

RADIOLOGIC CHARACTERISTICS OF PULMONARY METASTASES FROM DIFFERENT HISTOLOGICAL TYPES OF HUMAN SARCOMAS

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Summary: Pulmonary metastases configuration types were studied in 33 cases with osteogenic sarcoma, 35 cases with soft tissue sarcoma and 28 cases with malignant melanoma. It was found that the most frequent dissemination type was characterised by the presence of a limited number of large and medium sized metastatic deposits which was found in 40 out of 96 studied cases.

Solitary metastases were found most frequently (9/35 cases) in soft tissue sarcomas, while miliary and submiliary dissemination was characteristic for malignant melanoma cases. In our series in 4 out of 28 cases a miliary dissemination was ascertained. Medium and small sized metastases appeared in an almost identical proportion in osteogenic sarcoma (6/33 cases) and soft tissue sarcoma (5/35 cases), and was not observed in cases with malignant melanoma. Pleural effusion seems to appear in cases with metastases situated on the periphery of lung parenchyma.

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Introduction. — The contributions on radiologic appearance of pulmonary metastases originating from human sarcomas of different histological types published so far have shown that differences in their characteristics, such as the size and number, may exist. Therefore a systematic description and characterization of pulmonary metastases from different types of sarcomas may reveal that they appear in different configuration types, which may be present, for instance, in preponderance among cases with a known histological type of sarcoma.

The majority of studies on pulmonary metastases from malignant tumors, published in recent years are concerned with their growth characteristics, therefore differences in their radiologic appearance are reported sporadically.

In a study (Cohen et al. 1974) the value of the scanning procedure with Sr-85 was compared with the radiologic appearance of the pathological changes observed in a

patient with osteogenic sarcoma. It was noted that the pulmonary metastases were numerous and characteristically ossifying. In connection with this, the authors believe that radiologic examination is a superior method for detection and evaluation of pulmonary metastases.

Similarly, the radiologic appearance of pulmonary metastases was also described in seven cases with pulmonary metastases originating from osteogenic sarcomas where a study of the Gompertzian type of growth was carried out (Miller 1976).

Radiologic characteristics of pulmonary metastases were reported in a comparative study where differences were noted when comparing the radiologic appearance of pulmonary metastases originating from fibrosarcoma case to those from osteogenic sarcoma cases.

Pulmonary metastases from fibrosarcoma were found to be less numerous and their onset after primary treatment was delayed, a fact which could contribute to

a longer average survival. It was noted also, that longer survival periods were in relation to the histological differentiation of the primary tumor; the more differentiated tumor grows at a slower rate (Jefree and Price 1976).

Differences in the metastatic appearances were reported in a series of seven cases with fibroxanthoma of the soft tissue. Metastatic deposits were found in mediastinal lymph nodes, kidneys, bones, in pleural cavity but preferentially, that is in five out of seven cases, in the lungs. In two cases solitary and in three cases multiple metastatic deposits were diagnosed in the lungs. Regardless their size the metastases were characterized by a fast growth rate. (Burgener and Landmann 1976.)

Similar variations in the radiologic appearance, that is in the size and number of pulmonary metastases, were observed also in previous studies of growth characteristics of pulmonary metastases, reported elsewhere (Plesničar et al. 1976, Plesničar et al. 1978).

Therefore, the purpose of the present communication is to ascertain possible existing differences in the number, size, distribution patterns and interrelationship, in the radiologic appearance of pulmonary metastases from different types of human sarcomas. For this study, cases with pulmonary metastases from osteogenic sarcomas and malignant melanoma were considered.

Material and methods. — Patients with pulmonary metastases originating from three different sarcomas were included into the study. Consequently the lung radiographs were studied in 33 cases with osteogenic sarcoma, 35 cases with soft tissue sarcomas and 28 cases with malignant melanoma. Altogether, 96 patients with pulmonary metastases from the three types of sarcomas were studied.

The antero-posterior radiographs were taken on »Stratomatic-CGR« diagnostic x-ray machine at a standard 150 cm focus-skin distance and with tube voltage

being 150 kV. In the study were included cases with histologically confirmed primary sarcoma, not previously treated by chemo- or radiotherapy.

