(This case will be published later in more detail in collaboration with Dr B Levin and Miss A Burgess.)

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Rupture of Diaphragm – Delayed Diagnosis

Keith A Moore FRCS

Man, aged 57

History: December 1959: knocked down by a lorry and admitted to a surgical ward in another hospital. There he was found to have a fractured left clavicle and fractures of the 5th, 6th, 7th and 8th ribs in the mid-axillary line on the same side. He remained in hospital one month. After two weeks at home he was readmitted for ten days to a medical ward where brownish fluid was aspirated twice from the left side of his chest.

Apart from occasional pain in the left side of his chest he was symptom free until ten months later, when he was admitted to the North Middlesex Hospital with a three-day history of pain in the epigastrium and left shoulder, and nausea, and of having twice vomited a few ounces of blood.

Course in hospital: On admission, he showed no evidence of having bled. There was dullness at the left lung base, where breath sounds were absent.

Chest X-ray demonstrated an opacity in the lower part of the left chest and what appeared to be a raised diaphragm. A barium meal three days later showed a large pouch of stomach, subsequently shown to be derived from the greater curvature of the fundus, lying above the diaphragm.

At operation, by a transthoracic approach, a tear admitting two fingers was found in the dome of the left diaphragm, beginning 4 cm from the margin of the œsophageal hiatus and running towards the summit of the dome. The gastric hernia was 13 cm in diameter and there was no peritoneal sac. The hernia was reduced and the diaphragm repaired with catgut.

Discussion

Two categories of diaphragmatic injury are recognized, bursting by abdominal compression or stabbing by a rib or external weapon; this case was due to injury by a rib. Bursts would seem likely to cause long tears with early herniation, and stabs to produce smaller openings with perhaps delayed herniation and a greater probability of strangulation. This case, and an interesting group of 5 reported by Fawcett & Das (1958), illustrate the delay that is almost usual in the diagnosis of these injuries.

REFERENCE Fawcett A W & Das J B (1958) *Lancet* i, 662

Carcinoid Syndrome

D G Grahame-Smith MB MRCP
(for Professor W S Peart MD FRCP and
D G Ferriman DM FRCP)

L C, man, aged 40

History: For two years has had attacks of flushing, at first lasting up to half an hour and occurring four or five times daily, but now lasting about one minute and occurring up to a dozen times daily. The flush predominantly affects the face, neck and upper chest but may, if severe, involve most of the body surface. During the flush he experiences increased lacrimation, tightness of the face, dryness of the mouth, huskiness of the voice, a regular pounding in the chest and upper abdomen and throbbing in the head. After a severe flush he sometimes notices a pallor and blotchiness of the skin. Embarrassment, excitement, alcohol, defæcation, salty foods and hot drinks tend to precipitate a flush. During the flush he feels he wants to inspire more deeply. His bowels are open two to three times a day, sometimes with normal stools but often with watery stools. Before passing the latter there is much abdominal rumbling. There has been no breathlessness, wheezing, œdema or weight loss and when not flushing he feels quite well.

On examination: When not flushing, the only abnormality is a poorly definable mass in the right side of the abdomen which is deep, fixed and does not move with respiration. There is no evidence of any valvular lesion, the liver is not enlarged, the unflushed skin is normal, there is no wheeze or œdema. No clinical evidence of any metastasis has yet been found.

In a flush, the face, neck and upper chest particularly become a bright, shiny, deep red. The facial skin becomes œdematous and tense and because of this the features change. The conjunctivæ become suffused and there is excessive lacrimation. Venous and arterial pulsation appear in the neck, and the præcordium and epigastrium pulsate. On occasions during a flush there is a slight fall in the systolic and diastolic blood pressures and a moderate tachycardia. After a severe flush the face may go very pale, the dorsum of the fingers may show areas of extreme pallor and the skin over the superficial veins of the legs and dorsum of the hand also becomes very pale. This phase lasts about five minutes.

Investigations: Chest X-ray normal. Barium meal shows an equivocally abnormal area in the terminal ileum which coincides with the palpable mass and may represent the tumour. An intravenous pyelogram shows some kinking of the right ureter which is probably being displaced by the tumour. A liver scan (Pho/Dot Scanner, Nuclear Chicago) after an I.V. injection of 100 μc of rose bengal ^{131}I, shows no definite liver

metastases. The daily urinary excretion of total 5-hydroxyindoles averages 160 mg and paper chromatography shows an increased excretion of 5-hydroxyindole-acetic acid and 5-hydroxyindole-acetic acid 5-sulphate ester (Jepson 1955). Flushing can be provoked by the I.V. injection of 2 μg of noradrenaline (Peart *et al.* 1959).

