Is routine abdominal radiography of any value prior to an abdominal ultrasound investigation?

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Abstract

It is common practice to do a routine abdominal X-ray prior to doing an abdominal ultrasound investigation. This study questioned the value of the abdominal film to determine whether it should be mandatory.

In this prospective, descriptive clinical study at Tygerberg Hospital, a tertiary referral hospital, we included 100 consecutive patients referred to the Ultrasound Department for an abdominal ultrasound, for a variety of indications.

An ultrasound of the abdomen was performed and the abdominal film evaluated for each patient. The examinations were performed within 24 hours of each other.

The abnormalities were observed and the ultrasound and X-ray diagnoses recorded.

The abdominal film played a vital role in ultrasound diagnosis in only 2% of patients, while in 8% it played a positive role.

Introduction

It is common practice to do a routine abdominal film prior to an abdominal ultrasound investigation. This study questioned the value of the abdominal film.

Due to the lack of references in radiology textbooks with regard to the indications for plain abdominal radiography, the *Oxford Textbook of Surgery* will be quoted.

- Acute abdominal pain (only a supine abdomen for gas pattern and erect chest film for subphrenic gas and lung changes)
- Intestinal obstruction (supine indicated — value of erect film undecided?)
- Renal colic (alone or as part of intravenous urogram)
- Constipation (only by specialist request).

The *Oxford Textbook of Surgery* does not mention the use of abdominal radiography as a routine investigation before an ultrasound investigation. They do state that it is not indicated for suspected biliary disease, pancreatitis, aortic aneurysms, nonspecific abdominal pain, urinary retention, loss of intra-uterine contraceptive device, haematuria, palpable mass, melaena and even appendicitis.

The average radiation dose from a plain abdominal radiograph is 1.5 mSv (7.5 times that of a chest radiograph), and from abdominal CT examination 8.0 mSv (400 times that of a chest radiograph).[2]

Most authors agree that the evaluation of a patient with abdominal pain should consist of a detailed interview and thorough physical examination, and selected laboratory screening tests. However, many physicians, because of their concern about 'missing something', seem compelled to order numerous tests. Schmidt *et al.*[3] showed that for vague abdominal pain, the primary radiological investigation should be an abdominal ultrasound. They did not evaluate the value of plain abdominal radiography.

Acute abdominal conditions are among the most frequent, dangerous and difficult ailments radiologists have to examine and diagnose. They are indeed a diagnostic challenge. The radiologist must insist on adequate clinical information. The radiological examination is not competitive but complementary to the clinical examination.

Materials and methods

This prospective, descriptive study included 100 consecutive patients, all

of whom had a plain abdominal film and an abdominal ultrasound within 24 hours of each other. Immediately after the ultrasound, the radiologist completed a form stating the patient details, history, symptoms and signs, previous or planned surgery, dates of investigation, the presence of an acute abdomen, the ultrasound diagnosis and the plain abdominal film findings. A specific opinion as to whether the X-ray film contributed to the ultrasound diagnosis was also recorded.

The abdominal ultrasound examinations were done on Toshiba Eccocee and Capasee machines with 5-7 MHz curvilinear tubes. The ultrasound pictures were taken with a Sony black and white printer.

Results and discussion

In this study of 100 consecutive patients, 55% were female and 45% male (Fig. 1). The age range was between 6 and 85 years, with a mean age of 30 years.
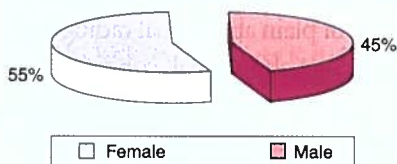

Fig. 1 Patient gender.

Positive diagnoses (positive pathological findings) were present in 56% of the patients in our study (Fig. 2). This is contrary to the findings in other studies. Colquhoun *et al.*[4] found positive findings in 27% of patients. This most likely reflects the fact that Tygerberg Hospital is a tertiary referral centre. In this study we also included hospitalised patients
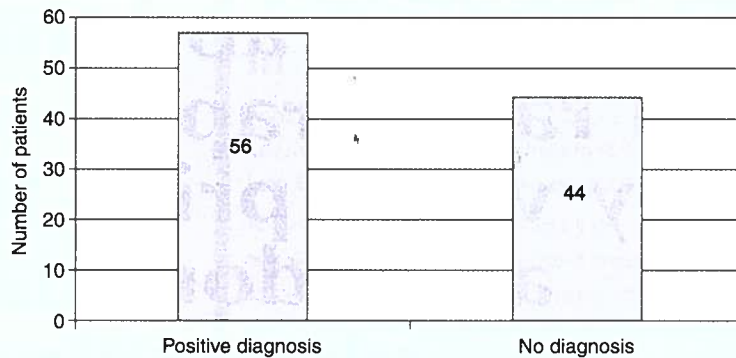

Fig. 2. Ultrasound diagnosis.

