

心肌梗塞於全身骨骼造影之異常顯影

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摘要

核子醫學的全身骨骼掃描檢查是臨床上診斷各類骨病變時十分重要的工具，在某些情形下，軟組織也會攝取放射製劑並顯影在骨骼掃描的影像中，此類非預期性的發現，常意味著患者的其他生理或病理性變化。此病例為一 70 歲之肺癌婦女患者，安排全身骨骼掃描檢查的目的是為了治療後的定期追蹤。由於左前胸部在影像上出現疑似心臟活性的不明骨骼外顯影，經過一系列的核醫及心臟檢查(包括心肌梗塞造影、心臟射出分率檢查及心臟超音波等)，證明患者伴有臨床症狀不明顯的心肌梗塞及早期心室功能衰竭。由於此結果改變了患者後續的治療方向，特在此提出報告並討論相關的核醫檢查項目。(慈濟醫學 2002; 14:49-53)

關鍵語：骨骼掃描，心肌梗塞，心室功能衰竭

Myocardial Infarction: An Incidental Finding on Bone Scintigraphy

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ABSTRACT

Tc-99m MDP whole body bone scintigraphy was performed in a patient with lung cancer to detect bone metastases. However, unexpected cardiac uptake of tracer was found. After a series of cardiac studies (including Tc-99m PYP myocardial infarction scan, Tc-99m

labeled albumin cardiac functional evaluation, and cardiac echo), a final diagnosis of myocardial infarction with heart failure was impressed. Due to this interesting incidental finding, it's valuable to report this case and discuss the role of nuclear medicine in evaluation of cardiac abnormalities. (Tzu Chi Med J 2002; 14:49-53)

Key words: bone scintigraphy, myocardial infarction, heart failure

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INTRODUCTION

In nuclear medicine studies, Tc-99m methylene diphosphonate (MDP) bone scintigraphy serves as a useful tool for clinical survey because of its advantages of high sensitivity, low radiation exposure, and ease of operation. Soft tissue presentation is an uncommon finding on bone scintigraphy.

However, some definite occult soft tissue related problems such as cellulites [1], chronic renal failure [2,3], acute hepatic failure [4], and soft tissue tumor [5] might be demonstrated. Recently, a bone scan was requested for whole body investigation to a patient with lung cancer. Cardiac accumulation of radiotracer on scintigraphy was incidentally noted. After further cardiac studies, this patient was diagnosed with myocardial infarction (MI) with heart failure.

CASE REPORT

A 70-year-old woman was under therapy for lung cancer. She developed pleural effusion with chest pain and dyspnea and she was admitted to our service for help. On admission,

her general condition was stable, with no specific serum biochemical changes. Her EKG studies revealed no definite abnormality except chest roentography showed pleural effusion over her left lung field. In order to confirm the patient's bone metastasis status, a bone scan study was performed. The scintigraphy showed radiotracer accumulation over the middle portion of the right femur shaft and the right pedicle of the T-9 vertebral body (Fig. 1), showing possible bone metastases from her underlying malignancy. Diffusely increased radiouptake over the left lung field showed evidence of malignant pleural effusion [6]. Interestingly, radioactivity increments over the patient's left anterior chest area were also noted (Fig. 1, arrow heads), representing soft tissue uptake of the radiopharmaceutical by the heart. Tc-99m PYP myocardium infarction study was performed 2 days later to avoid residual radiotracer effects. Diffusely increased uptake of the tracer over the whole heart was clearly demonstrated (Fig. 2). According to this patient's clinical condition (chest tightness, dyspnea) and the results of this study, myocardial infarction with heart failure was highly suspected.

Tc-99m albumin for ejection fraction (EF) and wall motion studies was requested to evaluate cardiac function. Her global ejection fraction decreased (30%) with akinesia of the anterior wall and hypokinesia of the apex and inferior wall of left ventricle. Cardiac echo disclosed the same conditions and confirmed the diagnosis of heart failure. After conservative medical treatment (Ramipril 2.5 mg twice daily), the patient's clinical condition was stabilized and improved.

DISCUSSION

Chemisorption of phosphate or phosphonate compounds is the major mechanism for bone scan agent (Tc-99m MDP) binding into the skeleton (Fig. 3). In a dead cardiac cell after acute MI or heart failure, an influx of calcium and formation of various calcium phosphate

complexes can be observed. Tc-99m MDP is the radio-pharmaceutical used for bone scintigraphy. It diffuses into necrotic tissues and binds with the microcrystalline to form deposits. Therefore, lesion sites in the heart can be demonstrated when doing a whole body projection.

