

27 (50, 1.7:1)
 (n=9), (n=11), (n=7) . 5 - MHz -
 20 - G (n=4) (n=10) / 18 - G (n=23)
 (n=17)

: 27 (n=8), (n=4) (n=15),
 4 23 (85.2%) 가
 100% 가
 24

가 0.9g/dL, 3.0%

가 가 (1-3).

가 (1-4).

가

가 (5-11).

1996 10 1999 10
 CT

가 17, 가 10 17
 82 50
 CT CT
 가

1 2000 3 31 2000 6 12 11 (Fig. 2A), 9 (Fig. 1A), 7 (Fig. 3A)

5 mm 3.4 mm 11 mm 25 mm 2 mm (Fig. 1B).
 17 mm 8 mm 18 mm 5 1 4 (, 2.6)
 13 mm . 24 가 3
 가 (PT, aPTT)
 5 - MHz (Gateway; Dasonics, Milpitas, U.S.A.)
 17 mm (Manan pro - mag 2.2; Manan medical products, Northbrook, U.S.A.) () 가
 4 20 - G 가
 23 18 - G 가 (n=10) ,
 6
 2%
 (Fig. 2B)
 (Fig. 3B) 가
 가 가 (100%). 27
 15 , 12
 9 15 가 (

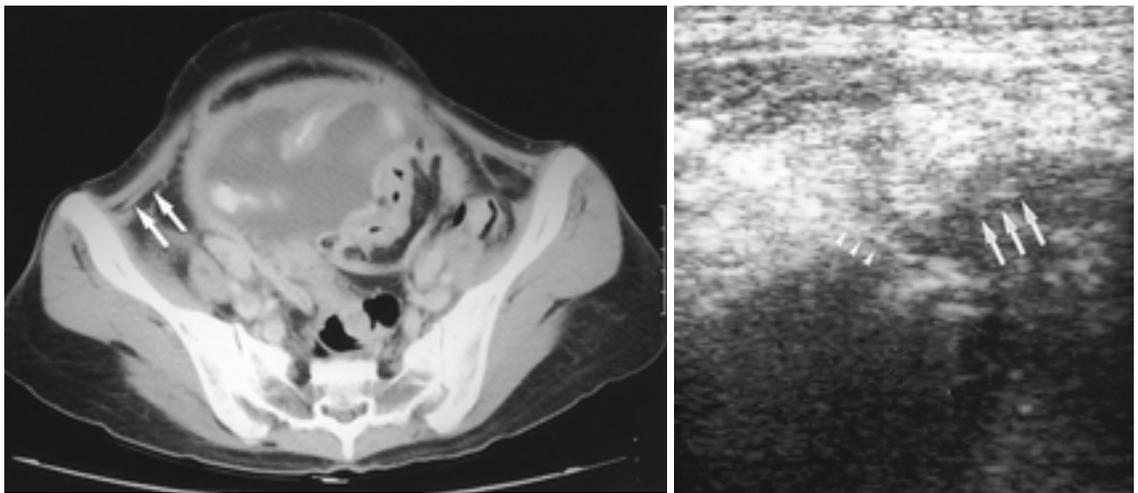
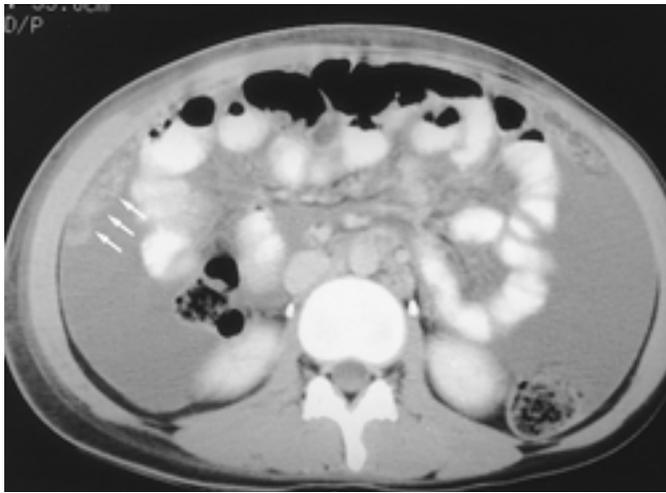


