

## CT Findings of Abdominal Actinomycosis\*

Hyang S. Kim, M.D., Young J. Kim, M.D., Kook J. An, M.D., Mi H. Kim, M.D.,  
Jin B. Park, M.D., Hye S. Jang, M.D., Sang C. Rho, M.D., Myung H. Rho, M.D.,  
Hyun K Ha, M.D., Kyung S. Shinn, M.D.

*Department of Radiology, Catholic University Medical College*

### — Abstract —

Actinomycosis still poses a problem for correct clinical and radiologic diagnosis. We retrospectively analyzed CT findings in 7 patients with pathologically proven abdominal actinomycosis. Involved areas were the pelvis (n=3), greater omentum (n=2), liver (n=1), and kidney (n=1). CT confirmed the infiltrative nature of the disease with a tendency to invade across tissue plane and boundary. Five of seven cases were predominantly solid mass (pseudotumor) with focal low-attenuation areas while two were predominantly cystic mass with thickened wall. Contrast-enhanced CT showed dense, inhomogeneous contrast enhancement in the wall and/or solid components of the masses in five. Minimal lymphadenopathy was noted in one case. CT is useful in demonstrating the extent and characteristics of this disease. Despite nonspecific findings, actinomycosis should be included in the differential consideration when CT shows an infiltrative mass with unusual aggressiveness and dense inhomogeneous contrast enhancement in patients with fever, leukocytosis, or long-term use of intra-uterine contraceptive devices.

**Index Words:** Actinomycosis

Abdomen, disease.

Computed tomography

### INTRODUCTION

Actinomycosis is a disease produced by gram-positive, non-acid fast, anaerobic bacteria found in the mouth and colon as a normal inhabitant (1). The radiologic manifestation of unusual aggressiveness and easy invasion beyond normal anatomic barrier or multiple organs has been well described in the literatures (2-4).

Despite the favorable response of the disease to a high dosage regimen of penicillin (1), nonspecific clinical and radiologic findings may delay the diagnosis, thus increase morbidity or the chance of unnecessary surgery.

A diagnosis can be made by the identifica-

tion of of sulfur granules within the discharge or lesions (5-7). Among various imaging techniques, CT is considered to be the most valuable tool in demonstrating the extent and characteristics of this disease. The common sites of involvement include the cervicofacial, thoracic, or abdominal regions(1, 5, 6), but the lesions in those sites may have similar CT characteristics except the lesions in lung parenchyma. Rather than reviewing individual cases, we attempted to analyse the general CT features of actinomycosis of 7 cases pathologically proven in the different sites of abdomen

### MATERIALS AND METHODS

Between 1988 and 1992, we reviewed the

\* 이 논문은 1992년 가톨릭 중앙의료원 연구 보조비로 이루어진 것임.

이 논문은 1993년 3월 9일 접수하여 1993년 5월 3일에 채택되었음.

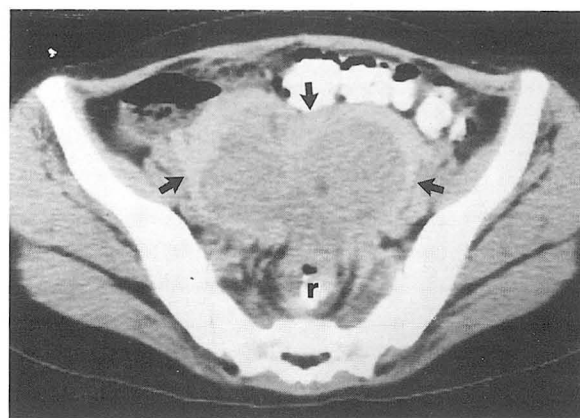
Received March 9, Accepted May 3, 1993

records of 7 patients with pathologically proven abdominal actinomycosis. In this group, three men and four women, aged from 24 to 67 years were included (mean, 46). Clinical symptoms were a palpable mass (n=2), mild fever (n=6), weight loss (n=6), or abdominal pain (n=5). Leukocytosis was noted in six cases, ranged from 7,700 to 12,900/ul at the time of admission. Symptom-duration varied from 1 week to 8 months. Three patients had a history of using intrauterine contraceptive devices (IUDs). Diagnosis was made by the pathologic confirmation of sulfur granules in the discharges or specimens obtained with surgery (n=6), or percutaneous aspiration cytology (n=1).

