Osseous metastases of renal cell carcinoma (RCC) are the second most frequent location after lung metastases. They rarely present as isolated location. When isolated, resection may offer five-year survival rates of 30–60%. The purpose of the current study is to focus on a particular subset, the isolated rib metastases (IRM). The files of six patients who underwent radical resection for IRM were reviewed. All had previous radical nephrectomy for clear-cell renal cancer. The mean age of these six men was 55.3 years. Preoperative evaluation included in all patients a conventional chest radiograph and thoracic computed tomography (CT) scanning. Chest wall resections were wide and curative. The mean disease-free interval (DFI) after renal cancer treatment was 25 months. There was no postoperative death. Two patients had synchronous disease. One of them developed two recurrences operated on by large resections. They survived for 77 and 81 months. The overall five and ten-year survival rates were respectively, 83 and 66.7%. IRM of RCC are rare and remain not well-known. Surgical wide resection is a safe and effective treatment.

© 2010 Published by European Association for Cardio-Thoracic Surgery. All rights reserved.

Keywords: Chest wall; Renal cancer; Osseous metastasis; Metastasectomy

1. Introduction

Renal cell carcinoma (RCC) represents 2% of cancer mortality worldwide. Its progression is estimated at 3% per year in the US [1]. Five-year survival of all stage RCC is 55.7% in Europe and 62.6% in the US [2]. RCC metastases are frequent, appearing in 25–50% of patients [3, 4] and may reveal the disease [5].

RCC bone metastases (BM) represent the second most common metastatic location after pulmonary metastases (20–40%) [6, 7]. Isolated BM are rare (0.7–2.5%) [1, 3, 4, 8]. Isolated bone metastasis is reported to be a good prognostic factor, with five-year survival varying between 30% and 60% [1, 3, 4, 6, 9]. RCC isolated thoracic wall metastases are published as case reports. Isolated rib metastatic location of RCC is rare and remains not well-known. RCC thoracic wall metastases are also manly associated with other organ metastatic locations (8–4.5%) [1, 6].

The purpose of the present study is to review the files of patients operated on for isolated rib metastases (IRM) of RCC and to discuss the place of surgical resection.

2. Patients and methods

The data of 78 patients who underwent surgery for RCC thoracic metastases between January 1984 and February 2005, in three centers, were reviewed. Five patients had only diagnostic procedures and the remaining 73 a radical resection. Among the last group, there were 65 cases of pulmonary parenchymal metastases, two cases of isolated mediastinal lymph node metastases and six cases of IRM. These six patients are the basis of this study.

All were male patients with a mean age of 55.3 years ranging from 44 to 61 years. In two patients the IRM were synchronous, revealing the renal cancer in one of them. All patients underwent radical nephrectomy for clear-cell renal carcinoma (right n=4, left n=2). Preoperative evaluation of IRM included in all patients: conventional chest radiograph and thoracic computed tomography (CT) scanning. Two patients had radionuclide bone scanning and one of them a diagnostic needle biopsy in another institution. All surgical procedures were performed through a thoracotomy in the area of the IRM location. After a systematic exploration of the pleural cavity and pulmonary parenchyma, the radical resection included: diseased rib, one rib and intercostal space above and below the tumor, the resection margins were 4 cm all around the lesion. Chest wall reconstruction was performed by the mean of soft tissue patch using either a 2-mm-thick Polytetrafluoroethylene (PTFE) (n=2) or a Vicryl® woven mesh (n=4).

Three patients underwent adjuvant chest wall radiotherapy (45 Gray) one of them had a concomitant chemotherapy. Another patient had exclusive adjuvant chemotherapy. Two patients did not have any adjuvant therapy. The
cumulative survival rate was estimated by the Kaplan–Meier method. The date of first rib resection was considered the starting point and the date of death or last contact as the end point (March 2007). The consent from the hospital institutional review board (IRB) was obtained.

3. Results

Clinical characteristics of the six patients with IRM are presented in Table 1. Data were complete for all patients. Records of the three surgical centers were collected in the same institution.

IRM were unilateral in all patients. Most of IRM were unique and right sided (4/6), their size varied from 1.8 to 9 cm. There was no pleural or parenchymal invasion.

All patients had an uneventful postoperative period. Mean follow-up was 8.5 years ranging between 4 and 20 years. In patients with metachronous IRM, the disease-free interval (DFI) after nephrectomy was 4, 14, 36 and 46 months (mean interval, 25 months). In the two patients with synchronous IRM, nephrectomy preceded costal resection (2 and 3 months).

Three patients developed disease recurrence all located in the thorax: 1st contralateral rib (patient 1) and contralateral pulmonary parenchyma (patient 3 and patient 4). DFI between the two metastatic episodes was 16, 11 and 14 months, respectively. All three patients had a radical surgical treatment for metastatic recurrence and none of them received complementary therapy. Eventually, patients 1 and 4 presented another tumor recurrence localised at contralateral kidney and lung, respectively. DFIs were 19 and 8 months. Radical surgical treatment was applied again for the two patients.

