ORIGINAL PAPER

The value of radio-imaging methods in the diagnosis of chest wall metastases

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Abstract

The aim of the study was to reveal the value of radio-imaging methods in the diagnostic assessment of chest wall metastases. We retrospectively reviewed 48 cases of chest wall metastases examined clinically, radiologically, by ultrasound, CT-scan and MRI. All cases were histologically assessed by surgical biopsies. Plain chest radiography (X-ray) was in all cases a prerequisite for any evaluation of the chest wall being of great value in demonstration of the displaced rib fractures, localized bony destruction and the detection of most soft tissue lesions. The ultrasound examination (US) allowed real time analysis and thus the functional imaging of the chest wall metastases with special interest in vascular impairment being limited by relatively small field of view with more difficulties in anatomical orientation. With involvement of bone marrow and spinal cord, MRI became the most sensitive and the most specific imaging method, successfully diagnosing intramedullar lesions in three cases. In the detection of chest wall infiltration by primary malignancies from the lung, pleura, pericardium, breast and spinal cord we preferred the CT-scan, which revealed the presence of the lesions in 29 cases with typically obtuse angles against the adjacent chest wall and pleura. In the imaging evaluation of malignant lymphoma the CT-scan demonstrated chest wall extension in five cases. CT-scan and MRI revealed chest wall localization for distant metastases in 14 cases. The imaging methods clearly showed the number, the extent, the anatomic reports and the aggressive characteristics of chest wall metastases being of great value in the decision of adequate therapy.

***Keywords*:** chest wall metastases, CT, US, X-ray, MRI.

Introduction

Resulting from hematogenic or lymphatic dissemination or by loco-regional step-by-step infiltration of an adjoining tumor, chest wall metastases develop as secondary complications in the development of various primary neoplasic entities. From the total of existing tumors, metastases occupy by far the first place as far as the frequency with which the chest wall is involved [1–4].

Owing to its complex anatomic structure, with various histopathological characteristics due to the multitude of its constituent tissues with different embryological origin and specific ontological development, the chest wall is one of the most common sites for metastases and malignant infiltration [5].

The skeletal contents rich in hematogenic red marrow explains the marked preference of hematogenic secondary determinations at this level. The common anatomic lymphatic drainage of the entire body in the venous angles at the level of the upper thoracic aperture represents the substrata of metastatic dissemination via the lymphatic system of malignancies whose primary locations are in the neck, thorax and abdominal cavity [6, 7].

Objectives

The study aims at underlining the role of radio-imagistic explorations in diagnosing and assessing the lesional damage of secondary tumors in the chest wall with an emphasis on the decisive role of these explorations in establishing adequate therapy.

Material and methods

Forty-eight cases of chest wall secondary tumoral formations have been statistically and retrospectively examined: clinical exam, X-ray, ultrasound, CT-scan and MRI. All the cases were confirmed post-operatively or by percutaneous needle biopsy.

Chest X-ray was the first choice investigation in AP standard incidence, profile ± tangential, ± special incidences for the sternum. The results obtained helped to assess the effectiveness of the first therapeutic steps, to sum up the initial extent of the damage and to decide upon further specific therapy or upon the necessity of complementary imagistic investigations. X-ray has always represented an important medico-legal document and an objective landmark in the development of the disease.

Ultrasound, always carried out at the beginning of investigations, completes X-ray in establishing and assessing parietal damage, being able to differentiate with maximum speed between a solid lesion and a cystic one, detecting at the same time the presence of possible subdiaphragmatic damage: hepatic, renal, spleenic, hemoperitoneal.

CT-scan of the thorax and upper abdomen made possible in all cases a thorough analysis of the thoracic

compartments: parietal, pleural, parenchymatous and mediastinal, due to its capacity of pluridensity study and its special ability of densitometric assessment of each regional thoracic tissue [8–10].

CT-scan was carried out following a technique of data-gathering by continuous native axial sections and using non-ionic intra-venous contrast medium, from the apex towards the caudal region, 10 mm thick and 10 mm sequences, the patients lying in supine position or prone position in the case of posterior thoracic damage, after having removed all metallic objects from the tegumentary surface or avoiding them by tilting the gantry.

MRI was carried out by using GE equipment of 0.5T, belonging to the Neuromed Diagnostic Center of Timişoara. The protocol consisted of spin-echo sequences in multiplane incidence: T1 native and post-contrast sagittal and coronal; T2 two-echo axial, and T1 native and post-contrast.

Results

The results of our study, concerning the value of radio-imaging methods in the diagnostic assessment of chest wall metastases, are shown below in Table 1 and Figures 1–5.

Table 1 – ***Histopathological results of secondary chest wall involvement following radio-imagistic investigations***

Metastatic lesional typology	No. of cases
Primitive malignant infiltrating damage of chest wall:	11
▪ *pleuro-pulmonary*	29
▪ *pericardial*	1
▪ *mammary*	14
▪ *neurogenic*	3
Chest wall relapses of malignant lymphoma	5
Chest wall metastases developed at a distance from the site of primary malignancy:	14
▪ *pharynx*	2
▪ *palate*	3
▪ *salivary glands*	5
▪ *stomach*	3
▪ *colon*	1
Total lesions	48

Discussions

X-ray and CT-scan revealed in all cases the existence of costo-vertebral osteolytic and/or regional sternal damage, as well as the presence of tumoral formations in the soft tissues of the chest wall.

The extension of the damage was assessed by ultrasound and MRI, the latter also revealing the existence of myelitic damage in three cases (Table 1, Figures 1 and 2).