Configuration type of metastases	Group number (No.)	Osteogenic sarcoma	Soft tissue sarcoma	Malignant melanoma
		(Number of cases)		
Large sized, solitary	1	3	9	2
Large and medium sized, limited in number	2	14	12	14
Medium and small sized, numerous	3	6	5	1
Nodular, large number	4	0	0	2
Miliary dissemination	5	0	0	4
Ossifying metastases	6	3	0	0
Mediastinal lymph nodes metastases	7	0	4	0
Pleural effusion	8	7	5	0

Table — Distribution and frequency of pulmonary metastases configuration types from 96 patients with sarcomas (33 cases with osteogenic sarcoma, 35 cases with soft tissue sarcomas and 28 cases with malignant melanoma)

Results. — According to their morphological and, consequently, radiologic appearance several patterns of pulmonary metastatic growths were identified and subsequently grouped in the following pulmonary metastases configuration types:

1. large sized, and usually solitary metastases,
2. large and medium sized metastases appearing in limited number, possibly in both lung parenchymas,
3. medium and small sized, numerous metastases appearing in both lungs,

4. nodular or coarse granular metastases appearing in large number on both sides, the so called submiliary type of metastatic dissemination,
5. miliary dissemination, represented by a large number of small sized metastases spread throughout both lung fields,
6. primary ossifying and, usually, numerous metastases,
7. metastases in the mediastinal lymph nodes, and
8. pleural effusion.

Both last types, i. e. the metastatic spread in the mediastinal lymph nodes and pleural effusion are reported as they appear often in connection with the metastatic dissemination in the lungs.

The frequency and distribution of pulmonary metastases configuration types according to the site are presented in the table.

Osteogenic sarcoma. — In the majority of cases, that is in 14 out of 33 patients with pulmonary metastases from osteogenic sarcoma, the second type that is large and medium sized metastatic growths were detected (Type 2). The second according to their frequency were six cases with medium and small sized but numerous metastases (Type 3). To the same group belong also three cases with primary ossifying lung metastases (Type 6). Large sized and solitary metastases (Type 1) were found in three cases of the studied group.

Pleural effusion was ascertained in seven cases and it always went along with solitary or smaller metastases which were situated along the lung periphery. This was observed more frequently in advanced cases.

The submiliary or miliary metastatic dissemination (Type 4 and 5) were not observed in the studied series of patients with osteogenic sarcoma.

Soft tissue sarcomas. — In this group, cases with soft tissue sarcomas of diffe-

rent histology like fibrosarcomas, rhabdomyosarcomas, leiomyosarcomas and hemanghiopericytoma, liposarcoma and angiosarcoma were studied.

Again in the majority of cases, that is in 12 out of 35 patients large and medium sized metastases were found in a moderate number (Type 2), meanwhile the next according to the frequency were in this group large and solitary metastases. These were found in 9 out of 35 cases (Type 1).

Medium and small sized metastases in large number (Type 3) were detected in five cases. In one patient the radiologic appearance was characterized by the presence of large and medium sized together with numerous small sized metastases thus presenting a mixed picture of metastatic distribution (Type 2 and 3).

Metastatic deposits in mediastinal lymph nodes were observed in four cases. In one patient lymph node metastases appeared during the terminal period of disease, after a complete cure by irradiation of a solitary metastatic deposit in the right lung, which appeared and was treated months before.

Pleural effusion was found in five cases, and in all the cases it was an accompanying phenomenon of the pulmonary metastases.

Submiliary or miliary metastatic spread (Type 4 and 5) was not observed among patients of the studied series.

Malignant melanoma. — Large and medium sized metastases in moderate number (Type 2) were found in 14 out of 38 cases with malignant melanoma. Next according to their frequency were four cases with miliary dissemination (Type 5). In these cases miliary dissemination appeared always combined with other types of metastases or developed subsequently to the already present metastatic spread of other types. For instance, in two cases miliary dissemination was found together with large and medium sized metastases (Type 2) and in another two cases combined with the submiliary dissemination (Type 4). The

submiliary dissemination (Type 4) was diagnosed only in two cases, while independent miliary metastatic spread was not observed in the studied series. With the exception of one case submiliary and miliary dissemination of pulmonary metastases (Type 4 and 5) was found to appear simultaneously, and to distinguish and characterize the dissemination type usually present difficulties.