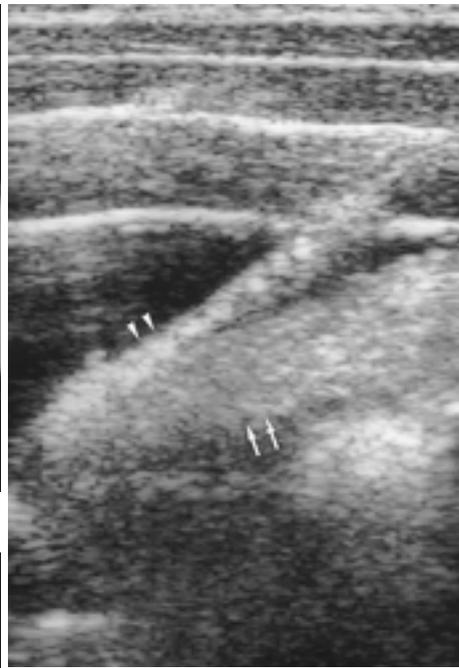
Fig. 1. A 45-year-old woman with peritoneal carcinomatosis of adenocarcinoma of unknown origin.

A. A contrast enhanced CT scan through the pelvis shows thickening of the parietal peritoneum (arrows) with marked contrast enhancement and ascites.

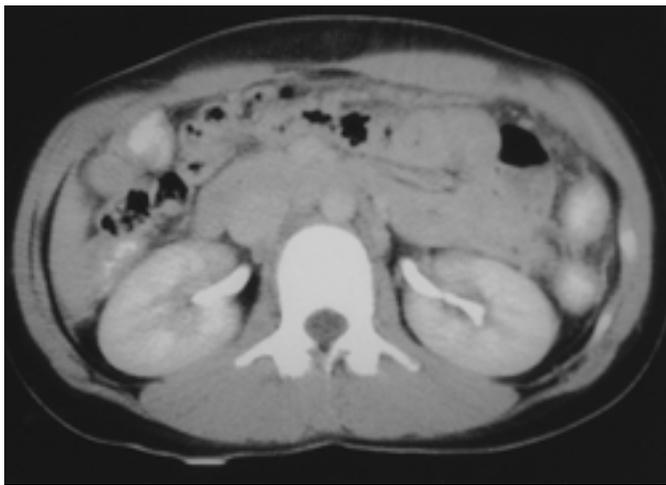
B. Ultrasonogram reveals the thickened parietal peritoneum (arrows) and ascites which is separating bowel loops from the parietal peritoneum. We perform a biopsy of the thickened parietal peritoneum with an oblique approach of the needle (arrow heads) to obtain a sufficient amount for specimen.



A



B



C

Fig. 2. A 22-year-old woman with peritoneal tuberculosis.
A. A CT section through the abdomen shows mild thickening of the greater omentum (arrows) and ascites.
B. Ultrasonogram obtained during the biopsy reveals the thickened omentum (arrows) and the biopsy needle (arrow heads) placed in the omentum with oblique approach.
C. On follow-up CT scan obtained 6 month after the administration of anti-tuberculous medication, no sign of peritoneal disease is found.

: 100%) 12 , , , 15 10
 1 . , 5 3
 , 15 12
 . 5 가
 3 8 4
 가
 - 가 . 27
 - 가
 (specific accuracy: 100%),
 4 24 (85.2%) 가 .
 12
 8 (66.7%) 가 .

12
 5 CT
 CT
 (Fig. 2C).
 100% .
 가
 24 . 5
 (Fig. 3C).
 0.9g/dL (0.1 - 2.6g/dL) ,
 3.0% (0.2 - 10%)
 가 24
 1.1g/dL (0.2 -
 2.5g/dL), 3.2% (0.4 - 10%) 가 3
 0.8g/dL (0.1 - 2.6g/dL), 3.1% (0.2 - 9%)
 가 가 .

