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Treatment and outcomes of upper extremity metastases

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Abstract

The incidence of bone metastases increases in direct proportion to the incidence of cancer. Upper extremity metastases are also a serious surgical problem. It is very important to publish experiences on this subject. Treatment results of 80 patients with upper extremity metastases were collected retrospectively. 47 (58.75%) of the patients were male and 33 (41.25%) were female. The most common location for metastasis was the humerus and the most common surgical treatment was intramedullary nailing. Non-surgical treatments were used in 24 (30%) patients. Considering the severity of functional losses and the difficulty of surgical options, it is important to collect and evaluate the treatment approaches of upper extremity metastases.

Keywords: bone metastasis, upper extremity, humerus, intramedullary nailing

1. Introduction

Bone metastases are the third most common site in all metastases (1). Cancer metastasizes in 60-70% of patients (2). 1.2 million new metastasis cases are seen in America every year (3, 4). Although there is no definitive data about our country, it is estimated that there are about 300 thousand metastasis cases. Breast, kidney, lung, prostate, and thyroid metastases are malignancies with a high frequency in the first diagnosis. Clinically, 3-15% of cases have metastasis at first diagnosis (5-7). Therefore, the treatment of metastatic cancer disease is crucial.

Upper extremity metastases are seen less common compared to lower extremities and spine metastasis. Therefore, there are few studies in the literature for the upper extremity metastasis and there is no consensus about the optimal treatment for these conditions.

This article has aimed to evaluate different treatment methods and results in rare upper extremity metastasis sites.

2. Material and Methods

Data of 80 patients with radiologically, histopathologically, and scinthigraphically proven upper extremity metastases treated in our institution between 1999 and 2005 were analyzed. Data were evaluated according to patients, age, gender, primary malignancy, bone localization, operation, operation localization choice, and operations distribution in localizations. Direct radiographic methods were used in the initial admission, follow-up of all patients. In the postoperative follow-ups, our cases were followed up at six weeks, 3-, 5-, 7-, 9-, 11 months respectively, and at 3-month intervals in the following year.

Whole Body Bone Scintigraphy was performed with Sophy Camera DSX rectangular (single-headed) for preoperative diagnosis and staging in all cases. Microsoft Excel 2002 were used in the graphical and statistical analysis of the data.

3. Results

Between September 1999 and December 2005, 80 upper extremity metastases of 80 patients were included in the study. 47 (58.75%) of our patients were male, and 33 (41.25%) were female. The mean age of the cases in the series was 54.8. The distribution of our cases according to the diseases was as in Fig. 1. Lung carcinoma was the most common primary of the cases (19 cases, 23.75%). Breast carcinoma was the second most frequent, with 13 cases (16.25%). The most common location in the upper extremity was the humerus (80% of 80 cases). The diaphysis was the most common site in the humerus (44 cases, 55% in the upper extremity bones, 68.75% in the humerus). 70% of the patients have undergone surgery. 30% of the patients were managed with non-operative

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treatment methods and follow-up and/or radiotherapy. The most common operation was intramedullary nailing in 34 cases (62.97%). Tumor resection prostheses were the second common operation. (13 cases, 24.07%).

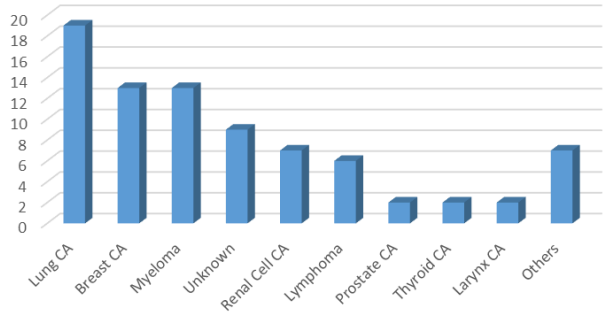

Fig. 1. Distribution of primary malignancy

The distribution of tumors in the clavicle was 2 (40%) lung carcinoma, 2 (40%) multiple myeloma, and 1 (20%) thyroid carcinoma. All metastases in the clavicle were followed up conservatively. Tumors in the scapula were seen as lymphoma in 2 (33.33%), multiple myeloma in 2 (33.33%), endometrial carcinoma in 1 (16.67%), and primary unknown in 1 (16.67%) patient. No operative approach was performed for any of the scapula tumors. 2 (50%) lung carcinomas, 1 (25%) myeloma, and 1 (25%) lymphoma of the metastases seen in the radius were found as primer tumors. The distribution of primary bone tumors in the humeral diaphysis was ranked as breast carcinoma (27.5%), lung carcinoma (20%), and multiple myeloma (17.5%) in the third place (Table 1). Eleven of our patients with involvement of the humeral diaphysis were breast carcinoma (25%). The frequencies are listed as lung carcinoma, multiple myeloma, and renal carcinoma.

