What is an abdominal radiograph?

Abdominal radiographs are part of the **routine diagnostic workup** for any patient presenting with acute abdomen, colitis, colicky pain, renal colic, or abdominal trauma. Abdominal radiographs are performed using the conventional x-ray beams we also use for the evaluation of skeletal abnormalities, i.e., fractures, or for the detection of free abdominal air.

The abdominal radiograph generally consists of **two main views**, an anteroposterior view with the patient in supine position and a lateral decubitus view if indicated. An erect chest x-ray should be performed in a patient with acute abdomen only if the possibility of viscus perforation is high.

The optimal abdominal radiograph should **show the diaphragm, lateral abdominal wall musculature, and the pubic rami**. When the image does not show the whole abdomen, one can miss the detection of certain abnormalities such as abdominal calcifications which are the focus of this article.
The radiation dose of a single abdominal radiograph in an emergency setting is minimal and the benefits of the radiograph in guiding the treatment plan are tremendous. The abdominal radiograph has the radiation dose of 75 chest x-rays! Therefore, even though the benefits outweigh the risks in most cases, caution must still be taken to avoid repeating the test due to an incomplete abdominal view.

How to interpret an abdominal radiograph?

Systematic approach

For us to not miss any abnormality by focusing on witch-hunting for calcifications, we suggest to use a systematic approach when reading an abdominal radiograph.

1. The first step should be reading and checking the patient’s demographics, name, and the date of the film.
2. Before looking for calcifications, it is always good practice to review the bowel gas patterns.
3. The third step is to evaluate each intra-abdominal organ individually. During this evaluation, one should look for organomegaly, abnormal outlines or calcifications within the reviewed organ.
4. The fourth step is all about evaluating each abnormal abdominal calcification trying to define the origin.
5. The fifth step would be to evaluate the skeleton, followed by the visualization of the lung bases and
6. the last step should be the documentation of the findings from each of the above-mentioned steps.

By following this algorithm, one can make sure to lower the risk of false-positives and avoid misdiagnoses.

Abdominal Calcifications

Abdominal calcifications are quite common on abdominal radiographs. Care must be taken to differentiate between normal and abnormal calcifications. The correlation between the radiographic findings and the clinical picture of the patient is always helpful and recommended.

Renal Tract Calculi

Stones within the kidneys, ureters and bladder can be visualized in most cases using a “Kidneys, ureters and bladder” (KUB) radiograph. KUB radiographs nowadays are rarely used in the assessment of the patient with renal colic after the introduction of low-dose computed tomography scans which makes it easier and more accurate to confirm or exclude the diagnosis of a renal tract calculus.
Renal stones can be small and resemble punctate foci of calcification on an abdominal radiograph. When the calculus is large enough to fill the renal calyces, the staghorn calculus sign is seen on the abdominal radiograph.

Calculi can be also seen within the ureters. The course of each ureter should be tracked down to exclude the presence of a calculi in both ureters. The ureters pass down the lateral borders of the transverse processes of the lumbar spine. The pelvico-ureteric junction and the vesicoureteral junction are the two most common sites for an entrapped ureteric stone and should be always identified and reviewed on an abdominal radiograph in a patient with renal colic.

Urinary bladder stones can be easily visualized on an abdominal radiograph. They are usually large and are caused by chronic cystitis or urinary stasis. Small urinary bladder stones usually resemble ureteric stones that recently passed into the bladder.

Phleboliths

Calcifications within the venous blood vessel walls are known as phleboliths. They are quite common especially in the elderly. There is no clinical significance whatsoever of a phlebolith but they can be confused with ureteric stones.

Sometimes, a phlebolith is misdiagnosed as a ureteric stone. To avoid a false-positive diagnosis one should focus on the clinical correlation of the radiographic finding. Such patients usually do not have renal colic, do not have symptoms and signs suggestive of urinary tract obstruction, do not have symptoms or signs suggestive of urinary tract infection and careful evaluation of the stones would reveal a location that is outside the outline of the ureter.

On the other hand, one might misdiagnose a ureteric calculus as a phlebolith. This is rarely done because the clinical picture of the patient would make the threshold for diagnosing ureteric calculi lower. Phleboliths are typically round, have a lucent center and have smooth borders. On the other hand, a renal calculus is irregular in shape and border and always has a homogenous high density on the radiograph. Virtually, any calcification below the ischial spines can be assumed as a
Whenever in confusion, one should always order an abdominal computed tomography scan. Computed tomography scans can clearly visualize the kidneys, ureters and urinary bladder and can very accurately differentiate between renal tract calculi and phleboliths.

Appendicoliths and Acute Appendicitis

Acute appendicitis is usually a clinical diagnosis that is supported by the laboratory finding of leukocytosis. If a radiograph is ordered for some reason, appendicoliths might be observed in few patients. The finding of an appendicolith is an indication for urgent appendectomy and makes further imaging evaluation unnecessary in the symptomatic patient.

Gallbladder Stones

In contrast to renal tract stones which are most commonly calcified, only 10% of gallbladder stones have enough calcium to be radiopaque on an x-ray. Therefore, it is not recommended to order an abdominal radiograph for the sole evaluation of gallbladder stones.

If, however, an abdominal radiograph is ordered for some reason, one might see a faintly calcified gallbladder stone, or a very densely calcified stone that is obvious. When a radiograph of the abdomen is performed for any other indication, it is always advisable to check the right upper quadrant to exclude gallbladder stones just in case.

Vascular Calcifications

Arterial wall calcifications are usually pathological in contrast to venous mural calcifications which are usually benign. Arterial wall calcifications are strongly related to atherosclerosis. Points of vascular calcifications also correlate well with sites of aortic or iliac artery aneurysms.
If the possibility of an aneurysm is high, computed tomography angiography scans are indicated. The urgency of further imaging is dependent on the hemodynamic stability of the patient. Incidental aneurysms in asymptomatic patients that are between 3-4.4 cm require annual ultrasonography follow-ups. Aneurysms that measure between 4.5-5.4 cm require regular ultrasonographical evaluations every three months. Larger aneurysms regardless of symptomatology require an urgent computed tomography scan.

References


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