(12). 5- 가 25 mm

MHz CT 15

(17, 18). 10

5- MHz - 10

가 , , ,

CT 14-G 가 가 (24, 25).

가 24 가

가 가 (12, 17, 18).

가 24

가 가 가

가 가 가

가 가 가

25 mm 11 가

7 , 7 5 17

mm 가 ,

4

20-G 가

3.8 (3-4)

18-G 2.8 (2-4

가

20-G 가

18-G

Gottlie (18) Sistrom (17)

96%

100%

100%

15

(n=10) 100%

(cytology)

가

1. 1994;31:1127-1132
2. Burbank F, Kaye K, Belville J, Ekuan J, Blumenfeld M. Image-guided automated core biopsies of the breast, chest, abdomen, and pelvis. *Radiology* 1994;191:165-171
3. 1994;31:125-130
4. Charboneau JW, Reading CC, Welch TJ. CT and sonographically guided needle biopsy: current techniques and new innovations. *AJR Am J Roentgenol* 1990;154:1-10
5. Silverman PM, Cooper C. *Mesenteric and omental lesions*. In Gore RM, Levine MS, Laufer I. *Textbook of gastrointestinal Radiology*. Philadelphia : Saunders, 1994:2367-2381
6. Epstein BM, Mann JH. CT of abdominal tuberculosis. *AJR Am J Roentgenol* 1982; 139:861-866

7. Hanson RD, Hunter TB. Tuberculous peritonitis: CT appearance. *AJR Am J Roentgenol* 1985;144:931-932
8. Jain R, Sawhney S, Bhargava DK, Berry M. Diagnosis of abdominal tuberculosis: sonographic findings in patients with early disease. *AJR Am J Roentgenol* 1995;165:1391-1395
9. Rodriguez E, Pombo F. Peritoneal tuberculosis versus peritoneal carcinomatosis: distinction based on CT findings. *J Comput Assist Tomogr* 1996;20(2):269-272
10. Ruess L, Frazier AA, Sivit CJ. CT of the mesentery, omentum, and peritoneum in children. *Radiographics* 1995;15:89-104
11. Hamrick-Turner JE, Chiechi MV, Abbitt PL, Ros PR. Neoplastic and inflammatory processes of the peritoneum, omentum, and mesentery: diagnosis with CT. *Radiographics* 1992;12:1051-1068
12. Pombo F, Rodriguez E, Martin R, Lago M. CT-guided core-needle biopsy in omental pathology. *Acta Radiol* 1997;38(6):978-981
13. Theoni RF, Margulis AR. Gastrointestinal tuberculosis. *Semin Roentgenol* 1979;14:283-294
14. Hulnick DH, Megibow AH, Naidich DP, Hilton S, Cho KC, Balthazar EJ. Abdominal tuberculosis: CT evaluation. *Radiology* 1985;157:199-204
15. Jeffery RB, Nyberg DA, Bottles K, et al. Abdominal CT in acquired immunodeficiency syndrome. *AJR Am J Roentgenol* 1986;146:7-13
16. Bhargava DK, Shrintwas PHD, Chopra P, Nijhawan S, Dasarathy S, Kushawaha AKS. Peritoneal tuberculosis: laparoscopic patterns and its diagnostic accuracy. *Am J Gastroenterol* 1992;87:109-112
17. Siström CL, Abbitt PL, Feldman PS. Ultrasound guidance for biopsy of omental abnormalities. *J Clin Ultrasound* 1992;20:27-36
18. Gottlieb RH, Tan R, Widjaja J, Fultz PJ, Robinette WB, Rubens DJ. Extravisceral masses in the peritoneal cavity: sonographically guided biopsies in 52 patients. *AJR Am J Roentgenol* 1998;171:697-701
19. Dodd GD, Esola CC, Memel DS, et al. Sonography: the undiscovered jewel of interventional radiology. *Radiographics* 1996; 16: 1271-1288
20. Matalon TAS, Silver B. US guidance of interventional procedures. *Radiology* 1990;174:43-47
21. Memel DS, Dodd GD, Esola CC. Efficacy of sonography as guidance technique for biopsy of abdominal, pelvic, and retroperitoneal lymph nodes. *AJR Am J Roentgenol* 1996;67:957-962
22. Rubens DJ, Strang JG, Fultz PJ, Gottlieb R. Sonographic guidance of mediastinal biopsy: an effective alternative to CT guidance. *AJR Am J Roentgenol* 1997;164:1605-1610
23. Fisher AJ, Paulson EK, Sheafor DH, Simmons CM, Nelson RC. Small lymph nodes of the abdomen, pelvis, and retroperitoneum: usefulness of sonographically guided biopsy. *Radiology* 1997;205: 185-190
24. Smith EH. Complications of percutaneous abdominal fine-needle biopsy. *Radiology* 1991;178:253-258
25. Satava RM Jr, Van-Heerden JA, Sheedy PF, Sommerskill WHJ. Omental arteriovenous fistula following liver biopsy. *Gastroenterology* 1975;69:492-495