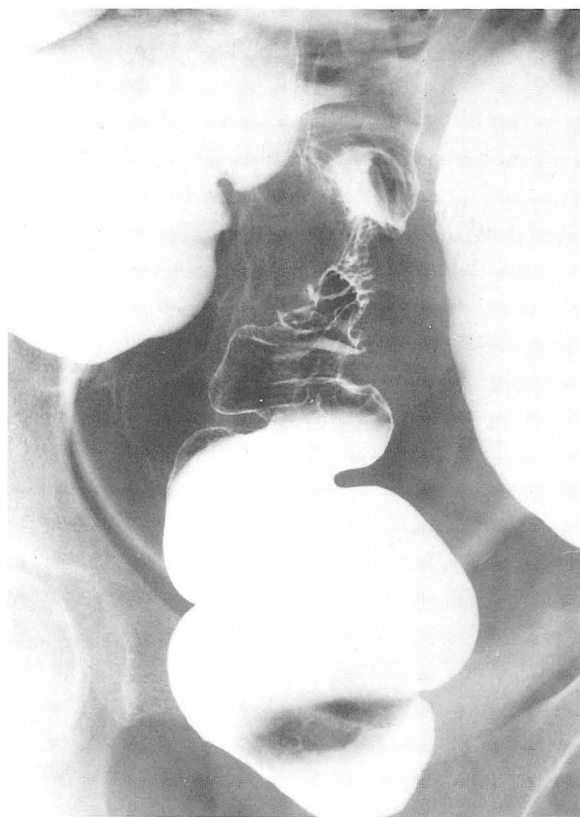
CT scans were obtained with a Somatom-DR (Siemens, Erlangen), Somatom-plus or GE 9800 (General Electric, Milwaukee). Continuous 8 or 10mm-thick sections at 8 or 10mm-intervals were obtained from the diaphragm to the pelvis. Nonenhanced CT scans were also obtained in the study of liver and kidney. Oral and intravenous (IV) contrast material were used in all patients. Dense contrast enhancement of the lesion was defined when the mass showed enhancement nearly isodense to the aorta or its major trunks.

## RESULTS

The sites of involvement were pelvis (n=3), liver (n=1), kidney (n=1), and greater omentum (n=2). CT scans demonstrated that multiple organs or anatomical structures were involved with a tendency to invade across tissue plane and boundary in all patients. In three cases with pelvic actinomycosis (Fig. 1), adjacent colon and ureter were involved, resulting in a short segmental narrowing of the colonic lumen and hydronephrosis. In two cases in which transverse colon, small intestine, greater omentum, and abdominal wall were involved (Fig. 2), the principal sites of the lesion were in the greater omentum, but its primary sites were



a

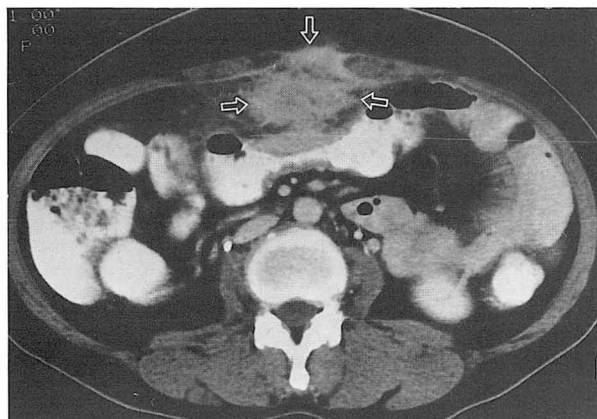


b

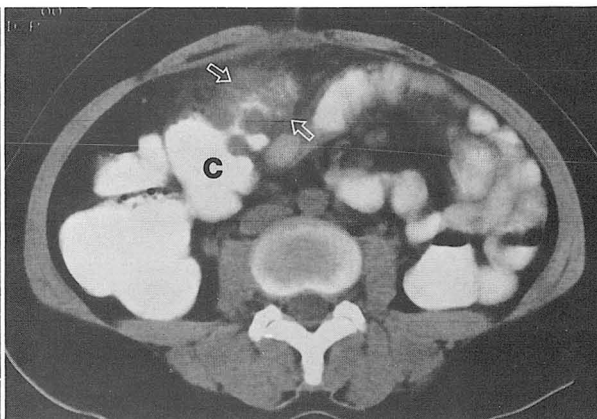
**Fig. 1.** Pelvic actinomycosis in a 26-year-old woman who had a history of a long-term use of the intrauterine devices.

a. Contrast-enhanced CT scan shows bilobed and inhomogeneous mass in the pelvis, surrounded by thickened and anteriorly displaced both mesosalpings (arrows). There is partial and thickened rectal wall (r). Surgery confirmed bilateral ovarian solid masses.