Solitary metastases (Type 1) were found in two while medium and small sized metastases (Type 3) were found in one case.

The interesting finding in the studied series was that pleural effusion was never found in cases with solitary metastases, whereas large, medium and small sized metastases (Type 2 and 3) were in our cases accompanied with pleural effusion.

From the presented observation of the metastatic dissemination of pulmonary metastases from osteogenic sarcoma, soft tissue sarcomas and malignant melanoma the following general characteristics, regarding their radiologic appearance can be deduced:

1. The most frequent metastatic dissemination type observed in almost equal proportion in all three instances is the appearance of a moderate number of large and medium sized pulmonary metastases (Type 2).

2. Solitary metastases (Type 1) were found most frequently in cases with soft tissue sarcomas followed by its frequency in cases with osteogenic sarcoma.

3. Submiliary and miliary dissemination (Type 4 and 5) were found in patients with malignant melanoma.

4. Numerous, medium and small sized metastases (Type 3) appeared in an almost equal number of patients in osteogenic sarcoma (6 cases) and soft tissue sarcomas (5 cases) while they were least frequent in the series of cases with malignant melanoma, probably because outweighed by the frequent appearance of submiliary and miliary dissemination.

5. Ossifying metastases were evidently found in cases with osteogenic sarcoma.

6. Mediastinal lymph node metastases were found only in cases with soft tissue sarcomas.

7. Pleural effusion seems to be always accompanying pulmonary metastases and in these series was never observed to appear independently. It appears most frequently in soft tissue sarcomas.

Discussion. — In the presented work an attempt was made to define the possible existing different pulmonary metastases configuration types in osteogenic sarcoma, soft tissue sarcomas and malignant melanoma. According to the presented findings the most frequent configuration type of metastatic spread to the lung is that characterized by the presence of a moderate number of large and medium sized metastatic growths in both lungs. Analysing further on, it was possible to ascertain that different metastatic configuration types were noted more frequently in cases with soft tissue sarcomas, while the miliary dissemination is characteristic for malignant melanoma cases. Medium and small sized metastases appeared in the same frequency in cases with osteogenic sarcoma and soft tissue sarcomas, while they could not be detected in malignant melanoma patients. Thus it appears that some of the described configuration types tend to be associated with a specific type of sarcomatous disease.

Accordingly, different therapeutic measures could be foreseen for different configuration types. Since the miliary dissemination is the most common final type of metastatic spread in malignant melanoma cases, it would be rational to treat with systemic chemotherapy such patients even in cases where large or medium size metastases are already present. In this way it would be at least possible to delay the appearance of miliary spread which leads the patients to the respiratory insufficiency and consecutive death. However, in

cases with solitary metastases which are frequently observed in patients with soft tissue sarcomas and were not ascertained to lead to miliary dissemination, surgical treatment would be recommended. In cases with a moderate number of large and medium sized metastases appearing relatively frequently in all three types of sarcomas, the possibility of a combination of chemotherapy and local, focused irradiation of predominantly large metastatic deposits demands further consideration. From these briefly mentioned possible applications of therapeutic measures it appears that the characterization of configuration types of metastatic spread in the lung could also have some practical bearing on the therapeutic planning.

S a ž e t a k

RENDGENOLOŠKE KARAKTERISTIKE PLUĆNIH METASTAZA RAZLIČNIH HISTOLOŠKIH TIPOVA SARKOMA ČOVEKA

Na Onkološkom institutu u Ljubljani proučavali smo udaljene metastaze u 33 slučaja primarnog osteogenog sarkoma, kod 37 bolesnika sa primarnim sarkomom mekih česti različitih delova tela i različite histologije i kod 30 slučajeva malignog melanoma. Osim u 4 slučaja metastaza u kosti radilo se skoro isključivo o metastazama u plućima, u pleuri i u mediastinumu. Broj naših slučajeva (96) prilično je visok i nam time omogućava analizu različitih tipova metastaziranja u pluća.

