KAWASAKI MED. J. VOL. 14 : NO. 2, 109-113 (1988)

Gallium-67 Citrate Scintigraphy in Sternocostoclavicular Hyperostosis

Nobuaki OTSUKA, Masao FUKUNAGA, Koichi MORITA, Shimato ONO, Kiyohisa NAGAI, Tatsushi TOMOMITSU, Shinichi YANAGIMOTO, Yosuke HINO,* Yoshiki YAMANO,* Ryo WATANABE,* Soichi NISHISHITA and Rikushi MORITA**

Department of Nuclear Medicine,
**Department of Orthopedic Surgery and*
***Department of Radiology,*
Kawasaki Medical School, Kurashiki 701-01, Japan

Accepted for publication on July 1, 1988

ABSTRACT. Four patients with sternocostoclavicular hyperostosis showing abnormal uptake on Ga-67 citrate imaging are described.

The combination of Ga-67 citrate and bone scintigraphies would contribute to the correct diagnosis of sternocostoclavicular hyperostosis.

Key words : ^{67}Ga scan — sternocostoclavicular hyperostosis

As the successful management of sternocostoclavicular hyperostosis (SCCH) is dependent upon the control of the inflammation, it is essential to evaluate correctly the activity of the disease. Bone scintigraphy using Tc-99m labeled phosphorus compound was widely used in the detection of the lesion in SCCH.[1-3] However, Tc-99m labeled phosphorus compounds accumulate not in the lesion itself but in the reactive bone formation around the lesion.[4,5] Ga-67 citrate also concentrates, in a different mechanism from bone seeking agents, in the involved bones in SCCH.

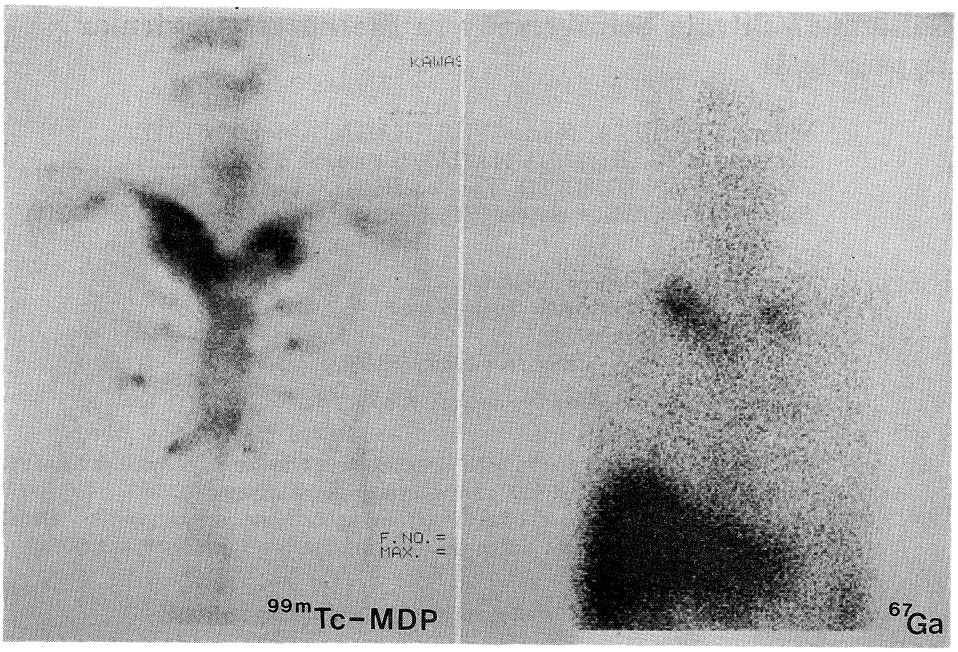
The mechanism of the accumulation of Ga-67 citrate in this inflammatory process was postulated as follows: increased vascular permeability, the expanded extracellular space, the labeling of Ga-67 citrate to the increased leukocytes and bacteria, and the presence of Gallium bindings proteins in the inflammatory sites.[6]

Therefore, Ga-67 citrate scan seems to demonstrate more correctly the activity of the inflammation. In this study, Ga-67 citrate and bone scintigraphies were performed to evaluate the activity of the inflammation in SCCH.