Table 1. Distribution of metastases in the humeral diaphysis according to primary malignancies

Primary origin	Cases	%
Lung CA	8	18.2
Myeloma	7	15.9
Breast CA	11	25
Renal Cell CA	5	11.4
Prostate CA	2	4.5
Larynx CA	1	2.3
Lymphoma	2	4.5
Melanoma	1	2.37
Nasopharynx CA	1	2.37
Thyroid CA	1	2.37
Synovial Sarcoma	1	2.37
Unknown	4	9.1

Intramedullary nailing was chosen as the treatment method for 34 (72.27%) of these diaphyseal metastatic patients. Flexible rods in 5 (11.36%), radiotherapy and follow-up in 3 (6.8%) patients, hindquarter amputation in 1 case (2.23%), and total modular tumor resection humerus endoprosthesis in 1 case (2.23%) (Fig. 2. & 3.). The mean age of the cases proximal to the humerus was 58.25 years. Of 16 patients, 12 male and 6 female, 4 lung carcinoma, 4 primary site could not be found, 2 patients had breast carcinoma. others were cervical carcinoma, clear cell carcinoma, larynx carcinoma, lymphoma, multiple myeloma, and esophageal carcinoma. Modular tumor resection shoulder endoprosthesis was applied to 12 of them. 4 of them underwent radiotherapy and were kept under follow-up. Of the four male cases with a mean age of 65.25 years in the distal humerus, two had lung carcinoma and two had renal carcinoma. An above-elbow amputation was performed on one lung carcinoma patient. Elbow resection prosthesis was applied to one patient with renal carcinoma. 2 patients received radiotherapy and were only followed up.

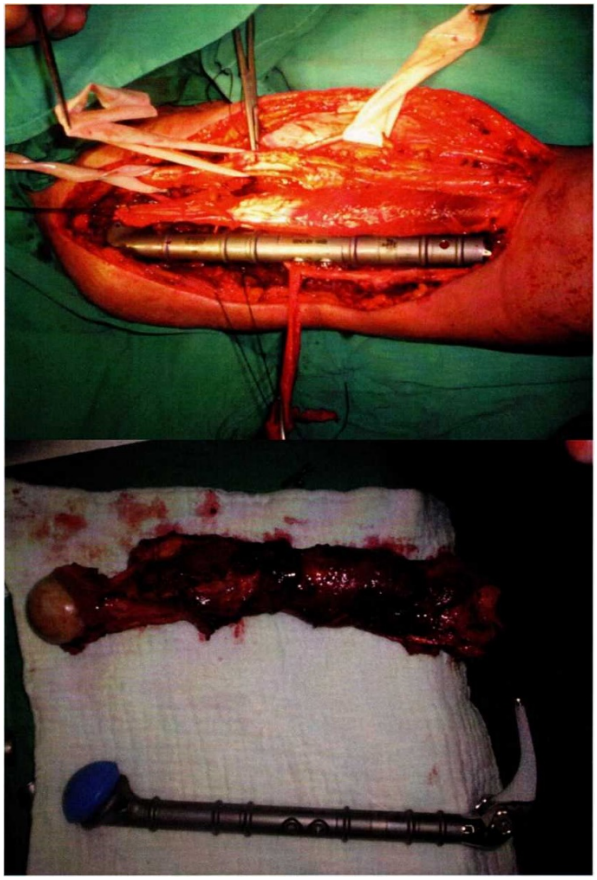

Fig. 2. Total humerus replacement

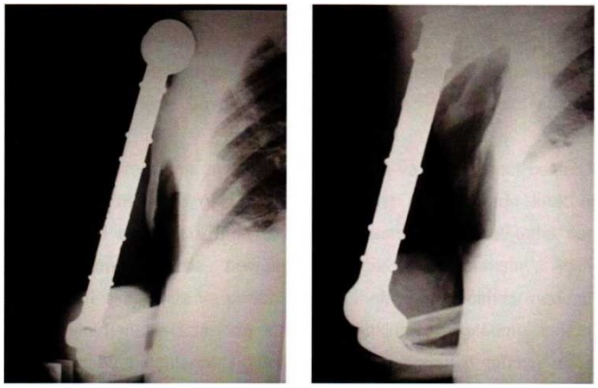

Fig. 3. Total humerus replacement (radiogram)

In terms of treatment methods, one of the two amputated cases was lung carcinoma and lymphoma. They were both male and their mean age was 67.5. The patient with lymphoma

had received radiotherapy before amputation.

