5. The passage of time may settle the diagnosis; beware lest it also settle the prognosis.

6. In the absence of haemorrhage, two hours or more are well spent in pre-operative preparation. This is resuscitation, not procrastination.

7. Exploration does not necessarily involve a long paramedian incision. A gridiron incision

takes little time; may be of vast advantage to the patient, but requires the strength of the surgeon's convictions.

BIBLIOGRAPHY

- HALL, R. J. (1886), *N. Y. med. J.*, 43, 662.
 KRIEGE (1892), *Berlin klin. Wchnschr.*, 29, 1244.
 LAWSON TAIT (1884), *Brit. med. J.*, 1, 1250.

THE PLACE OF RADIOLOGY IN THE MANAGEMENT OF THE ACUTE ABDOMEN

By J. W. PIERCE, M.D., M.R.C.P., D.M.R.D.

St. Thomas's Hospital, London

Introduction

For reasons of time, place—or preference—most acute abdominal emergencies in adults are successfully treated without X-ray examination. Many surgeons, however, prefer to have an X-ray of the abdomen in all save the most obvious cases, but the practice varies in different hospitals, and appears to be governed less by logic than tradition. In infants and children, the possibility of underlying congenital malformations has always to be considered and in this field the importance of radiology is generally accepted.

There is no point in submitting a patient to the discomforts, delays—and possible dangers—of an X-ray examination unless the result may either demonstrate that surgical intervention is unnecessary or enable the surgeon to modify his approach. Many acute cases present a clinical picture clear enough to warrant immediate operation, while the condition of others may demand a laparotomy no matter what an X-ray could show; radiology is therefore often superfluous. But in patients—particularly those with the not-so-acute abdomen—when the diagnosis is not reasonably certain, and the course of treatment as yet undecided, radiology can be very helpful, and should be undertaken whenever possible. It is also of great value in cases where observation is thought preferable to immediate operation, or when it is important to localize a lesion as accurately as possible. There are three main ways in which an X-ray examination can help.

(a) By demonstrating free air in the peritoneal cavity it may confirm a diagnosis of gastro-intestinal perforation.

(b) By showing loops of distended bowel it may indicate the presence of intestinal obstruction or

ileus and provide some idea of the level of the lesion.

(c) By showing calculi, areas of calcification, skeletal or soft tissue abnormalities, radiology may suggest that the lesion lies elsewhere than in the alimentary tract.

Radiography

The examination should be carried out quickly, and with as little disturbance to the patient as possible. It is essential to have one film to show fluid levels, and for preference this should be taken with the patient sitting up. If this is not possible then it should be taken with a horizontal ray—across the X-ray table—the patient lying on his left side. Although the examination should be done quickly it must not be hurried, as films of indifferent quality are worse than useless—they are dangerous. It is not always easy to obtain films of diagnostic quality from a portable set, and whenever possible the films should be taken in the X-ray department. Only rarely are the patients too ill for this to be done, but in dealing with acute admissions the decision to take an X-ray must be made early, so that it may be done on the way to the ward, and not left until the patient has been wearied by repeated examinations.

An X-ray of the chest should always be taken, preferably with rather more penetration than usual, so that shadows behind the heart can be seen.

Findings

Perforations

Free air is usually found immediately under the domes of the diaphragm, above the liver or stomach. Very small amounts can be demonstrated, but these cases must be examined carefully

as a thin crescent of air can easily be overlooked. Occasionally, instead of entering the main peritoneal cavity, the air may be trapped in the lesser sac, and it then lies more centrally in the epigastrium, a little below the level of the diaphragm. Sometimes when the perforation is on the posterior aspect of the duodenum, the air escapes into the retroperitoneal tissues, and may then be recognizable as a collection of small bubbles, centrally situated. Rarely the air may remain trapped around the site of the perforation, and unless a fluid level develops it may be very difficult to detect, though occasionally its presence may be inferred if the outside as well as the inside of the bowel wall can be seen. The finding of free air in the peritoneal cavity does not necessarily mean intestinal perforation, as air admitted at operation may persist for three weeks, and in women it may have entered through the Fallopian tubes. On rare occasions large amounts of air may escape—without any bowel perforation—in cases of pneumatosis intestinalis.

Obstruction

It is in cases of intestinal obstruction that radiology has most to offer. The diagnosis of obstruction can usually be made clinically—it must be seldom that an unsuspected case is revealed on an X-ray—but it may be useful to have more precise knowledge of the nature and site of the lesion before operating, and X-rays can sometimes provide this. When there are many fluid levels in the abdomen little can be inferred as to the cause, but should the distension involve only one or two loops which may become very large and yet remain in the same part of the abdomen, a localized obstruction by bands or adhesions, or a volvulus of sigmoid or caecum is likely. It is important however to remember that on the one hand even in a severe case of obstruction an X-ray may show only minimal evidence of bowel distension, or occasionally no evidence at all; and on the other that the absence of clinical findings does not mean that no obstruction is present; a positive radiological picture should override any clinical uncertainty.