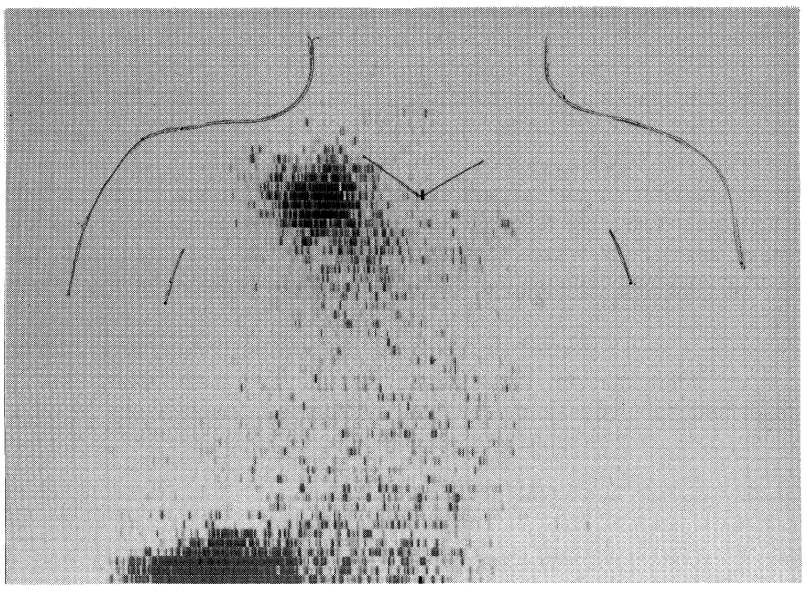
CASE REPORTS

Case 1 : A 61-year-old man with 7-years history of SCCH was recently referred to our department because of the increasing pain from the right clavicle to the right arm. Laboratory data were as follows: CRP 12.8 mg/dl (normal range$<$0.6), ESR 75 mm/1 hr (normal range$<$10) and alkaline phosphatase (ALP) 144 I.U./L (normal range 25-80). Bone scintigraphy showed an increased

大塚信昭，福永仁夫，森田浩一，小野志磨人，永井清久，友光達志，柳元真一，日野洋介，
山野慶樹，渡辺　良，西下創一，森田陸司



a b



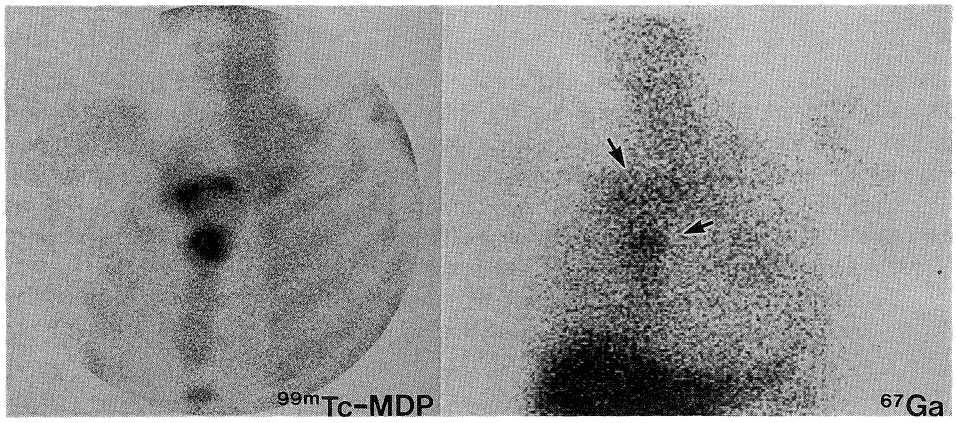
c

Fig. 1 a. Bone imaging shows abnormal accumulations in both clavicles and first ribs.
b. Ga-67 citrate image demonstrates abnormal uptakes in the same distribution as Tc-99m MDP.
c. Ga-67 citrate image obtained 7 years ago shows an abnormal accumulation in the right clavicle.

uptake in the both clavicles, the first ribs and the costosternal joints (Fig. 1a). However, no apparent changes could be seen, in comparison with the previous scans. Ga-67 citrate scintigraphy showed an increased uptake in the involved lesion (Fig. 1b), and its grade of the accumulation advanced far, comparing with the previous scan (Fig. 1c).