A Tc-99m PYP myocardium infarction scan is the study choice for MI evaluation because it can be localized in the mitochondria where hydroxyapatite crystals are deposited following cell damage. Theoretically, both Tc-99m PYP and Tc-99m MDP have similar radio-uptake pathways in damaged cardiac cells. However, Tc-99m PYP is clinically superior to Tc-99m MDP because of its better cardio image quality and slower soft tissue clearance rate. The uptake of radiotracer in acute MI usually begins within 12 to 24 hours, achieving maximum about 48 hours after attack [7]. Severity of disease is determined by comparing with the uptake intensity of tracer in adjunct ribs or sternum. Hence, grade 0 represents no cardiac uptake. Grade 2 means the uptake intensity is equal to that of the adjunct ribs (Grade 1 is defined as uptake intensity between Grade 0 and Grade 2). Grade 4, the most severe, means the uptake intensity is greater than that of the sternum (Grade 3 is between Grade 2 and Grade 4) [8].

Another important information for the diagnosis of MI is the changes of serum enzyme level. Cardiac enzymes such as creatine kinase (CK), MB-CK (specific myocardial isoenzyme), and lactate dehydrogenase (LDH) are commonly used in MI diagnosis due to their high sensitivity and specificity. Within 24-36 hours of onset of MI, a series of elevated plasma MB-CK levels are good indicators of the early stage of acute myocardial injury. However, MB-CK levels generally return to baseline approximately 48 hours after attack and then are not of value. In our patient, after 7 days of attack, the PYP scan still pictured the patient's infarcted myocardium even though her cardiac enzymes had returned to the

normal range. Therefore, in the late stage of cardiac MI, imaging with a Tc-99m PYP myocardial in-farction scan is more useful than cardiac enzymes.

In addition to morphologic study of the heart, functional study is also important for evaluation of cardiac condition. A cardiac output test determined by ejection fraction (EF) is the major evaluation of cardiac function [9,10]. EF is defined as the fraction of the left ventricular end-diastolic volume expelled during contraction. The average EF in normal subjects is within the range of 55% to 75% [11]. Nuclear medicine study with Tc-99m labeled albumin can be used to estimate the EF accurately. A diminished EF reflects poor cardiac function and prognosis. Using modern computer analysis with gated studies, the heart wall motion during the cardiac cycle can be clearly demonstrated. Wall motion abnormality is the results from the myocardial damage.

Bone scintigraphy has been widely applied for detecting bone destruction in various conditions. However, a more careful and detailed investigation of both skeletal structure and soft tissues is needed. Based on the clinical findings of this case, when traditional examinations (EKG, cardiac enzyme ... etc.) cannot provide a definite diagnosis in patients with acute cardiac symptoms, nuclear medicine studies can probably be considered as another useful diagnostic tool.

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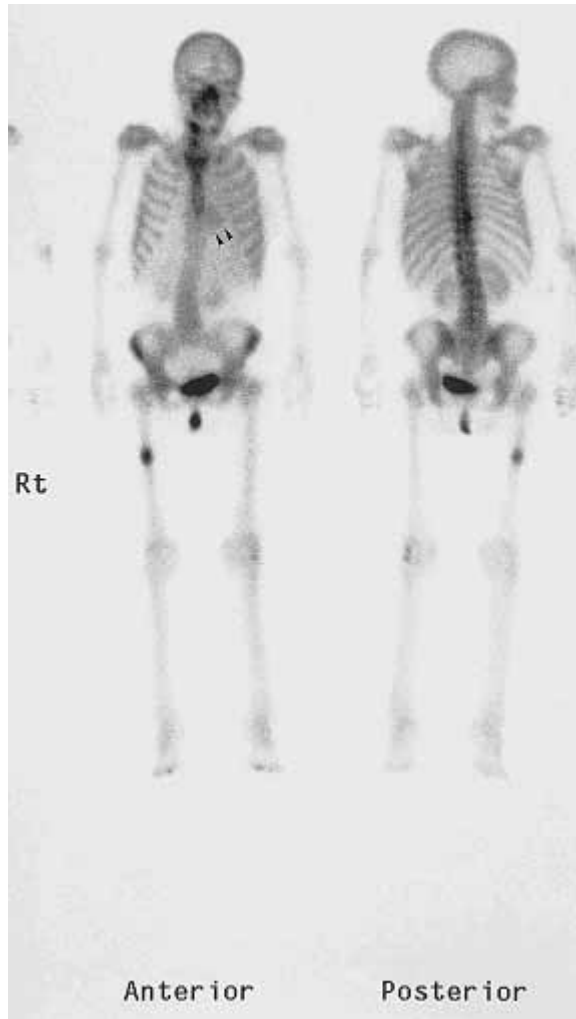


Fig. 1. Tc-99m MDP whole body bone scan of our patient. In addition to possible bone metastatic sites over the femur and vertebral body, faint visualization of a heart shadow is also demonstrated (arrow head), which represents soft tissue uptake of the radiopharmaceutical by the heart.

