

## INDICATIONS AND CONTRAINDICATIONS OF BONE SCAN

IBOLYA GANGWISCH<sup>1</sup>, ELISABETA ANTONESCU<sup>2</sup>, G. MIHULECEA<sup>3</sup>

<sup>1,2,3</sup> „Lucian Blaga” University of Sibiu

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**Abstract:** Bone scan is a diagnostic procedure that identifies areas with abnormal bone turnover by creating the image of a radioactive tracer collected in the skeletal system. The procedure is performed for a number of uses, enabling the detection of cancer in the earliest stages. There are no absolute contraindications regarding this procedure

**Cuvinte cheie:** scintigrafie osoasa, tumori maligne, indicatii de diagnostic, contraindicatii

**Rezumat:** Scintigrafia osoasă este o procedură diagnostică destinată evidențierii zonelor cu activitate metabolică osoasă anormală, realizată prin crearea imaginii distribuției unui radiofarmaceutic în sistemul osos. Această procedură are foarte multe aplicații, ușurând diagnosticarea cancerelor în faze incipiente. Nu există contraindicație absolută de aplicare a acestei proceduri.

Bone scan is a diagnostic procedure that identifies areas with abnormal bone turnover by creating the image of a radioactive tracer collected in the skeletal system.

The procedure consists of injecting a radiotracer and, after a certain amount of time, after the injection, the radiation emissions of the body are captured by a gamma camera and then turned into a computerised image.

### Indications of bone scan

Bone scan is one of the most commonly used types of static scans. The diagnostic procedure is used in the following situations:

- The identification and tracking of bone metastases, primarily from cancer in other areas such as the breast, the prostate or the lungs
- Cancer staging
- The diagnosis of primary malignant bone tumours (primary bone cancer) and the identification of multiplicity – namely of other locations of the same cancer type
- Alternative therapy to opioids in case of bone pain in bone metastases
- To highlight osteomyelitic processes
- To highlight occult bone fractures, compression fractures, stress fractures
- To highlight abnormal callus formation and of pseudoarthrosis
- To highlight aseptic necrosis
- To highlight mobility or inflammation in case of joint prosthesis – viability of prostheses
- To study the viability of bone implants
- To highlight pathologic changes in the bone turnover
- To highlight arthritis
- To investigate bone pains with unknown etiology

According to the guide for use of medical radiology and imagistic tests, which is a translation of the European Council Directive 97/43, developed by the French Society of Biophysics and Nuclear Medicine, drafted together with the National Agency for Accreditation and Assessment in the

Health System (ANAES) and with the support of the General Directorate for Nuclear Safety and Radioprotection (DGSNR), bone scans are indicated in the following diseases:

### A. Various types of cancer

1. In bronchopulmonary cancer, it is a test indicated for the extension evaluation, because it allows the evaluation of the entire skeletal system within a single image with the ability to detect bone metastases and thus facilitates the correction of the staging and of the therapeutic conduct.
2. In prostate cancer, it is a test indicated or the extension evaluation. The bone scan indication depends on the plasmatic PSA concentration, on the histology of the tumour, on the tumour extension and on the bone signals such as bone pain.
3. In breast cancer, it is used for:
  - pretherapeutic evaluation, for identification of remote metastases for the cases with favourable prognosis based on a multidisciplinary approach. There is no indication for the issuing of an extension evaluation before the infiltrant carcinoma diagnostic confirmation, and there is no „in situ” evaluation of the carcinoma
  - pretherapeutic evaluation, for identification of remote metastases for the cases with unfavourable prognosis. If obvious symptoms are not available, the evaluation must not be performed until the metastatic risk factors are assessed. In case mastectomy is predicted (large tumour) the evaluation can be performed before the surgery, in order to prevent mutilation of a person presenting metastases, even if the risk is reduced.
  - monitoring of breast cancer by identifying parietal recurrences, ganglion recurrence or metastases.
4. Bone scan and 18 FDG PET are useful for restaging in case of metastases or occult recurrences.
  - In nasopharyngeal cancers, it is an indicated test for the initial extension evaluation and in monitoring nasopharyngeal cancers by controlling the local and remote bone extensions
  - In pancreatic cancer, it is an indicated test in specific

<sup>1</sup>Corresponding Author: Elisabeta Antonescu, Faculty of Medicine “Victor Papilian” Sibiu, 2A, Lucian Blaga street, Sibiu, 550169, România, tel: +40 (269) 21.23.20

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cases for the extension evaluation, because it allows the evaluation of the entire skeletal system within a single image, especially useful in case of suspicion of bone metastases.

