Radical surgery for the solitary bony metastasis from renal-cell carcinoma

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We carried out excision of a solitary bony metastasis from renal-cell carcinoma in 25 patients in the hope that this would produce a prolonged disease-free interval. Two patients had excisions only, five had amputations and 18 had excision and endoprosthetic replacement. The one-, three- and five-year cumulative survival rates were 88%, 54% and 13%, respectively.

There were three complications. One patient developed a local recurrence and three had problems related to the endoprosthesis.

We recommend radical excision of a solitary bony metastasis from renal-cell carcinoma to achieve local control of the tumour for the remainder of the patient’s life.

Received 9 March 1999; Accepted after revision 15 June 1999

By the time the tumour is diagnosed, between 29% and 57% of patients with renal-cell carcinoma will have metastases.1-4 Of these, between 0.7% and 2% will have a solitary bony metastasis.1,5

Patients with skeletal metastases often have marked morbidity and present with varying degrees of pain and loss of function. The aim of treatment is to control the tumour locally and to restore function. The surgical technique used must provide stability and avoid the need for further operations. Internal fixation and radiotherapy are unpredictable, especially if survival is likely to be greater than 12 months. Excision of the metastatic lesion and reconstruction are the preferred options. This is especially true for patients with solitary bony metastases in whom the five-year survival, after resection, has been reported to be as high as 45%.6 These tumours should be excised radically since the risk of local recurrence will be high with incomplete removal. If possible limb-salvage should be attempted with the insertion of an endoprosthesis.

There is little information available concerning the survival of patients with a solitary bony metastasis from renal-cell carcinoma after radical surgery. We present our experience and suggest recommendations for management.

Patients and Methods

We carried out a retrospective study of patients with a solitary metastasis from renal-cell carcinoma who were treated at our centre between 1976 and 1997. There were 25 patients (14 men, 11 women) with a mean age of 60.2 years (27 to 81) at the time of presentation of the metastasis. Each had a solitary bony deposit which had been excised and the primary tumour had been resected.

All patients were staged with MRI or CT of the metastasis, a bone scan and CT of the chest. If there was any doubt, a biopsy was done to confirm the histological diagnosis. Details of the patients are shown in Table I.

Of the 15 patients who presented with pathological fractures, four had had an intramedullary nail inserted before referral to our unit. One patient, who did not have a fracture, had had prophylactic intramedullary nailing. All five patients with intramedullary nails were seen because of increasing pain due to progression of the tumour, at a median time of eight months after fixation (Fig. 1). Wide excision of the metastasis and limb-salvage surgery were undertaken.

Ten patients had metastases which presented as a solitary bony lesion at a mean of 3.5 years (1 to 7) after a nephrectomy. A total of 15 patients had synchronous metastases either with a symptomatic lytic lesion of bone, which turned out to be a metastasis from a hitherto occult renal primary carcinoma, or a solitary metastasis, which was detected on staging of the primary growth.

After confirming the solitary nature of the metastasis, two patients had radical excision without reconstruction, five had amputation and 18 had excision and an endopros-
Table I. Details of the 25 patients with solitary bony metastasis, their treatment and follow-up

<table>
<thead>
<tr>
<th>Case</th>
<th>Site</th>
<th>Treatment</th>
<th>Type*</th>
<th>Time from diagnosis of primary to diagnosis of metastasis (mth)</th>
<th>Outcome</th>
<th>Time to latest follow-up or death (mth)</th>
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* M, metachronous; S, synchronous
† endoprosthetic replacement

Fig. 1a
A 27-year-old man had a pathological fracture of the left humerus fixed with an intramedullary nail followed by radiotherapy. Figure 1a – The tumour progressed and within three months he had a completely unstable and painful arm. Figure 1b – After complete excision of the involved bone and endoprosthetic replacement he was free from pain and survived for a further 20 months.
thetic replacement, as outlined in Table I. Amputation was only considered if the tumour was inoperable and there was a major functional loss or severe pain (Fig. 2). The cumulative survival was estimated by the Kaplan-Meier method.\(^7\)

**Results**

The 15 patients who presented with synchronous tumours (Table I) had a nephrectomy before treatment of the metastasis. Ten presented with metastases (Table I) with a mean disease-free interval after nephrectomy of 42.5 months (12 to 84).

Of the 25 patients, ten remained free from disease at a mean follow-up of 42 months (10 to 156), and 15 developed further metastases at a mean of 17.4 months (3 to 32).

One suffered a local recurrence seven months after excision of a metastasis from the proximal humerus. This was treated by a further excision, but the patient died 11 months later.

The overall survival from the time of the first metastasis at one, three and five years was 88%, 73% and 13%, respectively. There was no significant difference in survival between patients presenting with synchronous or later metastases, although no patient with the latter has survived for more than five years from the time of presentation (Fig. 3).

The cumulative survival of the 25 patients from the time of presentation with metastatic disease.

**Figure 2a –** A 68-year-old man developed increasing pain in his groin and leg because of a solitary renal metastasis of the left hemipelvis. **Figure 2b –** CT confirmed extensive destruction. He was confined to bed because of pain. **Figure 2c –** After a palliative hindquarter amputation he survived for 3.5 years.
The overall survival of the patients from the time of diagnosis of the renal tumour was better in the metachronous group. This reflected the disease-free interval between the diagnosis of the primary and the first solitary metastasis.

