Technetium-99m-Pyrophosphate Scintigraphic Findings of Intestinal Perforation in Dermatomyositis

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Gastrointestinal complications are more common in children than in adults and present a serious problem with dermatomyositis. We report on a 66-yr-old man with dermatomyositis who suffered from intestinal perforation. The abdominal plain radiograph revealed only dilatation of the intestinal loops; increased radioactivity, however, was clearly demonstrated in the early 5-min and delayed 3-hr ^{99m}Tc-pyrophosphate images.

Key Words: dermatomyositis; intestinal perforation; technetium-99m-pyrophosphate

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Vasculitis of the small or large intestine is more common in children than in adults and is a very serious complication of dermatomyositis (*1*). The pathology ranges from segmental edema of the bowel to discrete ulceration, gangrene and perforation. Once perforation occurs, the prognosis is dismal and usually causes death. Early diagnosis of bowel ischemia or bowel necrosis, however, remains a difficult clinical and radiographic problem. Findings on plain abdominal radiographs and contrast studies are often normal or nonspecific (*2*).

In this article, we report positive findings from a ^{99m}Tc-pyrophosphate (PYP) abdominal scan in a patient with dermatomyositis with intestinal perforation.

CASE REPORT

A 66-yr-old-man was diagnosed with dermatomyositis in March 1992. Symptoms included proximal muscle weakness, increased fatigue and skin rashes. The patient received prednisolone but remained profoundly weak. Methotrexate was added to his therapeutic regimen in November 1992. The symptoms improved and he had routine follow-up.

In March 1993, he was admitted to the hospital due to complaints of progressive abdominal distension, constipation and abdominal pain for 3 days. The laboratory data revealed WBC 14290/CUMM, Hb 12.0 g%, K 4.4 mEq/liter, BUN 75 mg/dl, creatine 1.9 mg/dl and LDH 359 U/liter. Physical examination revealed a soft and mildly distended abdomen and hypoactive bowel sounds, although there was no rebounding pain, tenderness or muscle guarding. Abdominal radiographs demonstrated dilatation of the intestinal loops only (Fig. 1). Intestinal obstruction was suspected. The patient received a three-phase ^{99m}Tc-PYP abdominal study. After an intravenous injection of 15 mCi ^{99m}Tc-PYP, dynamic abdominal imaging was done in the anteroposterior view on a large field of view gamma camera with a low-energy, medium-resolution and medium-sensitivity collimator. Dynamic ^{99m}Tc-PYP abdominal scans demonstrated a lesion of increased blood flow in the left abdomen (Fig. 2), and the early 5-min and 15-min views revealed a lesion of transient increased radioactivity in the same area. Three hours later, a smaller area of increased PYP uptake was identified in the corresponding region (Fig. 3). A hypervascular lesion with tissue damage and probable necrosis was suggested. Exploratory laparotomy was not performed immediately, however, because of the surgeon's lack of experience. On the second day of hospitalization, diffuse abdominal tenderness with obvious rebounding pain and muscle guarding developed. Furthermore, 10 cc of turbid yellowish fluid was obtained by peritoneal lavage. Peritonitis was suspected and emergency surgery was performed. During surgery, a gangrenous change of the descending colon on the mesenteric side with a perforation hole near the sigmoid junction was found. Total colectomy with ileostomy and closure of the rectal stump was performed. Unfortunately, the patient died of intra-abdominal abscess and sepsis.

Pathological studies of the tissue obtained at surgery revealed a diverticular-like lesion with perforation in the descending colon near the sigmoid colon. Perforated acute diverticulitis was diagnosed.

DISCUSSION

Dermatomyositis is an uncommon disease of the connective tissues characterized primarily by inflammation of the skin and muscle. The underlying pathologic lesion is vasculitis, which may also involve the gastrointestinal tract, heart, genitourinary and nervous systems (*3*). Clinically, intestinal ischemia is quite difficult to diagnose in dermatomyositis. The classic physical findings may be masked by corticosteroid therapy. Bowel sound and muscle guarding are also not reliable signs (*4*). Consequently, bowel gangrene and even perforation may occur and result in death.

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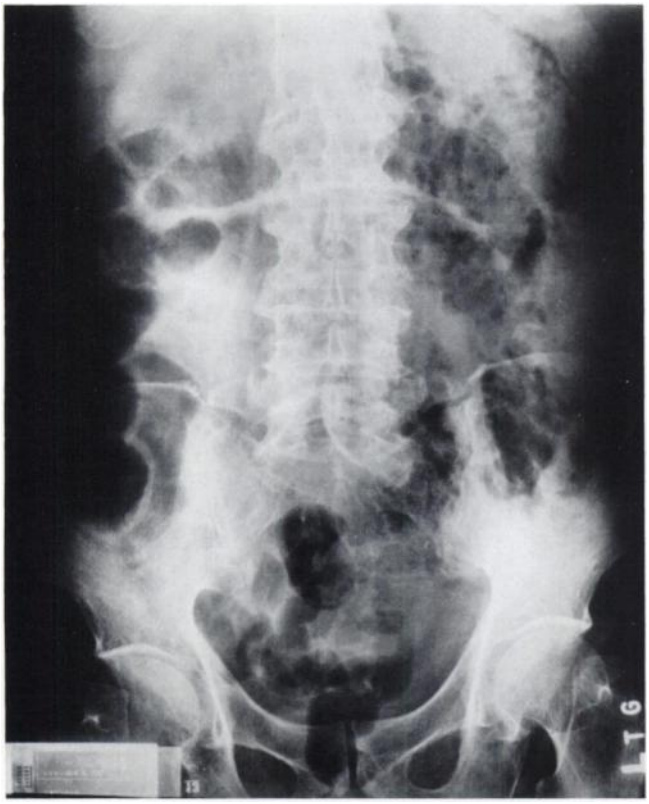

FIGURE 1. Abdominal plain radiograph reveals dilatation of the intestinal loops.

