite of the obvious functional, aesthetic and mechanical disadvantages.

In a recent paper (Sweetnam, Knowelden and Seddon 1971), we reported the findings of the Medical Research Council’s Working Party on Bone Sarcoma: 469 femoral and tibial growths were studied, 192 of which were osteosarcomas, and the results of their treatment were reviewed. There were 111 lower femoral growths, of which seventy-one were treated by amputation, either through the thigh or by disarticulation with or without preceding radiotherapy. Three of these were parosteal growths with better prognosis, and after their exclusion there remain sixty-eight patients, thirty of whom were treated by disarticulation and thirty-eight by amputation through the femur. They form an interesting group in which to compare the outcome of these alternatives. We have to consider why in the treatment of these similar tumours, some 44 per cent were denied the advantage of a femoral stump. The fear of inadequate local removal with a lesser chance of survival, or the possibility of recurrence in the stump, must surely have been the surgeon’s first consideration in advising this additional mutilation. Both must be considered in detail.

Survival—We have no definite evidence that disarticulation conveys a better prognosis for life than amputation through the upper femur well above the primary growth. Numbers in the present series are much too small for any comparison to be significant, but if all patients, whether or not amputation was preceded by radiotherapy, are included, ten of the thirty treated by disarticulation and eight of the thirty-eight treated by amputation through the femur survived more than five years. It might seem from these figures that those treated by disarticulation fared better, but, as in any such retrospective study, the two groups may not be comparable. In this example, preliminary radiotherapy was given to a smaller proportion of those undergoing amputation through the femur (fifteen out of thirty-nine) than those undergoing disarticulation at the hip (twenty out of thirty). For the present, therefore, no study of survival figures can give clear guidance about the best level of amputation. A review of the incidence of local recurrence proves more instructive.
Stump recurrence—Retrospective study may not reveal the true incidence of recurrence in the stump after high femoral amputation. This is particularly true if hospital records only are available for review, for it is during the terminal stage of the disease when the patient is at home that recurrence may occur, causing great, yet often unrecorded, suffering before death.

Disarticulation virtually ensures freedom from such recurrence. It did not occur in any of the thirty patients treated in this way. Those who favour amputation through the femur to leave a stump believe—possibly correctly—that their patients’ chances of survival are no less than after disarticulation. They also believe that the obvious advantage of leaving a stump outweighs what they regard as the relatively slight chance of recurrence in the stump. Possibly also, they do not regard very seriously the effects of such recurrence which, in any case, may occur only in the terminal stage of the disease.

![Radiograph](image)

**FIG. 1**
Radiograph on admission of a patient with six-week history of pain and swelling about the right knee. Treatment was by amputation through the femur three weeks later.

I believe that not enough emphasis has, in the past, been placed upon the comfort of the 80 per cent of patients with osteosarcoma who, in spite of treatment, will die from the disease. Cade’s advocacy of amputation only in those patients who, after a holding-course of irradiation, do not have pulmonary metastases, has surely been of the greatest kindness to those already doomed to die: many have thus been spared valueless amputation. To leave a femoral stump, however, is only a kindness if the incidence of local recurrence is low, for such recurrence terminally is a tragedy.

Review of the literature is unhelpful. However, experience at the Memorial Centre, New York, indicates a 15 per cent stump recurrence rate after amputation for “osteogenic” sarcoma (chondrosarcoma, fibrosarcoma and osteosarcoma). The site of tumour or amputation, though, is not defined (McKenna, Schwinn, Soong and Higinbotham 1966). At the Mayo Clinic, through-femur amputation for low femoral growths, with the safeguard of histological examination at the site of bone section, is usually advised. Dahlin and Coventry (1967) refer to ten patients “known to have stump recurrence”. The incidence is not clear, but it seems to be very low and certainly less than 4 per cent. One wonders whether the others were known not to have developed recurrence.

In the present series there was recurrence in the femoral stump in seven patients out of thirty-eight (16 per cent) treated by amputation through the femur, well clear of radiologically
visible tumour (Figs. 1 and 2). This figure is high and certainly very much higher than those already quoted. It has been obtained by a detailed review, not only of hospital notes, but in some cases also by correspondence with the patient's general practitioner. There has certainly not been histological proof in each case, but when any reasonable doubt remained recurrence was not accepted. In many patients details of the last months of life were not obtainable.

FIG. 2
Same patient as in Figure 1. There was a painful recurrence of the tumour in the stump, with considerable swelling and eventual fungation shortly before death.

Some of them also probably suffered recurrence; thus the true recurrence rate may be even higher than the confirmed figure of 16 per cent.

DISCUSSION

The decision to amputate through the hip joint or below it in a patient with an osteosarcoma of the lower femur must be based upon an assessment of the risk. One must balance, on the one hand, the obvious advantage of preserving a stump, and on the other, the danger of developing a recurrence if part of the involved bone is preserved. To this assessment must be added one's judgement of the importance of local recurrence in terms of pain and suffering in the terminal stages and also, although there is as yet no evidence either
way, the possibility of an improved prospect of survival with the more radical procedure. In short, does the benefit to the eight long-term survivors I have mentioned, who will retain a useful femoral stump for the rest of their lives, justify the terminal suffering of the seven less fortunate victims treated in the same way, but who suffered stump recurrence? No advantage is gained by leaving too short a stump. Less than 10 centimetres of femur measured from the level of the ischial tuberosity is virtually useless and, from the limb-fitting point of view, the patient is as well off with a hip disarticulation (Vitali 1972).

The figures I have quoted may have done little to help the surgeon in his dilemma. I hope, though, that I have clarified the basis upon which a decision can be taken and by the provision of a few facts made that decision a little easier. Until more facts are provided by the prospective study of a large number of patients treated in different ways, it remains my belief that it is wiser to amputate by disarticulation through the hip joint, thus ensuring freedom from local recurrence and possibly giving also a better prognosis.

**SUMMARY**

1. The question whether amputation for lower femoral osteosarcoma should be by disarticulation of the hip or through the upper femur to leave a stump is discussed.
2. Sixty-eight such patients are reviewed. Thirty were treated by disarticulation and thirty-eight by through-femur amputation.
3. There was a 16 per cent incidence of stump recurrence after through-femur amputation, but none after disarticulation. Comparison of survival was not conclusive.
4. Disarticulation of the hip is advised.

I wish to thank once again the many orthopaedic surgeons, pathologists and radiotherapists throughout the United Kingdom for their generous cooperation. I also wish to thank Professor R. Roaf and Mr Geoffrey Osborne for allowing me to reproduce Figures 1 and 2.

**REFERENCES**


