

Scintigraphic Evaluation of Tenosynovial Giant-Cell Tumor Using Technetium-99m(V)-Dimercaptosuccinic Acid

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Technetium-99m(V) dimercaptosuccinic acid (DMSA) and ^{67}Ga -citrate scintigraphy were performed in three patients with primary and recurrent tenosynovial giant-cell tumor (one localized type and two diffuse type). In all cases, $^{99\text{m}}\text{Tc(V)}$ DMSA showed marked accumulation in all primary and recurrent tumors; however, ^{67}Ga -citrate showed no accumulation in any of the tumors. Technetium-99m(V)-DMSA scintigraphy was useful in detecting tenosynovial giant-cell tumor and in diagnosing recurrence of this tumor.

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Tenosynovial giant-cell tumor is a slow-growing benign tumor of the synovial tissue. In cases of tenosynovial giant-cell tumor diffuse type, tumors often cause local recurrence after resections and rarely metastasize (1). Exact extension of recurrent tenosynovial giant-cell tumor is difficult to determine by conventional radiologic modalities (2).

Technetium-99m(V)-DMSA, a $^{99\text{m}}\text{Tc}$ -labeled tumor-seeking agent, was previously reported to be very useful in detecting soft-tissue tumors, especially in aggressive fibromatosis (3). In this report, we present scintigraphic findings in three cases of six tenosynovial giant-cell tumors. Intense uptake of $^{99\text{m}}\text{Tc(V)}$ -DMSA and no uptake of ^{67}Ga was seen in all tumors.

METHODS

Studies were performed on three patients with histologically proven primary and recurrent tenosynovial giant-cell tumor. Technetium-99m(V)-DMSA was prepared as previously reported (4). A lyophilized kit of $^{99\text{m}}\text{Tc(V)}$ -DMSA, containing 1.36 mg of dimercaptosuccinic acid, 1.26 mg of NaHCO_3 , 0.11 mg of $(\text{SnCl}_2 \cdot 2\text{H}_2\text{O})$ and 30 mg of glucose, was made available by Daiichi

Radioisotope Laboratories (Tokyo, Japan). Labeling was performed by adding to the kit 0.1 ml of 7% NaHCO_3 with 2–3 ml of pertechnetate with the desired activity. Purity of $^{99\text{m}}\text{Tc(V)}$ -DMSA was analyzed by thin-layer chromatography, and no free pertechnetate or other $^{99\text{m}}\text{Tc}$ derivative was detected. Technetium-99m(V)-DMSA imaging was performed 2 hr after a 370-MBq intravenous injection. Nine days after the $^{99\text{m}}\text{Tc(V)}$ -DMSA study, ^{67}Ga citrate scintigraphy was performed 72 hr after a 111-MBq intravenous injection. A conventional gamma camera was used in both studies.

CASE REPORT

Patient 1

In 1987, a 54-year-old man presented with asymptomatic swelling on the lateral side of the right ankle joint. The lesion gradually enlarged. Technetium-99m(V)-DMSA scintigraphy showed markedly high uptake of $^{99\text{m}}\text{Tc(V)}$ -DMSA in the lesion (Fig. 1A), but no accumulation of ^{67}Ga (Fig. 1B). Radical resection of the tumor was performed and pathological examination revealed tenosynovial giant-cell tumor. In 1989, the tumor recurred at the same site. At that time, marked accumulation of $^{99\text{m}}\text{Tc(V)}$ -DMSA was shown in the lesion (Fig. 1C), but ^{67}Ga did not accumulate in the tumor (Fig. 1D). In 1991, the tumor recurred again and follow-up study with $^{99\text{m}}\text{Tc(V)}$ -DMSA scintigraphy showed high uptake of $^{99\text{m}}\text{Tc(V)}$ -DMSA in concordance with the site of the recurrent tumor. Exact location was difficult to determine on CT scans but the accuracy of $^{99\text{m}}\text{Tc(V)}$ -DMSA scintigraphy was proven by surgical exploration (Fig. 1E, F, G).

Patient 2

In 1990 a 38-yr-old male patient developed swelling with mild pain at the right lateral malleolus. A radical resection of the tumor was performed and pathological examination revealed tenosynovial giant-cell tumor subclass diffuse type. The tumor recurred at the right lateral side of the ankle joint in 1991. At that time, there was marked accumulation of $^{99\text{m}}\text{Tc(V)}$ -DMSA in the recurrent tumor and an invasive tumor with high signal intensity was revealed on T2-weighted MRI scans (Fig. 2A, B). However, ^{67}Ga showed no accumulation at that site (Fig. 2C). Extensive resection was performed and the tumor was histopathologically proven to be a diffuse tenosynovial giant-cell tumor.