b. Barium enema shows a marked narrowing of the rectum and spiculation and irregularity of the mucosal margin.



a



b



c

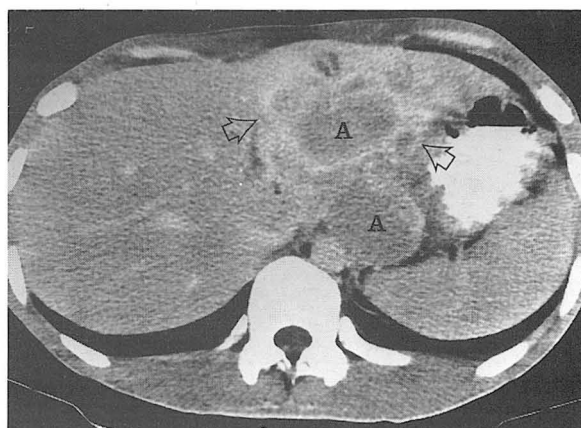
**Fig. 2.** Actinomycosis of the greater omentum in a 40-year-old woman who had a history of a long-term use of the intrauterine devices.

a. An ill-defined mass (arrows) is noted in the greater omentum with extension to the anterior abdominal wall on contrast-enhanced CT scan. The anterior aspect of the mass is densely enhanced. Also noted is focal wall thickening of the adjacent ileum.

b. On nonenhanced CT scan, thickened wall of the transverse colon (C) is well demonstrated (arrows).

c. Small bowel series confirms a short segmental narrowing of the ileum (arrows) and mid-transverse colon (arrowheads). There is evidence of a serrated outer margin along the ileum but transition between the normal and abnormal segment is not abrupt.

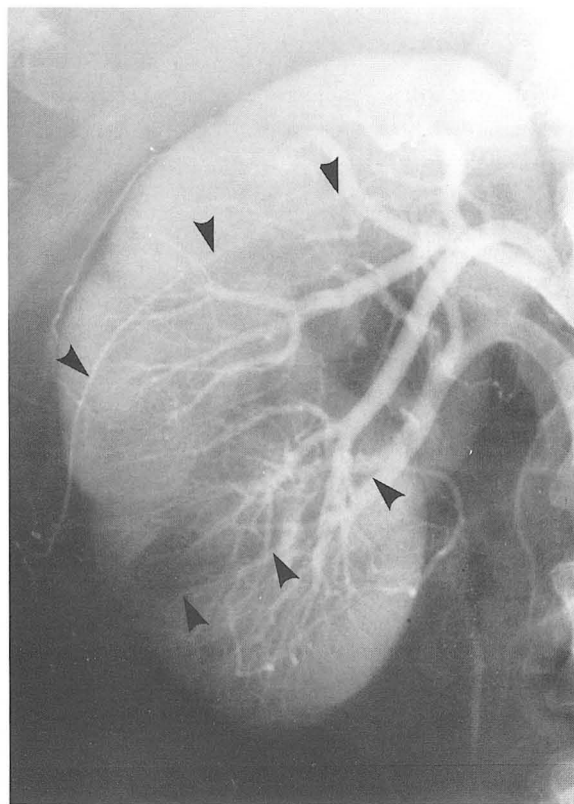
uncertain. In a patient who had multiple abscesses in the left lobe of the liver (Fig. 3), endoscopy disclosed the involvement of the distal esophagus and gastric fundus. A small amount of pus was aspirated from the distal esophageal wall near the gastroesophageal junction during this procedure and percutaneous aspiration of pus in the liver also confirmed the presence of sulfur granules in the discharge. In



**Fig. 3.** Hepatic actinomycosis in a 24-year-old man. Contrast enhanced CT scan shows multiple abscess (A) with thickened wall and low-attenuation center in the left lobe of the liver. Of note is dense contrast enhancement in the abscess wall and surrounding hepatic parenchyma (arrows). The wall of the gastric fundus is also focally thickened.



a



b

**Fig. 4.** Renal actinomycosis in a 58-year-old man.  
a. On contrast-enhanced CT scan, the right kidney shows an inhomogeneously enhancing mass (closed arrows) with focal areas of low density. The mass penetrates the renal capsule and extends to the adjacent quadratus lumborum muscle (open arrows).  
b. Arterial phase of selective right renal angiography shows a hypovascular mass (arrowheads) displacing the capsular artery and small renal arterial branches.

