SUMMARY AND CONCLUSIONS

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Intra-abdominal fluid collections have a myriad of etiologies including inflammatory, metabolic, traumatic, iatrogenic, and neoplastic sources (John and Miller,1984).

The inflammatory and traumatic intra-abdominal collections including, abscesses, hematomas, urinomas,bilomas, lymphoceles, and CSF collections.

Ultrasound is an exellent modality for detection of the intra-abdominal fluid collections being noninvasive, not expensive, and flexible. It is a rapidly survey the whole abdomen and highly sensitive (Mueller and Simeone, 1983).

It can detect collections as small as 5 to 10 cc and in cases of intra-abdominal abscesses it has a sensitivity of 82% and specificity of 94.5% (John and Miller, 1984). It localize and delineate the abnormal fluid collections and displays multiple cross sectional images of both intra and extraorgan fluid collections where, the relationship of these collections to normal organs, vessels and bowel is delineated (Mueller and Simeone, 1983). U.S. also can provide a guide for percutaneous diagnostic and therapeutic procedures (Alfred, Kurtz and Barry, Goldberg, 1988).

Generally speaking, on ultrasound examination, intraperitoneal abscesses appear as hypoechoic fluid collections that often contain internal echoes **(Doust et al.,1977)**.

The ultrasonic appearance may vary depending on the thickness of the pus and the duration of the abscess. **(Morley,1985)**. The distal acoustic enhancement depends on the protein content of the fluid, the greater the protein content the weaker the distal acoustic enhancement **(Skolnick, 1986)**.

The intraperitoneal abscesses often have multiple configurations because of the various anatomic compartments to which they may conform. Also being under tension, intraperitoneal abscesses tend to displace surrounding structures **(Mueller and Simeone, 1983)**.

The sonographic pattern of an intraorgan abscess varies from purely anechoic to a highly echogenic lesion. But the majority of intra-organ abscesses are less echogenic than the normal surrounding parenchyma. These hypoechoic lesions may contain variable amounts of low level internal echoes. These internal echoes suggest either septa or normal tissue protruding into the cavity **(Kuligowska et al., 1982)**.

Fluid-fluid interfaces can be seen, representing layering of debris inside the abscess cavity. Distal acoustic enhancement of variable degree is a prominent feature of most intra-organ abscesses (**Kuligowska et al., 1982**). Gas is an uncommon feature of intraorgan abscess (**Sutton,1987**). But if present within the fluid collection, it is highly suggestive of infection, consequently, the fluid collection will appear as a highly echogenic structure with or without acoustic shadowing depending on the amount of gas present (**Gosink, 1981**). Through transmission is therefore not noted initially because of gas present obscuring the abscess cavity. When the gas bubbles is absorbed, the abscess and good through transmission demonstrated posterior to the abscess (**Kuligowska et al., 1982**).

The wall of the abscess is usually irregular and it's thickness may vary from a well defined and prominent wall to an indistinct thin border (**Kuligowska et al., 1982**).

The size of intra-organ abscess vary greatly e.g the hepatic abscess vary from 1 cm in diameter upto almost an entire lobe of the liver (**Dewbury et al., 1980**).

The shape of intra-organ abscess varies from round or ovoid to elliptical, finger like, lenticular or completely irregular lesions (**Kuligowska et al.,1982**).The surrounding normal tissue of the affected organ is echogenic and there may be associated with organomegaly (Taylor et al., 1980).

Retroperitoneal abscess on ultrasonic examination appears as anechoic to hypoechoic mass with or without acoustic enhancement. Hyperechoic foci (with or without shadowing) with the mass suggest gas within the abscess. There is no associated enlarged visceral lymph nodes (to differentiate from malignant tumours); and it may extend to involve the psoas or lateral abdominal muscles (Skolnick, 1986).

Psoas abscess appears as a hypoechoic mass with or without acoustic enhancement. There is associated enlarged psoas muscle and disruption of the normal laminar pattern which may displace the adjacent kidney (Skolnick, 1986).

On ultrasonic examination of intra-abdominal hematomas they appear in different shapes. The shapes of intra-abdominal hematomas seemed to be determined by their location. The hematomas in retroperitoneum, pelvic, intra-peritoneal and hepatic hematomas all were ovoid or spherical in shape. The perirenal hematoma is lentiform. This configuration reflects the ease of dissection of the fluid collection along well defined tissue planes (Jeffrey et al., 1978). Hematomas ranged 4-23 cm in greatest dimmension. 25% of the hematomas increased in size and 75%

decreased in size. The increased in size considered clinically and surgically to be due to continued bleeding (Jeffrey et al., 1978). 88% of hematomas had irregularity of the wall at some time,once irregular the wall continued to be irregular on subsequent examinations old hematomas seem to contain fewer echoes. There is no difference statistically between the early (1-7 days) and middle (8-30 days) ages. However, late hematomas (31-380 days) contain significantlly fewer echoes than the early or middle groups (Jeffrey et al., 1978). Kaplan and Sanders demonstrated in vitro that fresh unclotted or homogenously clotted blood had no internal echoes. With fragmentation of the clot, internal echoes were found (Kaplan and Sanders, 1973).