Ultrasound-guided Biopsy of the Thickened Peritoneal Reflections: Efficacy and Diagnostic Role in the Differential Diagnosis of Peritoneal Tuberculosis and Peritoneal Carcinomatosis¹

Young Hwan Kim, M.D., Hun Kyu Ryeom, M.D., Tae Gyun Chung, M.D., Hyo Yong Park, M.D.,
Yong Joo Kim, M.D., Ph.D., Duck Sik Kang, M.D., Ph.D.

¹*Department of Diagnostic Radiology, Kyungpook National University Hospital*

Purpose: To evaluate the accuracy and safety of ultrasound-guided biopsy of the thickened peritoneal reflections and to determine the efficacy and diagnostic role of this procedure in the differential diagnosis of peritoneal tuberculosis and peritoneal carcinomatosis.

Materials and Methods: Twenty-seven patients with only mildly thickened (25 mm or less) peritoneal reflections without apparent mass formations, and in whom imaging findings were not diagnostic, underwent ultrasound-guided biopsy. Five-MHz linear or convex linear array transducers were used for ultrasound guidance, and an automated gun with 18-gauge (n = 23) or 20-gauge (n = 4) needles for tissue sampling. Biopsies were performed on the thickened parietal peritoneum (n = 9), greater omentum (n = 11), and small bowel mesentery (n = 7), and the results were compared with the final diagnosis determined by radiologic/clinical follow-up (n = 17) or laparoscopic biopsy (n = 10). Complications and changes in hemoglobin and hematocrit levels after the procedure were evaluated.

Results: Specimens adequate for pathologic examination were obtained in all 27 patients. The histopathologic results were metastatic carcinomatosis (n = 15), peritoneal tuberculosis (n = 8), and chronic granulomatous inflammation (n = 4). Specific pathologic diagnosis was obtained in all patients except the four with chronic granulomatous inflammation. Differentiation between benignancy and malignancy was possible in all patients and the histopathologic specific accuracy rate was 100%. No clinically significant complications were observed. In 24 patients with ascites at the site of the biopsy, transient bleeding was observed immediately after the procedure, but this stopped spontaneously within a few minutes. Post-procedural hemoglobin and hematocrit levels were only minimally lower (mean values of 0.9g/dL and 3.0%, respectively) than pre-procedurally.

Conclusion: Ultrasound-guided biopsy of thickened peritoneal reflections is a safe and effective diagnostic procedure and is useful in the differential diagnosis of peritoneal tuberculosis and peritoneal carcinomatosis.

Index words : Ultrasound (US)
Peritoneum, neoplasms
Omentum, neoplasms
Mesentery, neoplasms
Tuberculosis

Address reprint requests to : Hun Kyu Ryeom, M.D., Department of Diagnostic Radiology, Kyungpook National University Hospital,
52, Samduk 2 Ga, Chung-Gu, Taegu 700-721, Korea.
Tel. 82-53-420-5396 Fax. 82-53-422-2677 E-mail: hkryeom@kyungpook.ac.kr