a case of renal actinomycosis (Fig. 4), the renal fascia, pleura, and back muscles, as well as renal parenchyma, were invaded. All of seven cases showed single or multiple masses. Five of these were predominantly solid with focal low-attenuation areas, while two were predominantly cystic with irregularly thickened wall. After administration of intravenous contrast material, the masses in five of seven cases were inhomogeneous with dense contrast enhancement in the wall and/or solid components, while the masses in the remaining two were minimally enhanced. Pathologically, the solid component of the masses consisted of granulated tissue with varying degree of inflammations. It is noteworthy that the hepatic parenchyma surrounding the hepatic abscess was densely enhanced. We consider that this occurrence may be secondary to acute inflammation in the adjacent hepatic parenchyma. Lymphadenopathy, mostly less than 2cm in diameter, was noted in one of seven cases: paraaortic nodes in actinomycosis of the greater omentum.

Before pathological confirmation, correct CT diagnosis of the disease was possible in three patients who had a history of long-term use of IUDs in the uterus, while diagnoses in remaining patients were not obvious at the time of CT scan. Angiography, performed in one case with renal actinomycosis to exclude the possibility of renal neoplasm, showed a hypovascular mass without specific change for the diagnosis. Six patients underwent surgery: total hysterectomy with bilateral oophorectomy in three; segmental bowel resection of the colon and small intestine with en-bloc resection of the mass in the greater omentum in two; and right nephrectomy in one. All patients were treated with high doses of penicillin after confirming the diagnosis.

## DISCUSSION

Actinomycosis has a world-wide distribution

and is present with equal frequency in urban and rural dwellers (1, 5). Recent reports (8-10) have demonstrated an increased incidence in women using IUDs. In humans, *Actinomyces israelii* is the most common of the several species of this organism (1, 6). Poor oral hygiene and dental caries probably account for the most cases of the cervicofacial form of actinomycosis: the male predilection for the disease may be associated with higher incidence of oral and dental trauma (1, 5). The aspiration of infected materials into the oropharynx may be the main etiologic factor for thoracic actinomycosis (1, 11), while foreign body reaction to IUDs and concurrent anaerobic pelvic infection predispose women to pelvic actinomycosis (8-10).

Although the organisms usually extend into other organs or anatomic structures by spread with direct continuity, hematogenous dissemination also occurs in some instances (5, 12). The appendix and colon are the most common intra-abdominal organs involved, but the exact explanation for the route of infection in these organs is controversial (5). Variable clinical presentations exist depending on the primary or principal site of involvement, although it generally presents as a chronic inflammatory process associated with fever and leukocytosis.

In our study, CT confirmed the infiltrative characteristic of the disease with a tendency to easily invade the normal anatomic barriers. This may be caused by proteolytic enzymes produced by actinomyces organisms (13). Therefore, the aggressive nature of infiltration is comparable to that seen in acute necrotizing pancreatitis. Other inflammatory diseases, especially secondary to tuberculosis or fungus, or neoplasms may be confused with this disorder. However, as in our two cases in which actinomycosis involved the colon, small intestine, greater omentum, and abdominal wall, it is rare to see such a pattern in neoplastic conditions.

Five cases showed a mass predominantly solid with focal low-attenuation areas, while

two were predominantly cystic with thickened wall. This presentation reflects the histologic features of actinomycosis which is characterized by central suppurative necrosis surrounded by granulated tissue and intense fibrosis (14). It is important to note that predominantly solid masses (pseudotumors) occurred much more frequently in our and other (2) studies than cystic lesions, being attributed to the chronicity of the disease from the delayed diagnosis and treatment. In addition to the infiltrative nature of the disease, this pseudotumor easily makes the radiologist misinterpret it as a malignant disease. Furthermore, if the disease persists for several months or years with intermittent use of antibiotics and there is solely a solid mass on CT scan, differentiation from malignancy may be impossible.

Although most of the masses showed inhomogeneous patterns of contrast enhancement mainly due to the presence of small loculations, dense contrast enhancement in the wall and/or solid components of the mass was noted in five of seven cases. We consider this finding to be one of the important signs of inflammatory mass in association with the presence of acutely inflamed tissues. However, the variation existed in its degree, depending on different stages of the disease and contrast infusion method. Since the organism in actinomycosis usually spreads regardless of lymphatic or hematogenous routes, regional lymphadenopathy is, therefore, not a common manifestation (1). Even if present, the degree appears to be minimal, as in our case.

