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Imaging of abdominal abscesses

Abdominal abscesses are one of the reasons of acute abdomen. The quick diagnosing is essential in proper management of the patients with acute abdomen. The imaging modalities used in diagnosis of abscesses are of various diagnostic value (3, 4, 6).

The aim of the study is presenting own experiences in using different diagnostic modalities in evaluating abdominal abscesses.

MATERIAL AND METHODS

Material comprises a group of nine patients with diagnosed abdominal abscess (three women and six men, aged between 22 and 78 years). The examinations were performed in the 2nd Department of Radiology, Medical University of Lublin within the years 1998–2002.

The plain abdominal radiograms were performed in erect patient's position, and in supine and left and right lateral position in heavily ill patients.

The ultrasound examinations and computed tomography were also performed. The CT examination was performed in 10-mm thick axial sections, before and after administering the contrast agent.

RESULTS

In two patients with appendicitis in the right lower abdomen abscesses were found. US examination revealed hypochoic or anechoic structures, representing early abscesses (Fig. 1). The perirenal abscesses were found in two patients. In US they showed various, inhomogeneous echogenicity, depending on the age of the abscess.



Fig. 1. In the right lower abdomen hypochoic area representing abscess in the area of appendix vermiformis

In three cases perirenal abscesses were found. The contrast CT examination revealed polycystic hypodense area. After administering the contrast agent the enhanced thick walls and septa were seen, while central fluid areas remained unenhanced (Fig. 2A). CT was necessary to assess the extent, depth and shape of retroperitoneal fluid collections. The extent of the abscess was easily assessed on MPR images (Fig. 2B). In one patient CT examination revealed the hepatic abscess, easily seen on enhanced sections and coexistent omental abscess (Fig. 3 AB). In two cases abscesses were complications of previous cholecystectomy. CT revealed subhepatic hipodense liquid area revealing air-fluid level, with thick wall, enhancing after administering contrast agents. The central part of the abscess containing puss did not change the density after contrast administering (Fig. 4).



Fig. 2AB. Perirenal abscess on the left side with enhancing wall and septa, and the density of the central areas of 10–30 HU

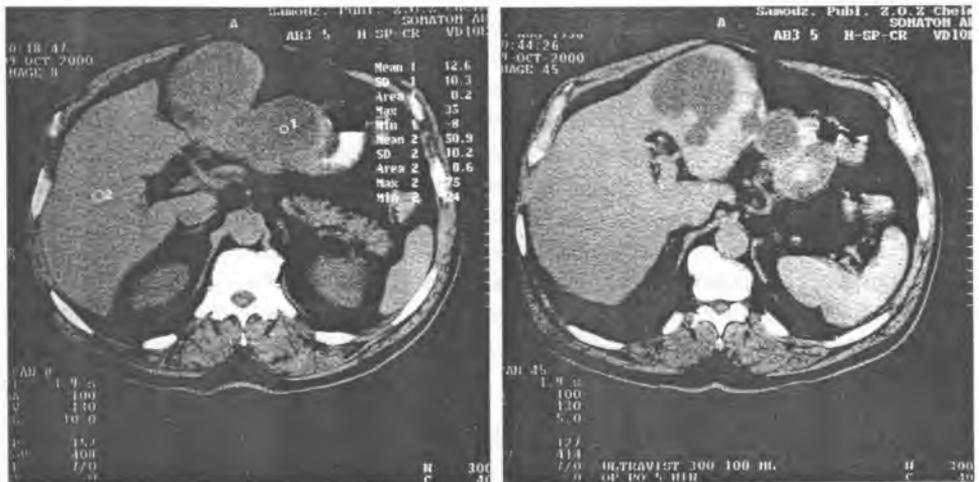


Fig. 3AB. Intrahepatic abscess within the left lobe, and omental abscess. Hipodense areas not enhancing after administering of contrast agents, with thick enhancing walls



Fig. 4. Subhepatic abscess after cholecystectomy. Air/fluid level, typical of abscess.
Evident enhancement of the walls

DISCUSSION

Abscesses are collections of pus that may displace adjacent structures: examples include the elevation of a hemidiaphragm by a subphrenic abscess, the displacement of the duodenum by a pancreatic abscess, or the displacement of the colon by a paracolic abscess. Subphrenic abscess nearly always occurs as a result of surgery, whether performed electively or because of an acute abdomen. The high mortality associated with these abscesses can be reduced by early diagnosis and drainage. A detailed anatomical knowledge of the subphrenic space is essential to the understanding and diagnosis of subphrenic abscesses (3).