The patient who underwent modular tumor resection elbow endoprosthesis was a 68-year-old male patient with renal carcinoma at a 7-year follow-up. Flexible rod and PMMA were applied 14 months before our operation. Modular resection elbow endoprosthesis was applied to the patient due to implant failure and implant migration to the elbow joint. The patient survived for 19 months without pain and with limited elbow movements.

The mean age of 12 patients who underwent shoulder endoprosthesis application was 55.5, and 8 were male and 4 were female. Of these patients, 4 (33.33%) were lung carcinoma, 2 (16.67%) breast carcinoma, and 2 (16.67%) were primary unknown. Others were clear cell carcinoma, carcinoma of the larynx, carcinoma of the cervix, and esophagus.

Of 5 patients (2 females, 3 males), a flexible rod (with Rush pin) was applied, all in the humeral diaphysis, 2 had breast carcinoma, 1 had larynx carcinoma, and 1 had renal carcinoma. No complications were encountered in our patients who remained in our follow-up period.

Lesions of all 34 patients who underwent intramedullary nailing were in the humeral diaphysis. The mean age of the patients was 57.85, and they had a distribution of 18 females and 16 males. Their distribution for the primer was as in Table 2.

Table 2. Distribution of primary malignancies of intramedullary nailing surgery cases

Primary	IMN cases	%
Breast CA	9	26
Lung CA	7	21
Multiple Myeloma	5	15
Renal Cell CA	3	9
Prostate CA	2	6
Nasophx CA	1	3
Malign Melanoma	1	3
Lymphoma	1	3
Synovial Sarcoma	1	3
Thyroid CA	1	3
Unknown	3	9

Only 2 (2.5%) patients were followed up without radiotherapy. Twenty-two (27.5%) of the patients were followed up after radiotherapy application. The mean age of these patients was 63.46 years, and they constituted a series of 24 cases consisting of 16 women and 8 men. The most common was multiple myeloma with 7 (29.17%). Lung carcinoma was the second with 6 (25%) cases. In order of frequency, 4 (16.67%) lymphomas, 4 (16.67%) were of unknown origin, 1 (4.12%) were renal carcinoma, endometrial carcinoma, and thyroid carcinoma. The bone distribution of this series was as in Table 3.

Table 3. Distribution of localizations of non-surgical cases

Bone	Number of cases	%
Clavicula	5	21
Humerus Diaphysis	4	17
Humerus Distalis	2	8
Humerus Proksimalis	4	17
Radius	3	13
Scapula	5	21
Ulna	1	4

4. Discussion

Despite surgical techniques and technological advances, metastatic bone tumors still represent great challenges for orthopedic oncologists (8). Upper and lower extremity bone metastases show serious differences in terms of tumor biology and functional expectations. In his study, Fidler showed no difference between the upper and lower extremities in terms of impending fracture.

We have limited information about fracture risk in metastases of the upper extremity since studies mainly focus on the lower extremity and peritrochanteric fractures. Mirels achieved important results in a scoring study to predict fracture risk in the light of these findings (2, 9). We did not use this scoring system in our series, but when the literature is reviewed, it is seen that this scoring has obvious advantages and is recommended.

There are several differences between upper extremity pathological fractures and lower extremity fractures. There are adhesion places of important soft tissue structures in the proximal humerus for shoulder functions, especially the rotator cuff. Therefore, the expected functional results in involvement close to the shoulder are quite limited. The intramedullary canal of the humerus is quite narrow, especially in women. This is one of the technical difficulties (5, 10). Intramedullary application in our series was preferred in diaphyseal involvement. It constituted an important group with a rate of 72.27%, and since breast carcinoma is the most common, this medullary canal stenosis was also observed by us. With adequate preoperative planning and examination of intact upper extremity radiographs, this problem has been eliminated. Breast, lung, and renal cell carcinoma often metastasize to the upper extremity, and myeloma and lymphoma can also metastasize. Of the patients in our study, 23.75% had lung carcinoma and 16.25% had breast carcinoma. Male patient dominance was 1/1.42.