In 29 cases, imaging revealed the existence of infiltrating parietal neoplastic damage belonging to various primitive malignant entities: pleuropulmonary, mammary and neurogenic.

Five of the cases present thoracic parietal relapses of malignant lymphomas, and 14 cases were diagnosed with thoracic parietal metastases situated at a distance from the site of the primary malignancy.

In every case, radio-imagistic exploration helped to quantify the number, extent, anatomical relations and the lesional character proper of each secondary thoracic parietal secondary malignancy, thus determining and guiding therapeutic approach (Figures 3–5).

Conclusions

Owing to the ability of simultaneous visualizing of all the anatomical structures involved, radio-imagistic examination is mandatory in the diagnosis and assessment of secondary parietal tumoral pathology, playing a key role in establishing adequate therapeutic conduct, as well as in subsequent evolutive monitoring.

References

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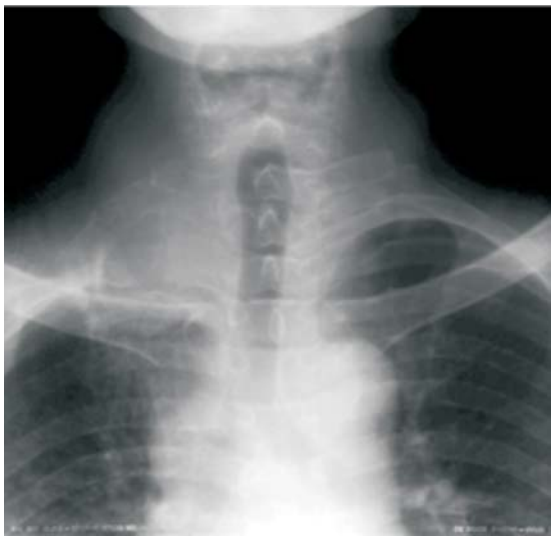

Figure 1 – ***Right pulmonary apex tumor infiltrating the posterior chest wall with osteolysis of adjacent costal arches***

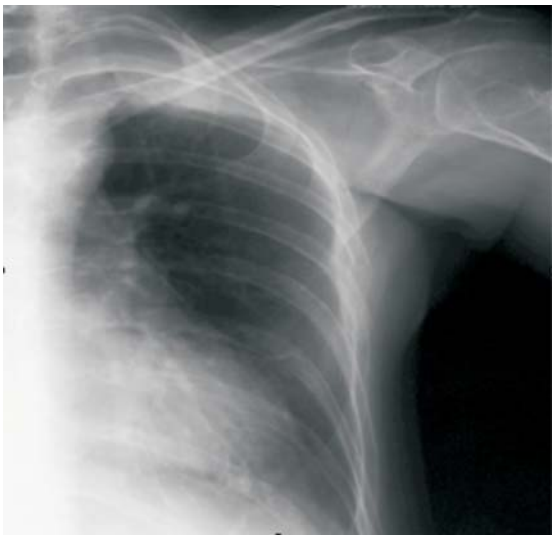

Figure 2 – ***Left latero-thoracic parietal metastasis with pathological fracture of the regional costal arch***

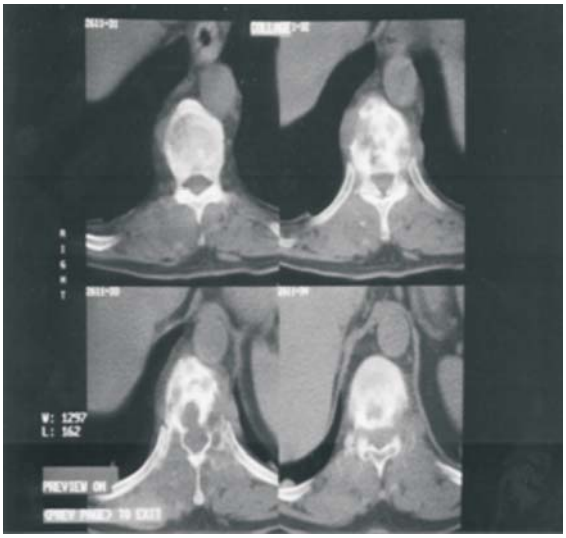

Figure 3 – ***Lower thoracic vertebral metastasis of osteolytic type, diagnosed by CT-scan***

Figure 4 – ***Secondary medullar involvement, revealed by MRI***

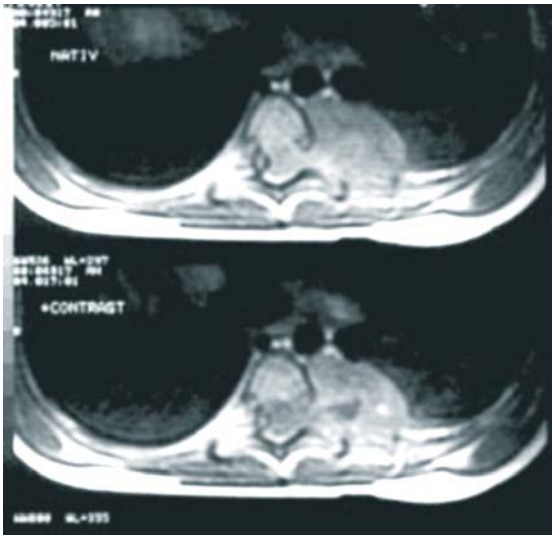

Figure 5 – ***Secondary parietal involvement in the infero-posterior thorax with medullar infiltration, revealed by MRI***