where any doubt exists at all, of obtaining consultant opinion or of taking a section for histological examination. While admitting that the latter suggestion is controversial, I personally feel that much would be achieved by engendering the outlook that for the ulcerated lesion a section is as easy to get as a Wassermann test, and is of infinitely more value. Once such cases are diagnosed in their early stages, treatment becomes so important that they should be looked upon as urgent. Urgent treatment is particularly called for in early carcinoma of the breast.

Considering only the knowledge and the facilities at our disposal at the moment, greater immediate achievements are possible from the use of more simplified methods of education and propaganda for the early treatment of the accessible cancers, and by the organization of treatment facilities, than by any visible promise of accomplishment in the technique of treatment, whether by surgery or by irradiation.

Summary

This is an attempted analysis of the part which radiotherapy is capable of playing in the treatment of malignant disease. A survey is made of the various methods and technical facilities available, and how far they have been proved in practice to be effective or otherwise in treating each of the known types of malignant disease.

A classification of malignant disease in relation to treatability by radium is submitted.

The opinion is expressed that greater immediate achievements are possible from the use of more simplified methods of education and propaganda for the early treatment of accessible cancers, and by the organization of treatment facilities.

THE COMPLICATIONS OF GASTRIC ULCER

DESCRIPTION OF A CASE

BY

J. A. MARTINEZ, Ch.M., F.R.C.S.

Resident Surgical Officer, Walton Hospital, Liverpool

It is unusual for more than two of the direct pathological complications of gastric ulcer to develop in one patient. The following case is of interest in that four complications were observed—namely, perforation, gross haemorrhage, pyloric stenosis, and carcinoma.

Case History

A mechanic aged 36 was first admitted to Walton Hospital, Liverpool, in February, 1936. Five hours previously he had felt a sudden violent pain in the epigastrium, and nausea but no vomiting. He gave no history of previous dyspepsia. On examination the whole of the abdominal wall was almost rigid, and there was pronounced tenderness to the left of the umbilicus. At operation a chronic ulcer was found on the anterior surface of the stomach near the middle of the lesser curvature, with a perforation in the centre. The perforation was repaired and covered with omentum and the abdomen closed with a pelvic drain. Apart from the development of a small patch of consolidation at the base of the left lung, convalescence was uneventful and the patient was discharged with instructions to report in two months' time.

He was admitted again five months later, complaining of epigastric pain after food and vomiting. The symptoms had

begun two months after the operation. The fractional test meal showed a high acidity without delay in emptying of the stomach. The radiologist reported distortion of the pyloric antrum; the stomach wall was mobile, and no ulcer was seen; there was no evidence of carcinoma. The patient's condition improved with dietetic treatment, and he refused to undergo an exploratory operation.

One month later he was again admitted with a history of having vomited about two pints of red blood on the previous day. There was marked pallor. The red cell count was 1,625,000 and the haemoglobin content 25 per cent. There were two further haematemeses of about eight ounces each on the next two days, and he passed tarry stools for five days. After this his condition improved steadily. The fractional test meal now showed an abnormally low acidity with some delay in the disappearance of starch. The radiologist reported that there were multiple filling defects at the pyloric end of the stomach with some induration of the wall. A blood transfusion of 500 c.cm. was given. The patient was once more urged to submit to operation, but he again refused, and left hospital.

Admitted for the fourth time seven months later, he presented the appearance of advanced emaciation. He had been vomiting repeatedly for three weeks, and it became apparent during the next few days that very little food was passing through the pylorus. He was treated for ten days with gastric lavage and intravenous and rectal salines until it was possible to explore the abdomen under local anaesthesia. A huge indurated ulcer was found on the anterior wall of the pyloric antrum and some soft enlarged lymph glands in the vicinity. The naked-eye appearance of the ulcer did not suggest malignancy. A posterior gastro-enterostomy was done, but it was noted that a gastrectomy would have been better treatment had the patient's general condition allowed it. After this he gained weight steadily and was fairly well on discharge from hospital.