In the post-laparotomy patient a subphrenic abscess is the commonest cause of pleural effusion (3, 6). After a cholecystectomy, small bowel may adhere to the gallbladder bed and produce a slightly irregular gas/fluid level (3, 6). Perirenal and renal abscess may be found in patients with colitis, urologic infections, diabetes, trauma, urologic surgery or immunosuppression (3, 6). Abdominal radiographs, centred just below the diaphragm to ensure maximum visualization of the subphrenic area, can be expected to show evidence of the abscess in over 60% of cases, as a gas/fluid level (3, 6). A small number of cases will demonstrate a paralytic ileus.

Abscesses are usually of soft-tissue density on plain radiography but frequently contain gas. This gas may form single or multiple, small bubble-like or streak radiolucencies. Over 80% of subphrenic abscesses can be expected to show a raised hemidiaphragm on the affected side, about 70% show evidence of basal consolidation or collapse, and 60% have a pleural effusion (3, 6).

Ultrasound is particularly valuable in the detection of gas-free abscesses (especially on the right side), though abdominal dressings, drains, scars and excessive postoperative bowel gas can all limit the value of the technique. The sensitivity of US is about 80–85% (3, 4). In US examination most of abscesses form anechoic or hypoechoic irregular areas. Negative results of US examination do not exclude the presence of abscess.

CT is an accurate method in detecting abdominal abscesses, often used in CT guided percutaneous drainage. CT improved abscess management and reduced frequency of postoperative laparotomy (3, 5). CT is the examination of choice, especially if abscess is clinically highly suspected (3, 6). CT reveal abdominal fluid collections and abscesses with sensitivity 90–100% (4).

The possibilities of multiplanar CT reconstructions, examination on suspended respiration, imaging with contrast inside the bowels exclude the risk of misdiagnose and enable differentiation of intestinal loops and fluid collections (5). The advantages of CT is revealing deep retroperitoneal abscesses covered by the intestinal gas and therefore invisible in US.

The presence of abdominal gas bubbles, irregular and thick walls, contrast enhancement of the walls and irregular reflective debris inside the fluid collections are helpful in abscess diagnosing. In CT they typically form oval hypodense changes, with enhancing wall (3).

The CT images of abscesses are various depending on the abscess stage. Early abscesses form soft tissue oval masses. Later appear the area of necrosis within the mass and liquid areas. Mature abscesses form cystic fluid collections with thick, irregular wall with evident contrast enhancement. The densities of the fluid areas are slightly higher than water, and air/fluid level of air bubbles are often present. In large abscesses displacements of adjacent structure occur (3).

The sensitivity and accuracy of MRI is similar to that of CT examination. MR may be indicated in patients who do not tolerate contrast agents. The advantages of MR include easy differentiation of haematomas and abscesses. The US or CT guided needle biopsy enable definite diagnosis (7).

Radionuclide imaging using leukocytes labelled with indium-111 is a useful method of detecting inflammation or abscess in the abdomen but it is under-used. This method is particularly suitable for abdominal imaging since the radionuclide is not excreted through the normal gastrointestinal tract. A sensitivity of 95% and a specificity of 99% have been reported for the method. Hepatic and splenic abscesses pose some difficulties owing to the accumulation of isotope that occurs normally in these organs, and in these circumstances CT or ultrasound are better (3).

Barium studies may increase the diagnostic yield by demonstrating displacement of bowel or by confirming that gas/fluid levels lie outside the bowel (3, 6). Diverticulitis and appendicitis are both common disorders, and left paracolic, right paracolic and pelvic abscesses secondary to these conditions comprise the largest group of paracolic abscesses (3).

US is used in US guided needle aspiration, are helpful in definite diagnosis of subphrenic, hepatic and pelvic abscesses. US and CT guided drainage is used as curative procedure. The advantages of percutaneous drainage is high efficiency (about 90%) (4, 7). In pancreatic abscesses and in abscess complicated with fistula the efficiency of drainage is a little lower (60–80%) (1, 5).

The curative drainage eliminating infections is achieved in more than 80%. The partial success (drainage with subsequent surgery) is performed in 5–10%. The successful drainage of solitary fluid collections in abdominal organs is performed in about 90% of patients (4). In early haematomas and pancreatic abscesses the successful drainage is performed in 70–80% of cases (5).

The complications of percutaneous drainage occur in 3–10% of cases (2, 6). The introducing US and CT guided percutaneous drainage of the abscesses decreased the mortality especially in postoperative patients from 20–30% down to below 10% (5, 6). The recurrence occurs in 5–10% of patients (2, 6).