(54%), while the other studies mainly comprised referrals from general practitioners (therefore a less selected group).

The commonest changes demonstrated on plain abdominal films were:

- Skeletal degenerative changes 18%
- Calcifications (vascular/stones) 14%
- Ascites 3%
- Faecal loading 4%
- Normal 45%

Value of the abdominal film (Fig. 3)

In this study the abdominal film contributed to the diagnosis in only 10% of patients. The plain film was
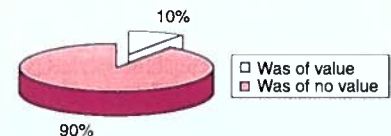

Fig. 3. Value of the abdominal film.

vital to the ultrasound diagnosis in only one-fifth (2%) of the 10% of cases.

This 10% can be divided as follows (Fig. 4):

1. 2% absolutely necessary:
- Calcification in the psoas mucle (hydatid/ old haematoma)
- Differentiation between faecal loading and a mass.

2. Even without the ultrasound investigation, 2% of the above patients would have had a plain abdominal
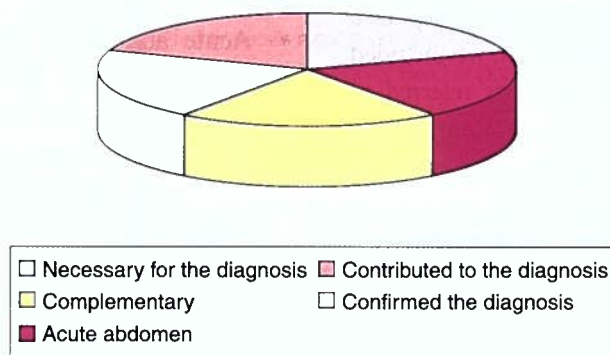

Fig. 4. Influence of abdominal film on definitive diagnosis.

film because they had an acute abdomen.

- Right lower lobe pneumonia (acute abdomen)
- Renal colic (stone missed on ultrasound; also an acute abdomen).

3. In 2% of the cases the abdominal film contributed to the diagnostic process only in the performance of the ultrasound investigation, but it was not a necessity. The patients included:

- Chronic pancreatitis (calcification missed on ultrasound and only seen on plain abdominal film) (Fig. 5)
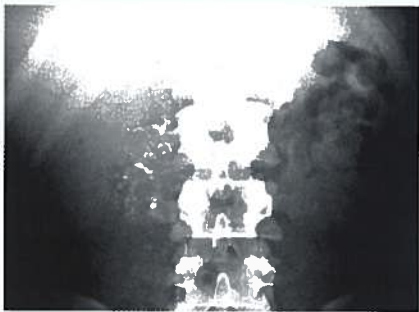- Congenital abnormalities —sacral agenesis. (The diagnosis was

Fig. 5. Calcification of the head, body and tail of the pancreas in a patient with chronic pancreatitis.

known, the renal ultrasound was normal.)

4. In another 2% of cases the plain abdominal film only complemented the ultrasound investigation. These patients included:

- Staging of cancer with metastatic disease
- Mega-colon (helped with work-up of the patient).

5. In the last 2% of cases the plain abdominal film only complemented the ultrasound diagnosis. These patients included:

- A left inguinal hernia and
- A hydatid cyst in the liver.

Note that in the 10% of patients with plain films that were of any value, only 2% made a difference in the final diagnosis.

Conclusion

The plain abdominal film was of value in 10% of cases, but in only 2% of the cases did it play an essential role. Kidney stones could only be detected in 4% with ultrasound, and 2% on plain film; it is therefore concluded

that plain films play a definite role in the diagnosis of renal colic.

In only 2% of the patients did the abdominal X-ray change the diagnosis and in only 8% did it contribute to the ultrasound diagnosis. It is therefore concluded that there is no indication for a routine abdominal film before an ultrasound investigation.

The very high overall positive diagnostic rate (56%) of ultrasound in this study suggests that vigorous steps to reduce its usage are not justified. Rather, consideration should be given to redirecting resources from less productive forms of radiological investigations.

References

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