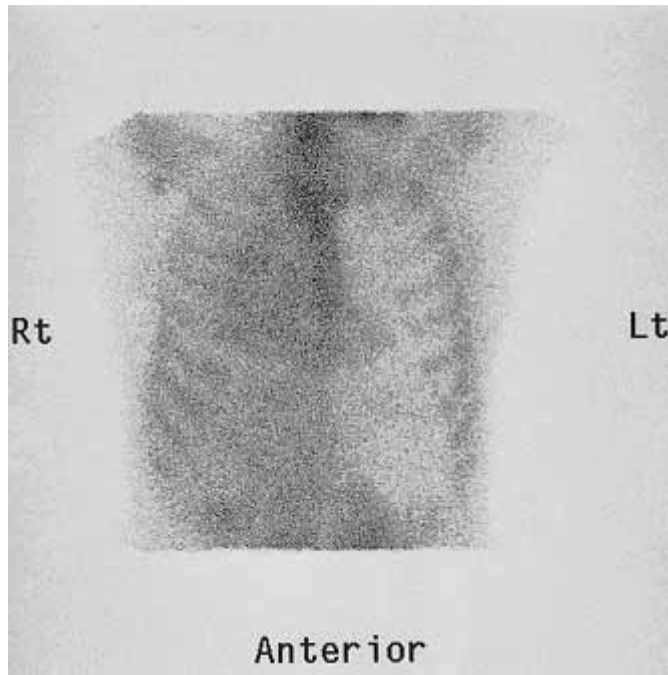


Fig. 2. Tc-99m PYP myocardial infarction scan performed 2 days after the bone scan shows generalized uptake of the tracer to nearly the whole heart. The intensity of radioactivity is similar to that of adjacent ribs (as Grade 2).

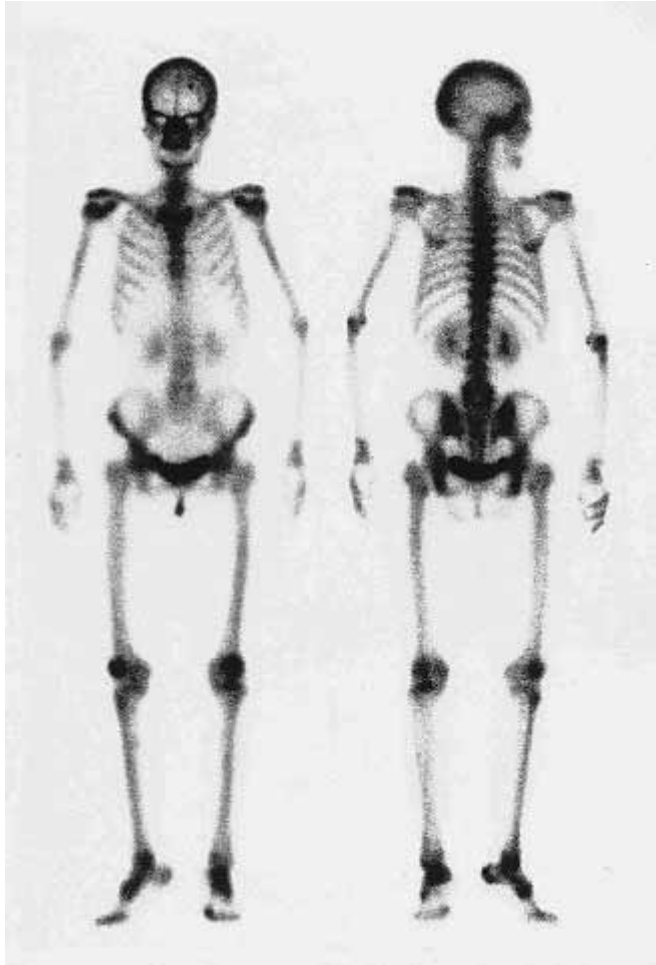


Fig. 3. A demonstration of a "normal" bone scintigraphy. This is an 82 year-old woman with lung cancer. Bone scintigraphy clearly demonstrates her whole body skeleton. No soft tissue shadow is present except in the kidneys and bladder.