CONCLUSIONS

Abdominal abscess is life threatening condition requiring quick diagnosis and proper management. The imaging methods are especially important in diagnosis of abscesses. Abscesses may be recognized on plain abdominal radiograms, but US and especially CT are much more sensitive and accurate. CT is imaging modality of choice in revealing abdominal abscess. CT and US are very useful in nonoperative therapies, including US and CT guided drainage.

REFERENCES

1. Barbanic Z. et al.: Percutaneous nephrostomy: placement under CT and fluoroscopy guidance. *AJR*, 69, 151, 1997.

2. Boland G. et al.: Percutaneous abscess drainage: complications. *Sem. Intervent. Radiol.*, 11, 267, 1994.
3. Garnier R. et al.: *Diagnostic Radiology. A Textbook of Medical Imaging.* Churchill Livingstone, vol. 2, 4, 2001.
4. Gazelle G., Mueller P.: Abdominal abscess: imaging and intervention. *Radiol. Clin. North. Am.*, 32, 913, 1994.
5. Lee M. et al.: Percutaneous intervention in acute pancreatitis. *Radiographic*, 18, 711, 1998.
6. Lee M.: Non-traumatic abdominal emergencies: imaging and intervention in sepsis. *Eur. Radiol.*, 12, 2172, 2002.
7. van Sonnenberg E. et al.: Percutaneous abscess drainage: Update. *World J. Surg.*, 25, 362, 2001.

SUMMARY

The aim of the study is presenting own experiences in using different diagnostic modalities in evaluating abdominal abscesses. Material comprises a group of nine patients with diagnosed abdominal abscess aged between 22 and 78 years. The plain abdominal radiograms, ultrasound examinations and computed tomography were performed in those patients. The CT examination was performed in 10-mm thick axial sections, before and after administering contrast agent. The perirenal abscesses were found in two patients. In US have showed various, inhomogeneous echogenicity, depending on the stage of the abscess. The contrast CT reveals enhancing septa, thick walls and oval, central area of lower density. The plane radiograms revealed abscesses in three cases. In two of them abscesses were complications of previous cholecystectomy. The large abscesses dislocated intestinal loops. CT was necessary to assess the extent, depth and shape of retroperitoneal fluid collections. Abdominal abscess is life threatening condition requiring quick diagnosis and proper management. The imaging methods are especially important in diagnosis of abscesses. Abscesses may be recognized on plain abdominal radiograms, but US and especially CT are much more sensitive and accurate. CT is imaging modality of choice in revealing abdominal abscess. CT and US are very useful in nonoperative therapies, including US and CT guided drainage.

Diagnostyka obrazowa ropni jamy brzusznej

Celem pracy jest przedstawienie własnych doświadczeń w wykorzystywaniu różnych technik obrazowania w diagnostyce ropni jamy brzusznej. Materiał stanowi grupa dziewięciu pacjentów z rozpoznaniem ropni jamy brzusznej, w wieku 22–78 lat. U pacjentów tych wykonano zdjęcie przeglądowe jamy brzusznej, badanie USG oraz badanie TK przed i po podaniu dożylnie środka kontrastowego. U dwu pacjentów stwierdzono ropnie przynerkowe. W USG wykazywały one różną echogeniczność w zależności od wieku ropnia. Badanie TK z kontrastem wykazało wzmacniające się przegrody, grube nieregularne ściany oraz centralny obszar gęstości niewzmacniający się po podaniu kontrastu. Zdjęcia przeglądowe jamy brzusznej wykryły ropnie u trzech pacjentów. U dwu z nich były one powikłaniem cholecystektomii. Duże ropnie przemieszczały pętle jelitowe. TK było konieczne w ocenie rozmiaru, głębokości i kształtu zaotrzewnowych zbiorników płynu. Ropnie w jamie brzusznej są stanem zagrażającym życiu, wymagającym szybkiej diagnozy i właściwego postępowania. Szczególnie ważne w diagnostyce ropni są metody obrazowe. Ropnie mogą być rozpoznawane na zdjęciach przeglądowych jamy brzusznej, ale badania USG i TK są znacznie bardziej czułe i dokładne. TK jest metodą obrazowania z wyboru w ocenie ropni jamy brzusznej. TK i USG są również wykorzystywane w nieoperacyjnym leczeniu ropni za pomocą przezskórnego drenażu pod kontrolą USG i TK.