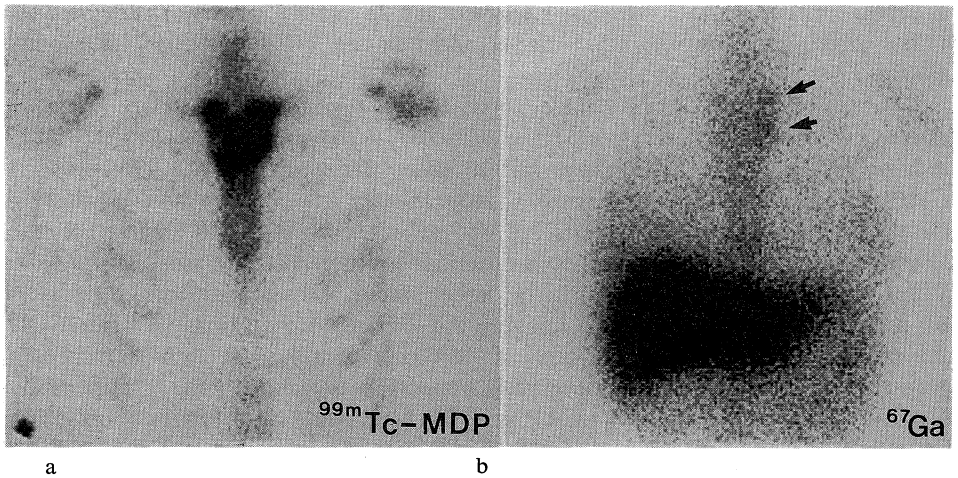
Case 2 : A 44-year-old man with slight painful swellings in the sternoclavicular regions for several years was referred to our department for the bone survey. He showed almost normal laboratory findings (CRP 0.7 mg/dl, ESR 14 mm/1 hr, and ALP 52 I.U./L). Tc-99m Methylene diphosphonate (MDP) and Ga-67 citrate scintigraphies showed an increased accumulations in the both sternoclavicular joints and sternum (Fig. 2a,b).

Case 3 : A 23-year-old woman with pustulosis palmaris et plantaris and chronic tonsillitis was complained of pain in the upper anterior part of chest for



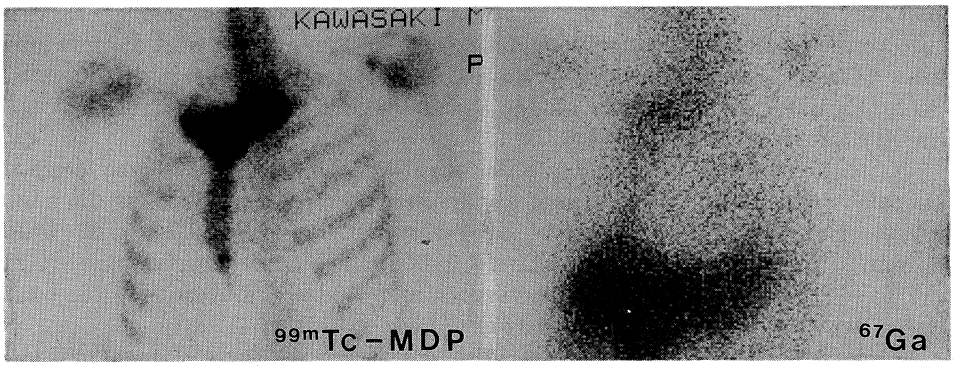
a b

Fig. 2 a,b. Bone and Ga-67 citrate images show an abnormal accumulation in the right sternoclavicular joints and sternum.



a b

Fig. 3 a. Bone imaging shows an increased accumulation in the both sternoclavicular joints.
b. Ga-67 citrate imaging shows an abnormal accumulation in the left sternoclavicular joint.



a b

Fig. 4 a,b. Bone and Ga-67 citrate images show abnormal accumulations in the both clavicles.

one year. She showed normal laboratory data (CRP 0.3 mg/dl, ESR 4 mm/1 hr, and ALP 65 I.U./L). Bone scintigraphy showed an increased accumulation in the both sternoclavicular joints (Fig. 3a), while Ga-67 citrate scintigraphy showed an increased accumulation in the only left sternoclavicular joint (Fig. 3b).