Septation within the hematomas was present in (44%) of cases (Jeffrey et al., 1978).

Urinomas appear on ultrasonic examination as purely cystic mass with posterior acoustic enhancement (Janis and Letourneau, 1987). All of which had sharp margins regular outline and generally elliptical in shape. All show good through transmission (Bruce et al., 1977). The peritrans-plant urinomas usually located at lower pole of kidney, show fluid/fluid level but no septations (Terry et al., 1981).

The bilomas appear on ultrasonic examination as cystic lesion. The bile collections were well demarcated, tended to be rounded or oval, had few central echoes and exhibited posterior wall enhancement. In few cases debris or blood clot were identified (Jorge et al., 1985). About 85% of bilomas are solitary and about 15% patients with bilomas had two distinct, segregated bile collections. About 75% of bilomas were in the right upper quadrant and about 25% were in the left upper quadrant. Of the 75% Rt sided bilomas,37.5% were subphrenic,37.5% were subhepatic, and 25% were intraheptic. 80% of the left sided bilomas were subphrenic and 20% were in the gastro-hepatic recess (Jorge et al., 1985).

The intra-abdominal lymphoceles in ultrasonic examination appear as anechoic (66%) or hypoechoic (34%) masses. Through transmission was observed routinely. Also depris present in about (45%) of cases and septa in about 15%) of cases (Eric et al., 1986).

An early finding in 7% of patients was chylous ascites, which developed into loculated abdominal lymphoceles. Lymphoceles with substantial debris and internal echoes are more likely to be infected (Doust et al., 1977).

The intra-abdominal CSF collections on ultrasonic examination appear as large or small loculated collection of hypoechoic fluid. Also there is septations and good through transmission. The collection is related to the peritoneal end of ventriculoperitoneal shunt **(Barnett and Morley, 1985).**

Computed (CT) is idealy suited to decument the presence of abdominal or pelvic collections, identify their location and full extent, characterize the fluid and often suggest it's sources and provide guidance for percutaneous diagnostic and therapeutic procedures when required **(Robert and Churchill, 1989).**

It also, possible detects multiple concurrent collections and it is very sensitive e.g. CT has an accurancy rate approaching 100 percent in the diagnosis of intra-abdominal abscesses **(Robert and Churchill, 1989).**

The criterias for identification of an intra-abdominal abscess by CT have been well described and include identification of an area of low CT attenuation values in an extraluminal location or within the parenchy-ma of solid abdominal organs. The density or the attenuation coefficient of abscesses usually falls between that of water (zero to 20 hounsfield units) and solid tissue (40 to 60 Hounsfield unit) **(Mueller and Simeone, 1983).**

Therefore, the attenuation within most abscesses is between + 10 to + 30 Hounsfield units. However, sometimes the attenuation value may reach higher than + 30 HU, thus differentiation between an abscess and a tumour will not be definite, and thus clinical history may be of great help in differentiation that kind of lesion (Lundstedt et al., 1983).

In the same manner, the attenuation value of the abscess cavity may be the same as that of water depending on the amount of debris, blood or protein materials (Haaga and Alfidi, 1983).

Intra-cavitary gas is a helpful additional finding and has been reported in 40% to 50% of intra-abdominal abscesses (Wolverson et al.,1979).The gas can appear as an air-fluid level or as small, finely dispersed air bubbles appearing as black densities throughout the collections (Haaga and Alfidi, 1983). In some cases, there may be no well defined fluid collection and small pockets of gas may be the only sign of infection (Mendes and Isikoff, 1979). Very small gas bubbles may not measure-1000 HU because of the partial volume effect,these may only measure-200 to 300 HU.However,one can easily confirm the nature of such gas bubbles by adjusting the window center until the adjacent fat appear gray. Thus, any structure that appears darker than the gray fat represents gas (Haaga and Alfidi, 1983).

The use of intravenous contrast material may aid in the identification of small intraorgan abscess by accentuating the density difference between the normal surrounding tissues that enhance and the non enhancing abscess itself (**Lee, 1983**). Often, extraorgan collections demonstrate a wall or rim of tissue that is hypervascular and is enhanced after the accumulation of iodinated contrast material, thus better defines the margin and the extent of the abscess (**Mueller and Simeone, 1983**).