Discussion

Superficially this might seem a straightforward case of the carcinoid syndrome but there are some unusual features. By the time the carcinoid syndrome supervenes, carcinoid tumours of the small intestine have usually metastasized to the liver. It has been suggested (Waldenström 1958) that primary tumours draining into the portal circulation must be associated with hepatic metastases draining into the systemic circulation before the carcinoid syndrome appears, the supposition being that the hormonal substances responsible for the symptoms are otherwise inactivated by the liver. In this patient there is no evidence of hepatic or other metastases and it may be that the tumour, which is large and fixed to the posterior abdominal wall, is draining via anastomoses with the systemic circulation. Should this be so then removal of the tumour may effect a cure and the post-operative urinary excretion of 5-hydroxyindole-acetic acid will be a guide to the adequacy of tumour removal.

The flushing in this patient, although not excessively severe, is unusual in that it is associated with increased lacrimation, facial œdema and signs of an increased cardiac output. Sjoerdsma & Melmon (1964) have commented upon these features, which are usually associated with bronchial tumours, and we have seen one such patient previously in whom it was possible to show a marked increase in cardiac output and femoral artery blood flow during a flush suggesting a more widespread vasodilatation than is normally assumed.

Oates *et al.* (1964) have found that carcinoid tumours contain large amounts of a kallikrein and that during a flush a kinin is released into the circulation. They also showed, and we have confirmed this in the present case, that the flushing produced by an I.V. injection of bradykinin is similar in many respects to the flush provoked by intravenous adrenaline. They demonstrated also that the tumour kallikrein was inhibited *in vitro* by a trypsin-kallikrein inhibitor Trasylol. We therefore administered, over twenty hours, 170,000 units of Trasylol by intravenous infusion to this patient but we were unable to show any quantitative or qualitative change in the flushes provoked by noradrenaline and the patient continued to flush spontaneously during the infusion. The possible explanations for this therapeutic failure are: (1) The dosage of Trasylol used was too small. (2) Trasylol is ineffective against the tumour kallikrein *in vivo*. (3) Trasylol is unable to penetrate the tumour cells and inhibit the kallikrein.

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Addendum (15.6.65)

A laparotomy was performed on 12.4.65 (Mr J Stephen). A tumour was present in the terminal ileum from which there was direct spread into the mesentery, forming a mass about 1·5 in. (4 cm) in diameter. There was a good deal of surrounding fibrotic reaction and to the mass adhered a loop of ileum. Numerous secondary deposits were present in the liver.

Two feet of terminal ileum, the ascending colon and half of the transverse colon were resected and an end-to-end anastomosis of the ileum to the transverse colon was performed.

Histological examination of the specimen confirmed the diagnosis of a carcinoid tumour.

Post-operative recovery was uneventful but flushing continued as might be expected from the finding of hepatic metastases. The flushing has been markedly diminished by the administration of phenoxybenzamine 10 mg b.d. and the mild diarrhœa controlled by methysergide 2 mg b.d. The 5-hydroxyindole-acetic acid urinary excretion has remained unchanged.

Our hopes that the tumour had not spread to the liver were unfulfilled. We were misled by the absence of a palpable liver and the negative liver scan. Nevertheless, even in retrospect, a laparotomy appears worth while since on the evidence at hand there was the possibility that the tumour had not spread and was draining into the systemic circulation.—D G G-S.

The following cases were also discussed:

Polycythæmia Associated with Hydronephrosis due to Ureteric Calculus. Mr B H Page

Acute Porphyria with Elevated Coprophyrin in the Stools of the Patient and Sibs. Dr N Whittaker

Fibroma of the Buttock. Mr T M Hennebry

Multiple Pulmonary Arteriovenous Fistulæ with Mitral Incompetence. Dr B G Wells

Association of Diabetes, Hypersplenism and Thyrotoxicosis.
Dr H N C Gunther (for Dr D G Ferriman)

Seventeen other cases were also demonstrated.