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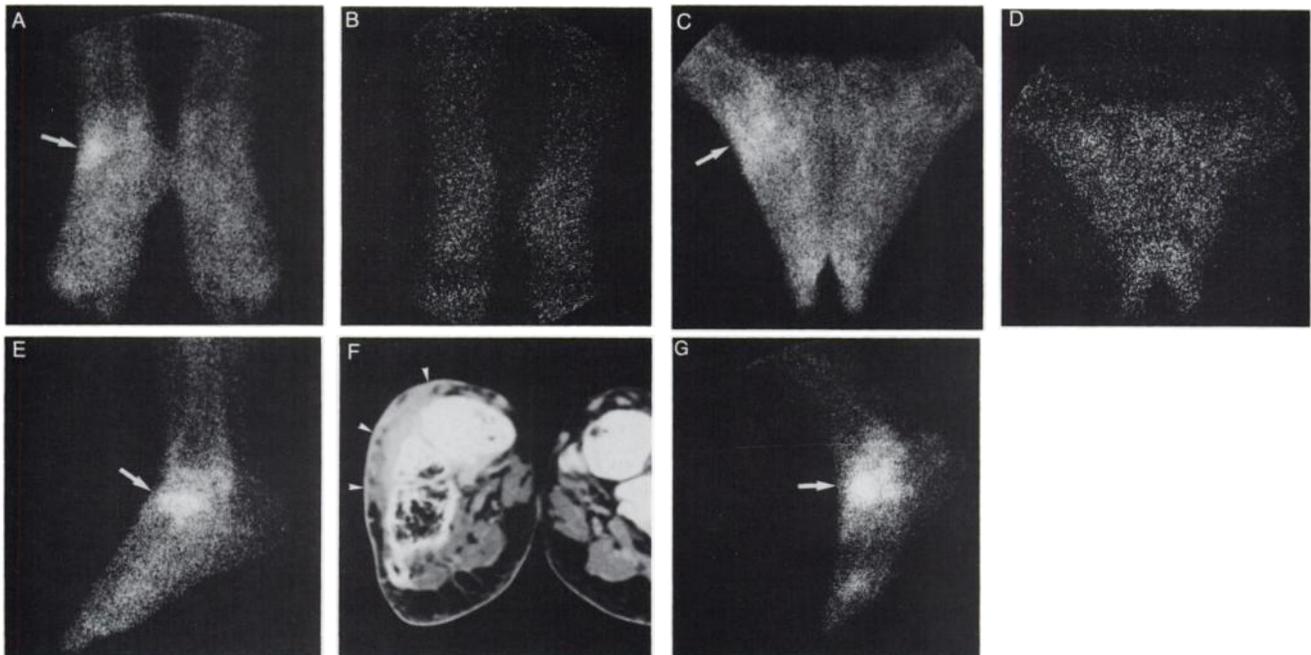


FIGURE 1. (A) Technetium-99m(V)-DMSA scintigraphy shows lateral view of the foot of Patient 1 who was admitted in March 1987. Marked accumulation of ^{99m}Tc (arrow) was shown at the lateral side of the right ankle joint. (B) Gallium-67-citrate scintigraphy of the same patient 9 days after the study shown in (A). No accumulation of ^{67}Ga was shown in the lesion. (C) Technetium-99m(V)-DMSA accumulated in the recurrent tumor (arrow) of a tenosynovial giant-cell tumor. (D) On ^{67}Ga -citrate scintigraphy, there was no accumulation of gallium in the tumor shown in (C). (E) Technetium-99m(V)-DMSA scintigraphy performed in February 1991 showed accumulation of ^{99m}Tc (arrow) at the lateral side of the ankle joint. After this scan, the tumor was followed without therapy. (F) On a postcontrast CT scan in February 1991, ill-margined, irregularly invasive tumors (arrowheads) were revealed in the soft tissue at lateral side of the ankle joint. (G) Technetium-99m(V)-DMSA scintigraphy performed in December 1991, showed accumulation of ^{99m}Tc (arrow) in a wider area than the study shown in (E) and proved to be a recurrent tumor upon surgical exploration.

Patient 3

In 1992, a 57-yr-old male patient presented with a gradually enlarging asymptomatic swelling at the distal portion of the PIP joint of the right middle finger. Technetium-99m (V)-DMSA scintigraphy showed markedly high uptake of ^{99m}Tc (V)-DMSA in that small lesion (Fig. 3A), but no accumulation of ^{67}Ga was shown (Fig. 3B). A radical resection of the tumor was performed and pathological examination revealed a localized tenosynovial giant-cell tumor.

In all six primary and recurrent tenosynovial giant-cell tumors in three patients on whom both ^{99m}Tc (V)-DMSA and ^{67}Ga -citrate

scintigrams were performed, marked uptake of ^{99m}Tc (V)-DMSA and faint or no uptake of ^{67}Ga was shown.

DISCUSSION

Diffuse tenosynovial giant-cell tumors have a strong tendency to recur (1), and are difficult to determine by CT and MRI scans (2). Thus, exact diagnosis of location and the determination of the existence of primary and recurrent tumors as well as distinguishing the tumor from surgical scars, are essential for treatment.

