

Significance of the Solitary Lesion in Pediatric Bone Scanning: Concise Communication

Manuel L. Brown

Mayo Clinic, Rochester, Minnesota

This study was undertaken to determine the incidence and importance of the solitary lesion in pediatric bone scanning. One hundred four children with known or suspected malignancy had 340 scans performed. There were 62 scans with a solitary area of increased uptake, 24 of which (39%) were due to metastatic disease. The solitary lesion in a child with known malignancy must be evaluated further and followed clinically.

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Bone scintigraphy has come to play a very important role in the initial workup and followup of patients with known or suspected malignancy. The bone-scan findings range from the completely normal to a multifocal asymmetric pattern that we believe indicates a high probability of metastasis. The single focal lesion has been discussed by Shirazi et al. (1), Corcoran et al. (2), and Rappaport et al. (3). Each of these groups of investigators studied primarily an adult population. We undertook this study to determine the significance of the solitary lesion in a pediatric age-group.

MATERIALS AND METHODS

A survey was made of bone scans performed on pediatric patients with known or suspected malignancy. From 1975 through mid 1981, 340 scans were performed on 104 children. There were 43 female and 61 male patients. The age range was 3 mo to 18 yr, mean 9.9 yr. The studies had been performed after the administration of a Tc-99m-labeled bone tracer (pyrophosphate for the early studies and methylene diphosphonate for the later examinations). The studies were performed on various types of equipment, including dual-head rectilinear scanners and gamma cameras.

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For reprints contact: Manuel L. Brown, MD, Mayo Clinic, 200 First St., SW, Rochester, MN 55905.

Each bone scan was reviewed to ascertain whether it was normal or abnormal and, if abnormal, whether a single lesion was present. A determination was then made regarding the cause of the lesion. The diagnosis of a benign condition required either a normal or a benign finding by radiography and 12 mo of clinical followup. The diagnosis of a metastatic lesion required either biopsy or classic radiographic findings and clinical followup.

In patients with a primary bone tumor, either osteogenic sarcoma or Ewing's sarcoma, the primary site of the tumor was not included in the evaluation.

RESULTS

The results for the 340 scans are given in Table 1.

In the group of patients with a single focus of increased uptake, 38 of 62 lesions (61%) were benign and 24 of 62 (39%) were due to metastasis. The diagnosis of metastasis was made in 16 of 24 patients (67%) by biopsy and in 8 of 24 (33%) by classic radiographic findings and clinical followup.

DISCUSSION

The single focal abnormality is not a common finding, but its presence must give rise to some concern (Table 2). Shirazi et al. (1) reviewed their large experience with F-18 bone scanning without regard to age or clinical

TABLE 1. RESULTS OF SCANS BY DISEASE AND ANATOMIC SITE

Disease	No. of patients	Total no. of scans	No. of scans with solitary lesions	Solitary lesions due to metastasis	Distribution of lesions								
					Feet & hands	Arms & legs	Ribs	Spine & pelvis	Head				
Ewing's sarcoma	46	244	43	8	8B	15B	2M	1M	7B	2M	5B	3M	
Osteogenic sarcoma	28	43	9	8			3M	1M	1B	3M		1M	
Other sarcomas	18	32	3	2				1B		1M		1M	
Neuroblastoma	12	21	7	6		1B	4M					2M	
Total	104	340	62	24	8B	16B	9M	1B	2M	8B	6M	5B	7M

(B = benign; M = metastatic)

TABLE 2. SUMMARY OF SOLITARY LESIONS FROM OTHER REPORTS, BY ANATOMIC SITE

Report	% of solitary lesions due to metastasis	Distribution			
		Axial region	Skull	Extremities	Ribs
Shirazi et al. (1)	54	27/38*	8/11	13/25	15/26
Corcoran et al. (2)†	64	40/50	4/8	12/20	2/12
Rappaport et al. (3)	19	1/7	0/2	1/6	2/6
This report	39	6/14	7/12	9/33	2/3
Total		74/109	19/33	35/84	21/47

* Ratio of solitary metastases lesions due to metastasis to total of solitary lesions

† Excluding studies not definitely established

indication. In that group there were nine primary bone tumors that were considered solitary lesions. In the present report, we excluded the primary site of primary bone tumors from consideration. Since osteosarcoma and Ewing's sarcoma predominated in our series of pediatric patients, to include the primary site of the bone tumor as a solitary lesion would have greatly increased our incidence of malignant solitary bone lesions. The series of Corcoran et al. (2) and Rappaport et al. (3) included only patients with extrasosseous malignancies, but their patients were primarily adults.

As in the other reports on solitary lesions, the percentage of metastatic lesions varied by the anatomic location (Table 2). Children have relatively fewer solitary lesions due to metastasis than the adults in the other series; this is partly because of the large number of extremity lesions due to trauma (24 of 33). However, we agree with Corcoran's statement that "the distribution of proved benign and malignant lesions in each anatomic area . . . should not be used in determining probabilities for specific patients" (2).

Although the various series differ in percentage of solitary lesions that are due to metastasis, the overall impression is that a solitary lesion in a patient with a known or suspected malignancy cannot be assumed to be benign or malignant; rather, routine radiography in addition to the history and physical examination will often reveal the nature of the lesion. And more involved procedures such as tomography and computerized tomography can be reserved for those cases not resolved by routine radiographic examination.

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