Other radiologic methods such as angiography and conventional barium study can be used in the assessment of the extent of the disease and in the differentiation between malignant and inflammatory diseases. Barium examination of the colon and small intestine may reveal signs of mural invasion and mass effect with tapered narrowing of the lumen and intact mucosal folds. However, the radiologic manifesta-



tions are nonspecific and quite similar to Crohn's disease, intestinal tuberculosis or sometimes excavated malignant tumor (15). The angiography is also nonspecific for the diagnosis of actinomycosis in our and other (3, 16) studies.

In conclusion, actinomycosis is a disease whose diagnosis cannot easily be made clinically and radiologically. However, CT scan is considered to be the valuable modality to demonstrate the extent and characteristics of this disease. Actinomycosis should be included in the differential diagnosis when CT shows a infiltrative mass with unusual aggressiveness and dense inhomogeneous contrast enhancement, especially in patients with leukocytosis, fever, or long-term use of intrauterine devices.

REFERENCES

1. Bennhoff DF. Actinomycosis: diagnostic and therapeutic considerations and a review of 32 cases. *Laryngoscope* 1984; 94:1198-1217

2. Allen III HA, Scatarige JC, Kim MH. Actinomycosis: CT findings in six patients. *AJR* 1987; 149:1255-1258

3. Shah HR, Williamson MR, Boyd CM, Balachandran S, Angtuaco TL, McConnell JR. CT findings in abdominal actinomycosis. *J Comput Assist Tomogr* 1987; 11:466-469

4. Webb WR, Sagel SS. Actinomycosis involving the chest wall: CT findings. *AJR* 1982; 139:1007-1009

5. Berardi RS, Moines D. Abdominal actinomycosis. *Surg Gynecol Obstet* 1979; 149:257-266

6. Brown JR. Human actinomycosis: a study of 181 subjects. *Hum Pathol* 1973; 4:319-330

7. Pollock PG, Meyers DS, Frable WJ, et al. Rapid diagnosis of actinomycosis by thin-needle aspiration biopsy. *Am J Clin Pathol* 1978; 70:27-30

8. Henderson S. Pelvic actinomycosis associated with intrauterine device. *Obstet Gynecol* 1973; 41:726-732

9. O'Connor KF, Bagg MN, Croley MR, Schabel SI. Pelvic actinomycosis associated with intrauterine devices. *Radiology* 1989; 170:559-560

10. Maloney JJ, Cho SR. Pelvic actinomycosis. *Radiology* 1983; 148:388

11. Kwong JS, Muller NL, Godwin JD, Aberle D, Grymaloski MR. Thoracic actinomycosis: CT findings in eight patients. *Radiology* 1992; 183: 189-192

12. Roesler PJ Jr, Wills JS. Hepatic actinomycosis: CT features. *J Comput Assist Tomogr* 1986; 10: 355-337

13. Schwarz J, Baum GL. Actinomycosis. *Semin Roentgenol* 1970; 5:58-63

14. Franz Von Lichtenberg. Infectious disease. In: Cotran RS, Kumar V, Robbins SL, 4th eds. *Robbins pathologic basis of diseases*. Philadelphia: Saunders, 1989; 383-384

15. Pringot J, Bodart P. Inflammatory disease. In: Margulis A, Burhenne J, eds. *Alimentary tract radiology*. 4th ed. St. Louis: Mosby, 1989; 759-815

16. Olsson T. Angiography in actinomycosis of the abdomen. *AJR* 1974; 122:278-280

<국문 요약>

복부 방사선균증(Actinomycosis)의 전산화단층촬영 소견

가톨릭대학 의학부 방사선과학교실

김향선 · 김영주 · 안국진 · 김미혜 · 박진범 · 장혜숙 · 노상천 · 노명호 · 하현권 · 신경섭

저자들은 병리조직학적으로 확진된 방사선균증(Actinomycosis) 환자 10명의 전산화단층촬영 소견을 후향적으로 분석하여 그 특징을 알아보고자 하였다.

침범 부위는 골반강(3예), 대망(2예), 간(1예), 신장(1예)로 다양하였다. 7예중 5예에서는 주로 내부에 국소적인 저음영 부위를 포함하는 가성 종괴의 형태로 나타났고, 2예에서는 두터운 벽을 가진 낭성 종괴로 나타났다. 5예에서는 종괴의 충실성 부분이나 벽이 불균일하게 조영증강되었고 1예에서는 경한 임파절 종대가 동반되었다.

결론적으로 발열, 백혈구증가 혹은 오랜 기간동안 자궁내 피임장치를 한 환자의 전산화단층촬영시 불균질한 조영증강을 동반한 침윤성 종괴가 관찰되는 경우 감별진단으로 방사선균증은 반드시 포함되어야 할 것으로 생각된다.