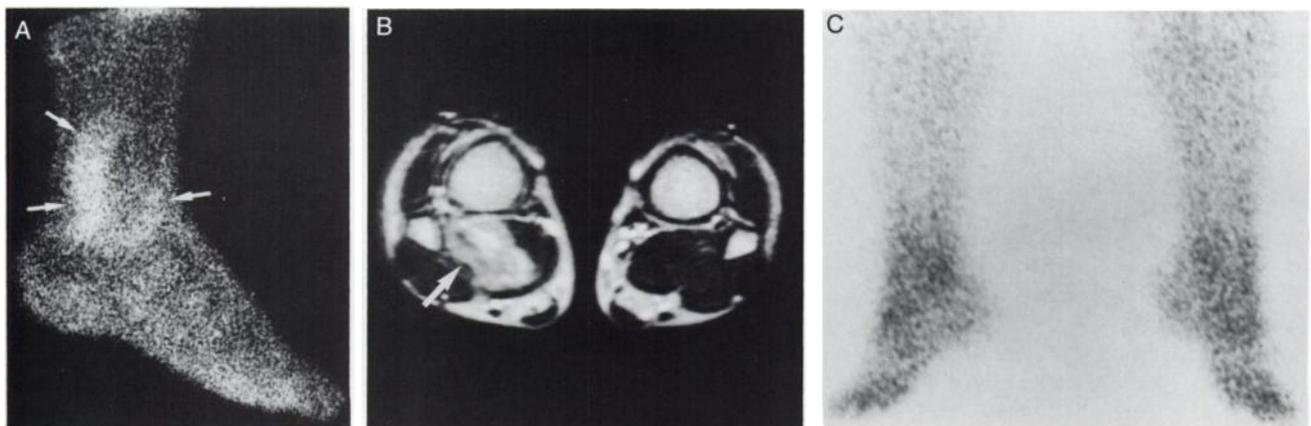


FIGURE 2. (A) Lateral view of the foot on ^{99m}Tc (V)-DMSA scintigraphy for Patient 2. Markedly ring-shaped accumulation (arrows) of ^{99m}Tc was shown around the ankle joint. (B) An invasive, recurrent tumor (arrow) with high signal intensity is seen on dorsal site of the right ankle joint on a T2-weighted MRI scan. (C) Gallium-67-citrate scintigraphy of the same patient shows faint accumulation of ^{67}Ga in the lesion.

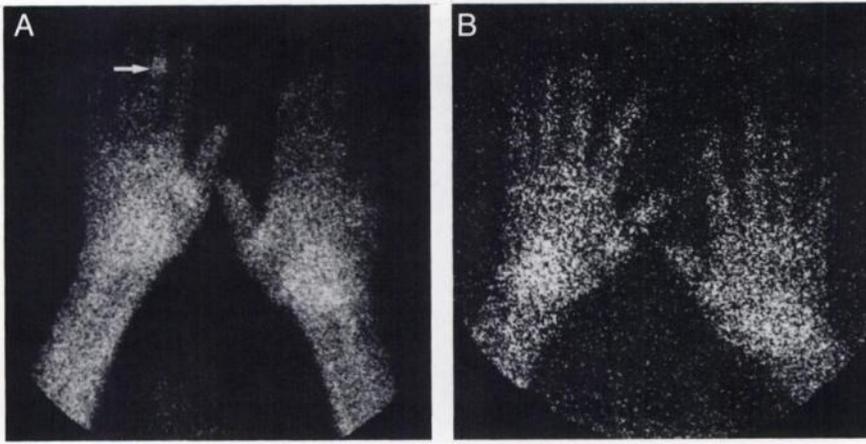


FIGURE 3. (A) Technetium-99m(V)-DMSA scintigraphy showed markedly high uptake of ^{99m}Tc in the small lesion (arrow) at the right middle finger of Patient 3. (B) Gallium-67-citrate scintigraphy of the same patient showed no significant accumulation of gallium in the tumor.

Technetium-99m(V)-DMSA accumulation at operative scar was usually faint and gradually decreased with time (5), but uptake in the tenosynovial giant-cell tumor was markedly high. Therefore, it was not difficult to distinguish accumulation in recurrent tumors from that in surgical scar tissue. However, ^{67}Ga -citrate showed no accumulation in the tumor. There is no other suitable scintigraphic agent to demonstrate tumor and tumor-like lesions in soft tissue.

Although the accumulation mechanism remains to be studied and nonspecific accumulation might reduce its effectiveness (6, 7), ^{99m}Tc (V)-DMSA seems to be superior to ^{67}Ga -citrate in evaluating primary and recurrent lesions in tenosynovial giant-cell tumor.

In conclusion, ^{99m}Tc (V)-DMSA scintigraphy was useful in detecting both subtypes of tenosynovial giant-cell tumor, especially in diagnosing local recurrence.

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