- In colorectal cancer, it is an indicated test in specific cases for the extension evaluation, and also as monitoring test, because it allows the evaluation of the entire skeletal system within a single image, especially useful in case of suspicion of bone metastases.
- In renal cancer, it is an indicated test in specific cases for the extension evaluation, because it allows the evaluation of the entire skeletal system within a single image, especially useful in case of suspicion of bone metastases.
- In cervical cancer, it is an indicated test in specific cases for the pretherapeutic extension evaluation (in case bone symptoms are associated)
- In uterine corpus cancer, it is an indicated test in specific cases for the pretherapeutic extension evaluation (in case bone symptoms are associated)
- In osteoarticular tumours, it is an indicated test for diagnosis and extension evaluation. Bone scan is indicated to ensure that a lesion is solitary. This investigation changes the diagnostic hypotheses depending whether the lesions are unique or multiple.

### **B. Musculoskeletal system**

1. In osteomyelitis, it is an indicated test, as triphasic bone scan is very sensitive, being able to identify multiple focal points, but it is quite unspecific. Sometimes it is necessary to use other radiotracers, such as gallium or marked leukocyte.
2. In primitive bone tumour, it is an indicated test. Bone scan must be quickly performed, before medical consultation in a specialised centre.
3. It is an indicated test when searching for bone metastases with known primitive tumour. The bone scan allows the study of the entire skeletal system. Although it is less specific, it is however more specific than standard x-ray imaging. Bone scan can help identifying the characteristics of the lesion and monitoring its evolution.
4. In bone pain, it is an indicated test. Bone scan is performed if the pain is persistent or under particular circumstances – when there is any suspicion of osteoid osteoma, osteomyelitis, bone metastases etc.
5. In myeloma, it is a specific test. Bone scan is frequently negative and underestimates the extension of the disease. Bone scan with MIBI allows an enhanced staging of the disease evolution.
6. In bone turnover disease, it is an indicated test. Bone scan can help identifying the etiology of hypercalcaemia or of the growth of alkaline phosphatase levels (Paget's disease, metastases, hyperparatiroidism, etc). It allows an extension and activity evaluation for Paget lesions, by lesion mapping. It might be useful for differentiating an old vertebral compression against a recent one and can identify the nature of possible bone pains unrelated to osteoporosis. It is necessary to establish a correspondence with standard x-ray imaging.
7. In osteomalacia, it is a specific test. Bone scan allows the identification of existence of focal points of hyperfixation that indicate fractures. In unknown condition, bone scan provides etiological arguments.
8. For painful prostheses, it is an indicated test. A normal triphasic bone scan shuts out most of the late complications. Specific bone scans allow the differentiation

of septic from aseptic prosthetic loosening.

9. In coxofemoral joint pain, it is a specific test. Bone scan can be used in case of negative x-ray imaging.
10. In coxofemoral joint pain due to ischemic necrosis, bone scan is an indicated test and is useful if the simple x-ray imaging is normal, primarily in patients with high risk. Bone scan allows identification of other possible focal points of dormant necrosis.
11. In thoracalgia, bone scan is indicated test only in specific cases. Bone scan is only useful for identification of possible metastases.
12. In lumbalgia, bone scan is performed in specific context or in case it is associated with serious signals like:
  - onset below 20 years of age
  - ponytail syndrome
  - sensitive or motor deficiency in the lower limbs
  - cancer record
  - HIV infection
  - weight loss
  - use of intravenous medication
  - corticotherapy
  - inflammatory pain

### **Contraindications of bone scan:**

There is no absolute contraindication. Relative contraindication in case of:

- Pregnancy, when the bone scan is performed only if the diagnostic value is significantly higher than the risk of exposure
- Breastfeeding, which must be interrupted for 24 hours after the injection of the radiotracer.

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