Fifteen months after the second operation he returned, complaining of vomiting of two weeks' duration. He was now pale and wasted, and a small hard mass was palpable in the epigastrium. A fractional test meal showed the characteristics of advanced carcinoma of the stomach, and the radiologist confirmed the diagnosis. The vomiting continued and a jejunostomy was done under local anaesthesia. The patient died two weeks later, two years and nine months after the first operation.

Necropsy.—A large saucer-shaped cancer was found surrounding the gastro-enterostomy opening, which barely admitted one finger. The growth had blocked the pylorus so that it was difficult to pass even a probe through it. There were no secondary deposits in the liver or in the other usual situations. The site of the cancer corresponded with the ulcer noted at the first and second operations, and presumably originated in it. Microscopical sections showed a columnar-celled cancer.

Discussion

The patient suffered from a gastric ulcer which was complicated successively by perforation, gross haemorrhage, pyloric stenosis, and carcinoma. It is difficult to state at what time the ulcer became malignant, but it is likely that the change had already occurred at the time of the second operation, which was done for pyloric stenosis. A gastrectomy performed three months after repair of the perforation would probably have resulted in a cure, but the patient's consent could not be obtained.

FREQUENCY OF THE COMPLICATIONS OF GASTRIC ULCER

The development of these four complications in one gastric ulcer must be a rare occurrence. Any estimate of the frequency of each of the various complications is affected by the fact that only a fraction of all patients with ulcer attend hospital, and almost all the available figures exclude the large ambulant group whose symptoms are never severe enough to demand hospital treatment.

Perforation.—A review of the literature shows that the estimated incidence of acute perforation among ulcer patients in hospital varies between 4 per cent. (Kruse, 1937) and 19.6 per cent. (Thompson, 1937). Eliason and Ebeling (1929) give 10 per cent., and Brown (1934) 11 per cent.

Haemorrhage.—The frequency of gross haemorrhage is given variously as 18 per cent. (Lahey, 1930), 20 to 25 per cent. (Gordon-Taylor, 1937), 28 per cent. (Kruse, 1937), 30 per cent. (Allen and Benedict, 1933), and 38 per cent. (Goldman, 1936).

Pyloric Stenosis.—The only reference I can find to the incidence of organic pyloric stenosis is that of Kruse, who gives a figure of 20 per cent., but mentions that 51 per cent. of peptic ulcers show some obstructive characteristics. Jordan and Kiefer (1934) report on seventy-nine cases in which a six-hour residue was found in the stomach on radiological examination. Only 11 per cent. of these patients required surgical treatment for relief of the obstruction, and it was assumed that in the remainder the obstruction was transient and due to inflammation, spasm, or oedema.

Carcinoma.—The literature on peptic ulcer abounds with discussions of the frequency with which carcinoma develops on chronic ulcer, and even now that the histological characteristics of ulcer-cancer have been described and generally accepted there is wide variation of opinion. Klein (1938) writes: "Malignant degeneration of chronic gastric ulcer, if it occurs at all, is rare." At the other extreme the astonishing figure of 68 per cent. has been attributed to Wilson and MacCarty, but the latter states (MacCarty, 1927) that it is impossible to determine the correct figure. Dible (1925), in a series of necropsy and operation specimens, estimated an incidence of 1.7 per cent. Gutmann (1935) gives 2 to 4 per cent., and his figures agree with those of Hauser (1926) (3.4 per cent.) and Newcomb (1932) (3.75 per cent.). Stewart's (1926) frequently quoted article gives 6.1 per cent., and from Gömöri's (1933) article a figure of 8.6 per cent. can be calculated. Most pathologists now agree that carcinoma is a rare complication of gastric ulcer, and I believe that this view is held by most surgeons, even if their choice of treatment is influenced by the possibility of malignant degeneration.

I am indebted to Dr. H. H. MacWilliam, medical superintendent of Walton Hospital, for permission to publish this case.

