POSITIVE ^{85}Sr BONE SCANS IN PERIOSTEAL NEW BONE FORMATION

The authors of the article "Positive ^{87m}Sr Bone Scan in a Case of Hypertrophic Pulmonary Osteoarthropathy" (*1*) are to be congratulated for their interesting presentation. Their article shows how the paraneoplastic hypertrophic bone formation in bronchogenic carcinoma can simulate metastatic skeletal lesions on the bone scintigram. In contrast to metastases, however, the increased strontium uptake in the areas with new bone formation returns to normal after radiotherapy of the pulmonary tumor according to our experience (*2*).

A similar pattern of the skeletal scan as in cases with pulmonary hypertrophic osteoarthropathy is found in the EMO syndrome, also called "thyroid acropachy." This syndrome is characterized by a triad of signs, exophthalmos, circumscribed myxoedema, and periosteal new bone formation. It occurs in patients who are or have been hyperthyroid. Reports on the syndrome are rare; its incidence is supposed to be about 0.1% of all thyroid patients. However, by application of bone scintigraphy even in subclinical and radiological inapparent cases the osteoarthropathy can be diagnosed.

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AUTHOR'S REPLY: POSITIVE BONE SCINTIGRAPHY IN SECONDARY HYPERTROPHIC OSTEOARTHROPATHY

We are glad to know that both Dr. Bieler's group (*1*) and our group (*2*) have independently confirmed each other's observation on positive strontium bone scan in hypertrophic pulmonary osteoarthropathy (HPO). In addition, they have illustrated positive bone scan in another variety of secondary osteoarthropathy, namely, EMO syndrome, also known as "thyroid acropachy" (*3,4*). The syndrome of thyroid acropachy (TA) is characterized by clubbing of the fingers, exophthalmos, and pretibial myxedema. Bone changes are often present, but they are not necessarily a part of the syndrome.

TA is a rare manifestation of Graves' disease. When it occurs, it usually follows subtotal thyroidectomy, ^{131}I therapy, or antithyroid drugs. However, it may also be associated with active hyperthyroidism. Despite the greater incidence of hyperthyroidism in females, TA is more common in males. The course of TA is usually benign. The osteoarthropathy of TA does not respond to thyroid administration.

This disease results in changes not only in the bones but also in the soft tissues. Roentgenographic examination reveals marked soft-tissue enlargement involving the hands, ankle, feet, and toes particularly on their dorsal aspects. Bone changes include periosteal new bone formation particularly on the dorsal aspects of the metacarpals (minimal bone changes in the metatarsals) and to a lesser extent along the distal half of the radius, ulna, tibia, and fibula (cf. HPO). The roentgenographic appearance of periosteal reaction in HPO and TA differs in that in the former the periosteal reaction is lamellar and oriented parallel to the long axis of the bone while in the latter periosteal reaction is composed of vertical striations creating a slightly feathery appearance (bubbles on the bone surface).

Although the exact pathogenesis of osteoarthropathy following post-treatment hypothyroidism is not known, it is thought that the sudden change from a condition of hyperthyroidism to one of hypothyroidism with resultant circulatory changes is the factor responsible for osteoarthropathy in these cases. Thus removal of the causative factors results in regression of the periosteal new bone formation in HPO, whereas removal of the diseased gland is the usual antecedent in TA. The role of pituitary dysfunction in TA remains unclear.

The radiological and/or clinical regression of HPO occurs not only after radiotherapy but may also happen following several other procedures (*5,6*)

such as (A) surgical removal of the tumor in the lung, (B) pneumonectomy, (C) hilar resection, (D) vagotomy, (E) section of intercostal nerves, (F) pulmonary artery division, or (G) corticosteroid therapy. The explanation for this observation is still obscure. The possibility of autonomic vascular reflex has been suggested. Even the exact mechanism of production of HPO is not yet clear. Theories of hypoxia and afferent vagal reflex have been postulated. Therapeutic effect on the disappearance of strontium uptake in HPO has no significance in the pretherapy differential diagnosis of HPO and metastases. Roentgenographic and clinical findings are at present suitable means to differentiate HPO from metastases prior to the institution of any therapy. The clinical and radiological evidences of disappearance of HPO after radiotherapy and several other procedures (as mentioned above) have been well documented in the literature (*5–7*). However, the interesting observation in one case (*1*) is that HPO did not disappear radiographically, yet the scan returned to normal. The strontium scintiscan thus seems to detect the effect of therapy on HPO earlier than does x-ray. It would be of further interest to see if the scintigraphy of HPO returns to normal after vagotomy or section of intercostal nerves.

Since the signs and symptoms of HPO may appear before the primary disease in the lung is diagnosed a positive (in the areas of typical distribution of HPO) strontium bone scan may, in retrospect, lead the physician to think of lung pathology in a patient in whom lung disease had never been thought of. Although the bone scintigraphy can be used to diagnose osteoarthropathy in subclinical and radiologically inapparent cases; here again I wish to stress that strontium bone scan is nonspecific. Strontium bone scan may show increased uptake in other conditions associated with periosteal new bone formation, namely pachydermoperiostosis, periostitis deformans, periostitis secondary to vascular disease, hyperostosis corticalis generalisata familialis, and various other osteoarthropathies.

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FEASIBILITY STUDY OF ^{99m}Tc PRODUCTION ON A MEDICAL CYCLOTRON

In the excellent feasibility study reported by Beaver, et al (*1*) the authors indicate that their results depend on the correctness of the p,n cross sections reported in the literature (*2*) for the copper monitor foils [". . . all yield data are relative to the published cross sections (*2*) for ^{63}Cu(p,n)^{63}Zn and ^{65}Cu(p,n)^{65}Zn reactions (*1*)"].

Unfortunately, there is much disagreement reported in the literature for p,n and other nuclear reactions with copper (*3–9*). This state of affairs has prompted us to measure some copper nuclear-reaction cross sections independently and compare them with values previously reported in the literature (*10*). We wish to report that the reference values used in the study of Beaver, et al are in agreement (within experimental errors) to the best values compiled in our report.

We also would be interested to learn what type of target design the authors propose to use. Since expensive, enriched isotopic targets are involved, the details of target design and product recovery can be very significant in determining the practicality of ^{99m}Tc production on a medical cyclotron.

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