Case 4 : A 37-year-old man with 5 years history of SCCH, pustulosis palmaris et plantaris and chronic tonsillitis was complained of chest pain. Laboratory data were normal (CRP 0.3 mg/dl and ALP 61 I.U./L).

Tc-99m MDP and Ga-67 citrate scintigraphies showed an increased activity in the both clavicles and in the first rib (Fig. 4a,b).

DISCUSSION

SCCH was first reported by Sonozaki in 1974 as a disease of unknown etiology in which ossification between the first ribs, the clavicles, and the sternum occurred.[7] Furthermore, Resnik observed the increased uptake of radionuclide in the clavicles, first ribs and upper sternum on ^{99m}Tc-polyphosphate bone imaging.[1]

Thereafter, many reports have appeared, in regard to the utility of bone imaging.[2,3] The bone scintigram is considered to be indispensable in the diagnosis of SCCH, since radiographs fail to show the abnormality. However, it is well-known that bone scintigraphy only reflects the reactive bone formation following the inflammation, and does not reflect correctly the degree of the inflammation in SCCH and its accumulation continue in the lesions in spite of the successful treatment. On the other hand, Ga-67 citrate scintigraphy has proven to be useful for the imaging the inflammatory lesions such as SCCH and osteomyelitis.[8] The histology of SCCH is similar to that of chronic osteomyelitis, although bacteriological examination of local tissue is universally negative. Laboratory data like CRP or ESR were wide used for the monitoring the activity of the inflammation. However, these tools were not fully sensitive in managing the disease. In fact, only one (Case 1) out of four patients showed the abnormal laboratory data, while all four patients did the increased accumulation on Ga-67 citrate scan. Furthermore, comparing with bone scintigraphy,

Ga-67 citrate scintigraphy showed more specific in the evaluation for the activity of the disease. On the other hand, bone scintigraphy is useful for the early detection of SCCH. Therefore, the combination of Ga-67 citrate and bone scintigraphies would contribute to the correct diagnosis of SCCH.

REFERENCES

1) Resnick, D.: Sternocostoclavicular hyperostosis. AJR **135** : 1278–1280, 1980
2) Hudson, T.M.: Sternocostoclavicular hyperostosis. Clin. Nucl. Med. **9** : 105, 1984
3) Otsuka, N., Fukunaga, M., Sone, T., Nagai, K., Tomomitsu, T., Yanagimoto, S., Muranaka, A., Ono, S. and Morita, R.: Usefulness of bone imaging in diagnosis of sternocostoclavicular hyperostosis. Clin. Nucl. Med. **11** : 651–652, 1986
4) Francis, M.D., Russel, R.G.G. and Gleisch, H.: Diphosphonates inhibit formation of calcium phosphate crystals in vitro and pathological calcification in vivo. Science **165** : 1264–1266, 1969
5) Guillemart, A., Besnard, J.C., Pape, A.L., Galy, G. and Fetissoff, F.: Skeletal uptake of pyrophosphate labeled with technetium-95m and technetium-96, as evaluated by autoradiography. J. Nucl. Med. **19** : 895-899, 1978
6) Graham, G.A., Lundy, M.M., Frederick, R., Hartshorne, M.F. and Berger, D.E.: Scintigraphic detection of osteomyelitis with Tc-99m MDP and Ga-67 citrate. J. Nucl. Med. **24** : 1019–1022, 1983
7) Sonozaki, M., Furusawa, S., Seki, H., Kurokawa, T., Tateishi, A. and Kato, K.: Four cases with symmetrical ossification between the clavicles and the first ribs of both sides. Kanto J. Orthop. Trauma **5** : 244-247, 1974
8) Tsan, M.F.: Mechanism of Gallium-67 accumulation in inflammatory lesions. J. Nucl. Med. **26** : 88–92, 1985