The overall five and ten-year survival rates were respectively, 83 and 66.7% (Fig. 1). Five patients of this series died from the evolution of their disease.

Data regarding RCC are shown in Table 2. All renal cancers were small staged (pT1–T2) and located within the kidney except one (patient 6: pT3).

4. Comment

Solitary and isolated BM of RCC are rare (0.7–2.5%) [1, 3, 4, 8]. Their prognosis is better than for multiple BM, mainly when they develop in peripheral or limb bones [1, 3, 4, 6, 10]. IRM are even rarer and, to our knowledge, no particular study in medical literature dealt with the subject. Preoperative evaluation, in our series, included systematically a chest radiograph and thoracic CT-scanning.

Preoperative needle biopsy was performed in only one patient before his admission in our department. Needle biopsy in this case was complicated by an important bleeding. Several investigators perform systematically preoperative needle biopsy [1, 4, 11], but do not state their complication rate. Others use needle biopsy only in case of diagnostic uncertainty [10] and finally some others never use it [6]. The hyper-vascularity of BM of RCC and the risk of tumor spread led us not to search for absolute preoperative histological proof, especially if the resection is supposed to be curative. In patients with extraosseous malignancies, when solitary abnormalities are noted in bone scintigraphy, the incidence of BM can reach 17% [12]. Bone scintigraphy is widely accepted as the test of choice for defining skeletal metastases [8]. Tumeh and co-workers [8] reported in a series of 41 patients with a history of cancer, presenting a single abnormality in a rib on radionuclide bone scanning, that only 9.8% of these images were due to malignant disease. Despite the low specificity of this test, it has a high sensitivity for screening to search for occult BM and should be widely performed.

Preoperative needle biopsy was performed in only one patient before his admission in our department. Needle biopsy in this case was complicated by an important bleeding. Several investigators perform systematically preoperative needle biopsy [1, 4, 11], but do not state their complication rate. Others use needle biopsy only in case of diagnostic uncertainty [10] and finally some others never use it [6]. The hyper-vascularity of BM of RCC and the risk of tumor spread led us not to search for absolute preoperative histological proof, especially if the resection is supposed to be curative. In patients with extraosseous malignancies, when solitary abnormalities are noted in bone scintigraphy, the incidence of BM can reach 17% [12]. Bone scintigraphy is widely accepted as the test of choice for defining skeletal metastases [8]. Tumeh and co-workers [8] reported in a series of 41 patients with a history of cancer, presenting a single abnormality in a rib on radionuclide bone scanning, that only 9.8% of these images were due to malignant disease. Despite the low specificity of this test, it has a high sensitivity for screening to search for occult BM and should be widely performed.

More recently, the use of 18F-FDG PET in the assessment of BM can offer better specificity. Kang et al. [13] showed that the (18) F-FDG PET had a sensitivity of 77.3% and specificity of 100% for BM, compared to 93.8% and 87.2% for combined CT and bone scan in the detection of RCC metastases.
Radical surgical treatment is considered the best approach for isolated BM of RCC [1, 14]. In fact, compared to other therapeutic approaches, wide surgical resection provides the best five-year survival rates. Wide resection was performed in all patients. To insure a complete and free margin resection we performed the resection of the rib below and the one under the metastatic rib. All resected tumors were metastases of a RCC. All resection margins were free from tumor cells.

The influence on survival of the second surgical interventions, the adjuvant chemotherapy or radiotherapy was not possible to analyze between those groups because of the small number of patients in each group. Jung and co-workers [1] reported in their series of 100 patients, treated for BM of RCC a five-year survival rates of 100% in a subgroup of nine patients who underwent radical surgical resections for solitary BM mainly located in long bones. Baloch and co-workers [3] observed five-year survival rates of 88% in a similar subgroup of patients. The evolution of RCC rib metastases could be similar to these located in other long bones if we consider ribs as long bones.

Jung and co-workers [1] considered the long DFI between nephrectomy and BM as a selection bias. However, there is some controversy regarding the influence on the long-term survival of the synchronous or metachronous character of BM. Several investigators believe that a long DFI offers some controversy regarding the influence on the long-term survival of a synchronous disease and not to be included in systemic hematogenous diffusion process.

5. Conclusion

IRM of RCC are rare. Surgical wide resection is a safe and effective treatment. The mechanism of cell tumor spread to bone is still unknown. The most commonly held hypothesis is that BM arise by hematogenous spread due to vascular invasion by the primary renal carcinoma. Lymphatic spread could be another mode of cancer cell dissemination. Renal lymphatic drainage is mostly directed to the thoracic duct. Renal tumor cells can further flow into the blood circulation. Lymphatic drainage of intercostal space is directed into the thoracic duct [15]. In the case of incontinent intercostal lymphatic vessels, tumor cells may back through from the thoracic duct into an intercostal space and rib (Fig. 2). Rib metastasis could be an indicator of a local disease and not to be included in systemic hematogenous diffusion process.

References