Fig. 4

The overall survival of the patients from the time of diagnosis of the renal tumour showed a trend for improved survival in the metachronous group, reflecting the disease-free interval between the diagnosis of the primary and the first solitary metastasis.

The overall survival of the patients from the time of diagnosis of the renal tumour was better in the metachronous group. This reflected the disease-free interval between the diagnosis of the primary and the first solitary metastasis (Fig. 4).

Patients with intramedullary nailing of a long bone had a similar rate of survival to those who had primary endoprothetic replacement. Patients with amputations had a similar survival to those undergoing limb-salvage.

There were seven complications, none of which resulted in major morbidity. Two patients had superficial wound infections which resolved with antibiotics. One developed wound necrosis after a distal femoral replacement. This was at the site of previous radiotherapy and required debridement and soft-tissue cover. One patient, who had a distal humeral replacement, developed two complications. She had a fracture of the ulnar component 40 months after surgery which required revision; 50 months later the distal humeral component showed aseptic loosening and was subsequently replaced. She remains alive 14 years after the primary surgery (Fig. 5).

Two patients had dislocation of a proximal femoral prosthesis which was reduced under anaesthesia. Both hips have since remained stable.

Discussion

Localised renal-cell carcinoma (stage 1 or 2 disease) carries a five-year survival of up to 65%. Once metastases become apparent this declines to 6%. Hence, in the presence of metastases, renal-cell carcinoma carries a dismal prognosis and most patients will die within 12 months.

Unfortunately, bony metastases from renal-cell carcinoma have an unpredictable response to radiotherapy and chemotherapy. Radiotherapy may predispose these

A 48-year-old woman presented with a painful elbow in November 1985. Figure 5a – Radiographs showed a destructive lesion of the right distal humerus and biopsy confirmed the diagnosis of a metastatic renal-cell carcinoma. Figure 5b – She had excision and reconstruction with a custom-made distal humerus and replacement of the elbow. After nephrectomy she remains alive 14 years later with good function. The prosthesis has been revised for loosening.
patients to pathological fractures. Metastases from renal-cell carcinoma are highly vascular. In some sites, particularly the spine, preoperative angiography and embolisation may reduce the morbidity and blood loss at the time of surgery. In our series, no patient had either angiography or embolisation. We have found that, while the tumour is highly vascular, there are a number of feeding vessels, which can be clearly identified and ligated at operation. Resection of a renal metastasis should be considered as a procedure similar to removal of a primary bone tumour with wide margins. The vascularity of the tumour is not important since its substance is never entered. If the intention is to ‘curette out’ the tumour as a palliative operation then the value of angiography and embolisation should be seriously considered.

Patients with solitary metastases have been known to have prolonged survival, with some patients living many years after removal of the metastasis. Between 13% and 35% of patients with a solitary metastasis have survived for five years, although these reports were of a heterogeneous group of patients, including those with bone, lung and brain metastases. Patients with a solitary lung metastasis, which can be completely resected, have a favourable prognosis, with a five-year survival of 45%. It is not well appreciated that patients with solitary bony metastases may also have prolonged survival.

Only the series reported by Swanson et al considered metastases in detail. Their five-year survival was 45%. This figure is a little misleading since the survival was considered after nephrectomy and not following the development of the metastasis. Interestingly, the five-year survival after nephrectomy for all our patients is also 45%.

Very few series have reported the results of excision of solitary bony metastases. Our five-year cumulative survival of 13% suggests that it is certainly worth considering radical surgery in these patients since some may enjoy prolonged survival.

Stener et al treated 17 patients with solitary musculoskeletal metastases aggressively. Although they do not report the cumulative survival, some of their patients survived for a considerable length of time. Like Pongracz, Zimmerman and Kotz, they felt that although the surgical treatment for the solitary bone metastasis was palliative, considerably higher rates of survival justified an aggressive approach.

The aim of this type of surgery, although palliative, is to give relief of pain and to allow rapid restoration of function. Although patients with widespread metastases, with a poor prognosis, may benefit from internal fixation and possible packing with cement, as recommended for metastatic bone disease in general, patients with a solitary metastasis are likely to present again with pain because of continuing osteolysis if treated in this way (Fig. 1). The value of reconstructive surgery with an endoprosthetic replacement is to improve local control of the tumour and to preserve function, as has also been noted by Chan et al. Wedin, Bauer and Wersäll have shown a rate of failure of fixation devices of 45% in patients with renal metastases who survived for two years. This was almost twice the risk in all other types of metastasis.

The decision to carry out an amputation is a particularly difficult one. In all our patients in whom this was undertaken there was no possible option for reconstruction which would have relieved pain and restored function. We were pleasantly surprised by the good use which they made of their artificial limbs and by their long survival.

Most series suggest that patients who present with metachronous metastases generally survive longer than those with synchronous deposits. This group is usually thought to have a better prognosis if they have a long disease-free interval, particularly if this is greater than 24 months. However, because of the small numbers, we could not investigate this trend in our series.

The role of nephrectomy in patients presenting with metastatic disease is also debatable. It has been reported that nephrectomy is justified only in patients with osseous metastases. These patients may have a better prognosis after the nephrectomy.

We recommend radical excision of the solitary bony metastasis in renal-cell carcinoma, both for control of local disease and because of the prospect of long-term survival in some patients. Despite aggressive surgical intervention, there is a low incidence of complications and rapid restoration of function, which is maintained.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

References