The life of the cancer patient is limited. Fracture risk should be carefully evaluated in plain radiographs. Rigid fixation or arthroplasty should be chosen. Surgery should have minimal morbidity. These should be taken into account and planning should be done carefully. It is generally accepted that if the survival of more than 6 months is expected, surgery can be planned for metastases. After the detection of metastasis in breast cancer and lymphoma, the average survival rate is 28 months, in prostate and renal cancers it is 20 months, and in lung cancer, it is 6 months. However, the mean survival after

surgery for humeral metastases was found to be 8-10 months. Our series found the survival rates to be 26 months in breast carcinoma, 29 months in myeloma, and 9 months in lung carcinoma. While the best bone healing is expected in myeloma and renal cell carcinoma, bone healing cannot be seen in lung carcinomas. Regardless of the fixation technique in pathological fractures, bone healing is expected around 6 months.

Better results were obtained in cases with arthroplasty surgery compared to osteosynthesis. Better results were obtained with nailing in the diaphysis of long bones. Cementing can be added to procedures to increase the stability (11).

However, in our clinical observations, it should not be the first choice for being a major surgical procedure and yield approximately the same results as endoprosthesis and intramedullary nailing in terms of stability. Küntscher, Gama and Russell-Taylor nails can be used for this purpose (8).

Endoprostheses were used more frequently, especially in the lower extremities, and good results were obtained. Modular tumor prostheses became available in the late 1980s. For metastases, the combination of plate and rod with PMMA was the most common method. Endoprostheses may be the first choice in the failure of these reconstructions and extensive bone loss (12, 13).

Surgery is not the only option in the treatment of upper extremity metastases. Considering that the majority of those who underwent surgery were fractured or at risk of fracture. We did not perform surgery on all clavicle and scapula metastases, and we provided them with a painless extremity only with follow-up and radiotherapy. Radiotherapy was applied as 3000 cGy in ten sessions. In the literature, it was observed that 90% of the patients had a significant reduction in pain, and 50% of the patients were completely relieved of the pain. However, the results of radiotherapy in our study are not within the scope of the study (5).

The humerus was the only bone to be operated on and the approach varied according to the localization in the humerus. Curettage and PMMA can be used in the treatment of small and painful lesions, even without fixation.

However, none of the proximal humerus lesions among our patients were small enough to allow this. We decided to operate in 75% of these cases and applied tumor resection endoprosthesis in all of them. We observed a satisfactory functional and almost complete recovery in terms of pain.

In terms of pain, 58.82% of 34 intramedullary applications consisting of humeral diaphysis cases were completely healed and 29.41% were healed almost completely. Functionally, the shoulder joint range of motions were comfortable enough to allow daily activities. Although adequate results were published with flexible rods, especially in the 1980s, they are recommended with an undisputed superiority in the current approach, especially when cementing is added to intramedullary nailing.

Intramedullary nailing is the gold standard if Mirels scoring is used primarily for diaphyseal involvement.

Due to the low number of distal humerus cases (4 cases), we did not have the chance to try the recommended treatment protocols in sufficient numbers. We do not have enough data to contribute to the scientific discussion, with one case going to amputation due to severe soft tissue involvement and vascular nerve invasions. The other two cases were followed up with radiotherapy and tumor resection elbow prosthesis is applied only in one case. Osteosynthesis, PMMA application, and retrograde flexible rods are recommended for this region in the literature. Tumor resection elbow prosthesis is another recommended alternative in advanced cases.

Function after resection in humeral metastases remains a critical problem. Early range of motion exercises to be given after the treatment allow us to reach the maximum limits that can be reached in shoulder and elbow endoprosthesis (14).

The metastatic problems in the upper extremity region in orthopedic surgery are a very problematic issue regarding treatment outcome expectations and patient satisfaction.

However, when the upper extremity is examined alone, it is clear that significant gains can be achieved in cases that have not progressed compared to the lower extremities and that the pathological involvement does not tend to progress, as long as the results are better, especially if the functional expectations are not high.

Conflict of interest

None to declare.

Acknowledgments

None to declare.

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