Generally speaking, all abscesses are identical in the CT appearance whether the causative organism is bacteria, yeast or parasites. The only exception to this is that tuberculous abscess and infected echinococcus occasionally may be associated with calcification (**Haaga and Alfidig, 1983**).

The CT appearance of intra-abdominal hematomas differ from the intracranial hematoma for number of reasons. One factor which alter the appearance of the intra-abdominal blood is the convention of photography abdominal CT scans at a much wider window than is customary for cranial CT scanning (**Michael et al., 1986**). A wider window is necessary for optimal visualization of the abdominal contents, which have a much wider range of attenuations coefficient than the brain parenchyma. Photographying a wider window width has the effect of increasing the gray scale and minizming the density difference between the substances of similar attenuation (e.g splenic parenchyma and hematoma) **(Michael et al., 1986)**.

Blood may be hypo-hyper, or isodense relative to splenic or hepatic parenchyma depending on the hematocrit and physical state of the blood (clotted or lysed), the use of iodinated contrast media, and the density of the adjacent organ **(Michael et al., 1986)**. Hemoglobin is a major determinant of the CT attenuation of blood, and a linear relationship between attenuation and hematocrit has been established. The high density of recent hemorrhage results from clot retraction and/or sedmentation of cellular elements in liquid blood **(Michael et al., 1986)**.

Chronic anaemia (but not acute blood loss) may result in clots of lower attenuation. Clotted blood is usually non homogenous due to disruption of the collection by tissue barriers, septation of clot from serum, and sedimentation of cellular elements. Intermittent bleeding may result in episodes of clot formation and retraction. Curvilinear peripheral layers of clot reflect the tendency of clot to form in contact with tissues. Fluid-fluid levels may occur following liquification of clotted blood or in fresh bleeding that fails to coagulate. The later phenomenon is seen in hemophiliacs and those on anticoagulant medication **(Swenson et la., 1984)**. Densely clotted blood may have a CT attenuation of more than 100 HU. Most clots have an attenuation range of 50-70 HU. Lysed blood flowing freely within the peritoneal cavity has an attenuation range of about 30-45 HU.Hemoperitoneum should be never have an attenuation value less than 20 HU, excluding severe chronic anaemia, errors due to CT artifact, or poor calibration, or blood more than 48 hours old **(Federle and Jeffrey, 1983).**

In cases of isodense hematomas in spleen or liver following intravenous administration of contrast media the spleen or the liver becomes hyperdense relative to the non enhancing hematoma **(Michael et al., 1986).**

On CT examination the attenuation value of urinomas tend to be in the -10 to +30 range **(Heals et al., 1984).** Enhancement of the wall of urinomas during the phase of capillary transit of contrast medium is noted, reflecting the inflammatory neovascularity in the wall **(Long et al., 1985).**

Active communication with the collecting system may be indicated by a substantial step up of the attenuation coefficient attendant to entry of contrast medium-laden urine into the urinoma **(Long et al., 1985).**

The enhancement of the urinoma is homogenous and there is thickening of the renal fascia reflecting irritation by extravasated urine (**Erich, Lang and Lawrence Glorioso, 1986**).

On CT examination 20% of bile collections exhibited a thin rim, 1-2 mm thick, and 5% of chronic biloma of 5-6 weeks duration had a thick rim about 4 mm thick. 30% of the patients had free ascitic fluid in addition to an encapsulated biloma (**Jorge et al., 1985**).

The CT numbers for a regions of interest within the bilomas ranged from 2 to 54 HU. 90% of the collections had CT numbers less than 20 Hu. For the 10% collections with CT numbers of greater than 20 HU., one contained blood as well as bile and other was judged to be infected (**Jorge et al., 1985**).

The CT characteristics of intra-abdominal lymphoceles included mass lesions of low density with negative CT values (CT numbers as low as-18) in about 25% of patients. Infected or complicated lymphoceles had CT numbers in a higher range (up to CT number 24). Calcification was seen in about 5% of patients (**Rifkin et al., 1983**). The lymphoceles show no enhancement after intravenous contrast medium (**Reed and Dunnick et al., 1990**).

On CT examination the appearance of CSF collection is non specific and aspiration must be performed to exclude infection (Robert and Churchill, 1989).

As we see an ultrasound assessment should be the first diagnostic test done on the patient suspected of having an intra - abdominal fluid collections. Many conditions share ultrasonic characteristics but with attention to the clinical findings and medical history a resonable list of the possible diagnosis can be derived. When the diagnoses is not reached the CT examination should involved and if still not sure about diagnosis, diagnostic aspiration of the collection under US or CT is done.