The radiological feature of obstruction is bowel distension, but there is no absolute standard of normal, the diagnosis depending on the degree; and some bowel distension—often with fluid levels may occur in cases of simple diarrhoea, or after purgation or enemata. Identical appearances may be found in cases of ileus, and it may not be possible to tell from the X-ray whether the case is one of intestinal obstruction or paralytic ileus, but this does not matter as in the majority of cases the differentiation is clinically simple. Emphasis is often laid on the importance of localizing the

site of obstruction from the disposition of the distended loops of bowel, and indeed this can often be done. Not infrequently however, such inferences can be most misleading and much reliance should not be placed on these guesses—for instance it is not unusual for the bowel distension above a sigmoid obstruction to stop short at the splenic flexure.

It is usually possible to distinguish between obstruction of the large and small bowel, unless the condition has been present for some time—in the late stages, with increasing distension of the small intestine, the pattern of the valvulae conniventes is obliterated, and the characteristic ladder pattern disturbed, making the distinction difficult. Often both large and small bowel are distended, as many a large bowel obstruction produces distension of the small intestine as well, the degree depending on several factors including the level of the obstruction, the patency of the ileo-caecal valve and the ability of the small bowel to deal with the accumulating gases. The higher the level of a large bowel obstruction the more frequent—and marked—will be the small intestinal distension.

Occasionally when the clinical findings point to a diagnosis of ileus an important distinction may be drawn between a true paralytic ileus and the ileus accompanying a peritonitis. This uncertainty is usually encountered in the post-operative case that is going wrong; the patient may be very ill and the usual clinical findings with fever, pain, rigidity and tenderness, may be absent. In these cases it is sometimes possible in cases of peritonitis to show a thickening of the walls of the distended loops as fluid collects between them.

Infants and children with a suspected abdominal emergency should always be X-rayed. Although perforations are rare, intestinal obstruction is relatively common, and not infrequently is caused or complicated by a congenital anomaly. A plain film of the abdomen may clearly show the level of the obstruction—as in duodenal or anal atresia—or the disposition of the gas shadows may suggest an intestinal malrotation or duplication or other complicating deformity. Although a diagnosis of intussusception can usually be made without radiological aid an occasional uncertainty may be resolved by a barium enema. Occasionally a film may show peritoneal calcification indicative of a prenatal perforation or meconium ileus.

Alternative diagnoses

The third way in which radiology may help in the diagnosis of an acute abdominal emergency is by suggesting that the cause may lie outside the gastro-intestinal tract. Numerous conditions have

been reported presenting as an 'acute abdomen' in which an X-ray has helped towards the diagnosis, but many of them are rare and of more interest than importance.

It is always advisable to X-ray the chest, because some of the conditions which closely simulate abdominal emergencies may be easily recognized on a chest film.

A ruptured oesophagus, for instance, though producing a characteristic appearance in the chest X-ray, may be very difficult to diagnose clinically; and on occasion an acute pneumonia or spontaneous mediastinal emphysema may pose a difficult diagnostic problem.

Renal or biliary colic can usually be diagnosed clinically, but a pyelonephritis or pyonephrosis can cause considerable difficulty, and a film showing renal calculi may help; the demonstration of gall stones is of less significance as they are so commonly found in the symptom-free. Rarely, a large gall stone may cause intestinal obstruction; in these cases the stone has probably not passed through the bile ducts, but has ruptured through from the gall bladder directly into the small intestine, and the finding of air in the bile ducts may confirm this diagnosis.

Extension of a dissecting aneurysm—which can sometimes be spotted by the calcification in

its walls—and the metastatic collapse of a vertebra are among the commoner rarities which may simulate an acute abdominal emergency.

Accident cases which may have sustained abdominal injuries should be X-rayed whenever possible, though little attention should be paid to negative findings. Effusion of blood from a ruptured viscus may sometimes be detected by obliteration of the normal soft tissue fat and muscle planes or by the obscuring of the visceral outlines, and the site of the blood may provide some clue as to its origin. Cases with haematuria after an injury may be safely examined by intravenous pyelography, and in cases of kidney rupture it is sometimes possible to show the extravasation of the contrast medium into the renal and perirenal tissue.

The place taken by radiology in the management of the acute abdomen should be decided by the surgeon. The emphasis should be on correct management, and it should be for him to decide whether the case needs X-raying, and how detailed an examination is necessary. An X-ray in selected cases can be of the greatest value, but the indiscriminate investigation of every patient is unnecessary and undesirable; as though it may add to our store of knowledge it does not improve the individual chances of recovery.

OXFORD MEDICAL PUBLICATIONS

THE EARLY DIAGNOSIS OF THE ACUTE ABDOMEN

by Sir ZACHARY COPE, M.D., M.S., F.R.C.S.

'The mortality of intestinal obstruction is still high, and the need for early diagnosis is emphasized and facilitated by the main part of the text. No doctor can afford to be without the wisdom in these pages.'

—MEDICINE ILLUSTRATED

'An excellent guide to what is often a difficult class of case.'

—THE MEDICAL PRESS

TENTH EDITION

286 pages

39 illustrations

15s. net

OXFORD UNIVERSITY PRESS