REFERENCES

- Allen, A. W., and Benedict, E. B. (1933). *Ann. Surg.*, **98**, 736.
Brown, H. P. (1934). *Amer. J. Surg.*, **24**, 63.
Dible, J. H. (1925). *Brit. J. Surg.*, **12**, 666.
Eliason, E. L., and Ebeling, W. W. (1929). *Ann. Surg.*, **89**, 209.
Goldman, L. (1936). *J. Amer. med. Ass.*, **107**, 1537.
Gömöri, G. (1933). *Surg. Gynec. Obstet.*, **57**, 439.
Gordon-Taylor, G. (1937). *Brit. J. Surg.*, **25**, 403.
Gutmann, R. A. (1935). *Paris méd.*, **2**, 40.
Hauser, G. (1926). *Handbuch der speziellen pathologischen Anatomie und Histologie*, **4**, 497, Julius Springer, Berlin.
Jordan, S. M., and Kiefer, E. D. (1934). *J. Amer. med. Ass.*, **103**, 532.
Klein, S. H. (1938). *Arch. Surg.*, **37**, 155.
Kruse, F. H. (1937). *J. Amer. med. Ass.*, **109**, 868.
Lahey, F. H. (1930). *Ibid.*, **95**, 314.
MacCarty, W. C. (1927). *Amer. J. med. Sci.*, **173**, 466.
Newcomb, W. D. (1932). *Brit. J. Surg.*, **20**, 279.
Stewart, M. J. (1925). *J. Path. Bact.*, **29**, 231.
Thompson, H. L. (1937). *Surg. Gynec. Obstet.*, **64**, 863.

Proteins in Nephrosis.—In cases of nephrosis the molecular weights of the serum albumin and globulin were about twice the normal, while those of the urinary proteins were below normal.—Osmotic Pressure Study of Protein Fractions in Normal and in Nephrotic Subjects. J. Bourdillon.—*J. exp. Med.* June, 1939, **69**, 819.

USE OF STORED BLOOD FOR TRANSFUSION

AN INTERIM REPORT

BY

J. L. HAMILTON-PATERSON, M.D.

Pathologist at Redhill County Hospital, Edgware, Middlesex

Group O blood was collected from the voluntary donors of the Emergency Blood Transfusion Service on September 3 and 4, 1939, for use in the event of air raid casualties. As these did not materialize it was decided to use the blood for patients already in hospital and requiring transfusion rather than waste it completely. To keep up the stock, relatives of these patients who belonged to Group O were bled when possible.

The apparatus used was that issued by the Medical Research Council and described in their publication, *Blood Transfusion Outfit*, September, 1939. The anticoagulant employed was pure sodium citrate. This was preferred to the citrate-saline mixture recommended, as in our experience less haemolysis of the stored blood resulted. At the time when the donors for the Emergency Transfusion Service were tested the samples were stored in this citrate-saline mixture (auto-claved in 1-oz. screw-topped bottles) and in many cases haemolysis was practically complete in forty-eight hours. With sodium citrate solution alone treated in the same way this did not occur.

Method of Storage

Into each bottle 90 ml. (c.cm.) of 3.8 per cent. sodium citrate was put. When blood was added to the 540 ml. mark the final concentration of citrate was 0.63 per cent. The blood was collected straight into the bottle with a needle and a piece of rubber tubing about eight inches long. This was previously lubricated with sterile liquid paraffin. The double-bored cork was not fitted because when the bottle was agitated it disturbed the position of the needle unless a piece of tubing eighteen to twenty-four inches long was used. This was unsatisfactory, as the blood was more likely to clot, and the tubing was much more difficult to clean satisfactorily than the shorter piece. The mouth of the bottle was surrounded by a piece of sterile gauze. Latterly 20 ml. of a 50 per cent. sterile glucose solution has been introduced into the bottle with aseptic precautions. This gives an approximate final concentration of 2 per cent. glucose. The advantages of intravenous glucose in shocked patients is well known, and it also has some value in preventing haemolysis during storage. Spontaneous glycolysis does not occur at the temperature at which the blood is stored, as we have shown by daily sugar estimations over periods of ten days.

The blood was stored in ordinary household refrigerators of the size rented at 2s. 6d. a week, each one of

Drip chamber