Svi primarni su tumori histološki potvrđeni. Metastaze u plućima merili smo u njihovom uspravnom (vertikalnom) i vodoravnom (horizontálnom) promeru na snimcima pod jednakim tehničkim uslovima i to na rendgenskim snimcima sa tvrdim zrakama 150 KV i kod udaljenosti žarište (fokus) — film 150 cm. U obzir smo uzeli samo slučajeve, kod kojih pluća nisu bila zračena i koji nisu primali hemoterapiju.

Broj, oblik, veličina i lokalizacija metastaza prikazani su na tabeli. Opis, nazive raspodelu kao i oznake odnosno karakteristike metastaze morali smo pronaći sami, jer ih u nama pristupačnoj literaturi nismo pronašli.

Sa stanovišta rendgenološke morfologije možemo metastaze u plućima podeliti na više grupa i to:

- a) velike — solitarne
- b) velike i srednje — malobrojne
- c) srednje i malene — mnogobrojne
- d) nodularne (gruba zrna) — jako mnogobrojne — submiliarne
- e) tipične miliarne
- f) primarno koštane — mnogobrojne
- g) metastaze u limfnim čvorovima mediastinuma
- h) pleuralni izliv.

Osteogeni sarkom je u plućima imao najviše velikih i srednjih — malobrojnih metastaza (14 slučajeva od 33 primera osteogenog sarkoma). Na drugom su mestu bile srednje i malene — mnogobrojne metastaze (6 slučajeva). U ovu grupu ulaze i metastaze, koje su bile primarno koštane — osificirane (3 slučajeva). Solitarne, velike metastaze bile su pronađene samo u 3 slučaja. Submiliarnih i tipično miliarnih metastaza kod osteogenog sarkoma nismo našli. Pleuralni izliv bio je u 7 slučajeva, ali nikada samostalno — pratio je uvek periferne metastaze u plućima.

Sarkomi mekih česti različite histologije (fibrosarkomi, rhabdomyosarkomi, leiomyosarkomi, hemangiopericitomi itd.) daju također najviše metastaza iz grupe velikih i srednjih, malobrojnih (12 slučajeva). Odmah iza njih dolaze velike, solitarne metastaze (9 slučajeva). Srednje velikih i malih, mnogobrojnih metastaza bilo je u plućima kod 5 bolesnika. Submiliarnih i tipično miliarnih metastaza u ovoj grupi sarkoma nismo našli. Pleuralni izliv bio je 5 puta i uvek je pratio metastaze u plućima — nije dakle nastupao samostalno. U limfnim čvorovima mediastinuma našli smo metastaze kod 4 bolesnika.

Kod malignog melanoma u plućima bilo je također najviše velikih i srednjih — malobrojnih metastaza (14 slučajeva) — isto kao i kod osteogenog sarkoma. Na drugom su pak mestu tipične miliarne metastaze, koje su u ovim slučajevima nastupile zajedno sa drugim tipovima metastaza ili su došle posle njih (2 puta nastupaju zajedno sa velikima i malobrojnim, a 2 puta zajedno sa submiliarnima). Submiliarne samostalne metastaze videli smo samo 2 puta, dok samostalnih tipičnih miliarnih metastaza uopšte nije bilo. Submiliarne i tipično miliarne metastaze nije bilo. Submiliarne i tipično miliarne metastaze nastupaju obično zajedno (4) i teško ih je međusobno razlikovati. Velike, solitarne metastaze videli smo u 2 slučaja. Pleuralni izliv je uvek pratio velike, srednje i malene — malobrojne i brojne metastaze, dok ga kod solitarnih metastaza nismo zapazili, što je neobično i baš obrnuto kao kod osteogenog sarkoma.

Nadamo se, da smo našom ocenom rendgenske morfologije pomogli kod razjašnjavanja

važnog pitanja plućnih metastaza kod različitih vrsta sarkoma, što može biti od pomoći prilikom donošenja odluka o eventualnom načinu terapije metastaza — pre svega solitarnih — u plućima.

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