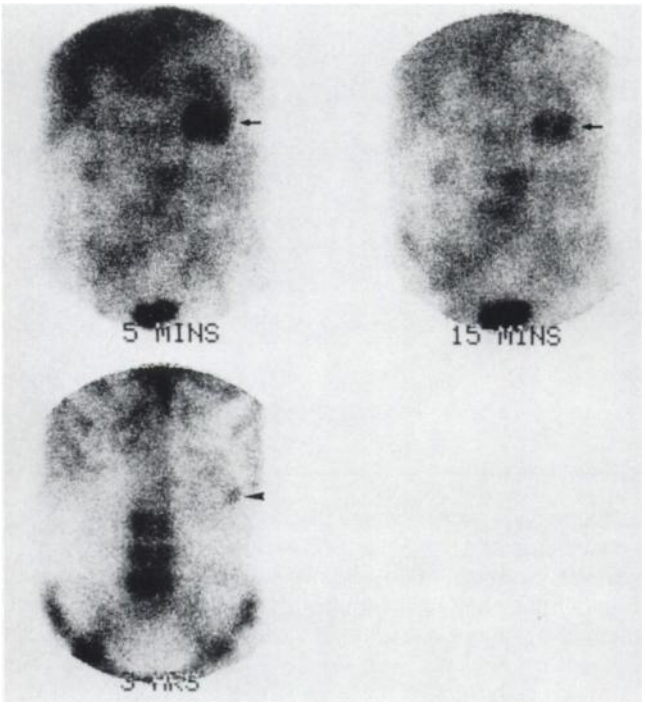

FIGURE 3. Technetium-99m-pyrophosphate abdominal scintigrams demonstrate a hypervascular lesion (arrow) in the early 5- and 15-min images. Three hours later, a smaller area of increased PYP uptake is identified in the correspondent area, indicative of bowel necrosis (arrowhead).

In the evaluation of bowel ischemia or infarction, plain abdominal radiographs may show a normal, adynamic ileus or a nonspecific obstruction pattern (*5,6*). Even in the presence of bowel perforation, the radiographic examination may be negative if the perforation is very small, self-sealed or well contained by the adjacent structures (*7,8*). Extraluminal air as the radiographic hallmark of a perforated hollow viscus is only visible in 50%–70% of patients (*9–11*). When perforations involve the posterior aspect of the ascending or descending colon, the diagnosis becomes more difficult because gas leakage is extraperitoneal and thus, easily missed. Further evaluations with barium radiography, CT and angiography may increase diagnostic accuracy but still may not be satisfactory (*2,12*). In our patient, only the ileus was demonstrated in the plain abdominal film, which led the clinicians to the incorrect impression of intestinal obstruction.

FIGURE 2. Dynamic ^{99m}Tc-pyrophosphate abdominal scintigrams demonstrate an area of increased blood flow in the left abdomen (arrow).

Technetium-99m-PYP was first used in the diagnosis of bone lesions. We also observed localization in acute myocardial infarction and other necrotic tissues. Although PYP's mechanism of localization has not been clearly demonstrated, it is thought to react with intramitochondrial calcium phosphate crystals formed in damaged tissues, similar to the reaction with hydroxyapatite crystals in bone (*13–15*). Dewanjee et al. (*16*), however, reported that the uptake of ^{99m}Tc-PYP in myocardial infarcts may be due to the formation of polynuclear complexes with denatured macromolecules rather than to the deposition of calcium in mitochondria. In our patient, there is a focal region of increased blood flow and blood pooling in the left abdomen. The scintigraphic findings suggested a hypervascular lesion compatible with an active inflammatory process such as vasculitis or tissue damage. The delayed 3-hr scan

revealed a smaller area of increased MDP uptake in the corresponding region. These findings suggest bowel necrosis, since ^{99m}Tc-PYP has been proven to accumulate in the infarcted intestine in animal experiments (*17,18*). Thus, we stress the usefulness of early imaging, such as 5-min and 15-min views, which may be able to detect intestinal vasculitis or diverticulitis before infarction or perforation formation, and could therefore be helpful in the localization of the lesion, as in our patient. Once the PYP abdominal scan reveals a localized lesion, especially in the delayed image, bowel necrosis is highly suspected and exploratory laparotomy should be seriously considered.

CONCLUSION

When clinical symptoms or signs suggest possible abdominal vasculitis, bowel infarction or even perforation, ^{99m}Tc-PYP abdominal imaging may be advisable. Technetium-99m-PYP abdominal scans may be useful in detecting a bowel gangreneous lesion before perforation occurs.

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