speculate how much of the 25-year history of back pain was due to the presence of Hodgkin's deposit. In view of the very fibrous nature of the mass it seems reasonable to suggest that it had been there for some considerable time.

Summary

A 54-year-old man with a 25-year history of low back pain and episodes simulating acute lumbar disc prolapse was found at operation to have an extradural mass of lymphoma tissue without other clinical evidence of Hodgkin's disease.

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THE DANGERS OF INTERMITTENT INTRAVENOUS HEPARIN THERAPY

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HEPARIN is widely used for the treatment of acute myocardial infarction, arterial embolism and venous thrombosis. Although it may be given either by the subcutaneous, intramuscular or intravenous routes, the former two methods have largely been discarded in this country due to local pain, haematomata and delay in reaching adequate levels of anticoagulation. There is also evidence that intravenous injections may be more effective therapeutically than intramuscular injections (Bauer, Boström, Jorpes and Kallner, 1950).

Repeated intravenous injections of heparin through an indwelling venous needle (e.g. Gordh needle) is comfortable for the patient and convenient for the house physician or nursing staff (Central Consultants and Specialists Committee Report, 1966) but we believe there is ample evidence to suggest there are inherent dangers in this method.

A case, recently seen, is described here. It illustrates one of the dangers of intermittent heparin treatment and it served to focus our attention on this problem.

Case Report

A 49-year-old man was admitted to hospital with an acute infero-lateral myocardial infarct. He was given 10,000 units of heparin intravenously every six hours. His recovery was uneventful until two weeks later when he developed the signs of an aortic saddle embolus. The patient was operated on by Mr. E. J. Williams who removed a large embolus from the aortic bifurcation. Emboli and fresh clot were also removed from both common iliacs, common femorals and popliteal arteries.

Post-operatively normal pulses were present in both legs and one month later a heparin tolerance test was performed.

This involved the administration of a single dose of 10,000 units of heparin with subsequent estimations of whole blood clotting times. For each estimation 1 ml. of blood was placed in each of three plain glass test tubes measuring 3 inches by $\frac{3}{8}$ inch. These were placed in a waterbath at 37°C.

The patient's heparin tolerance curve is illustrated in the figure and compared with five control subjects, two of

FIG. 1—The patient's clotting times are indicated by the interrupted line, the mean clotting time of the five control subjects by the continuous line.

whom were free from ischaemic heart disease, the remaining three having established coronary artery disease without recent infarction. It will be seen that the patient's curve does not differ significantly from the control subjects. Within half an hour of the heparin injection the clotting time was in excess of one hour. The clotting time rapidly returned to the control level within 3½ hours of the injection.

Discussion

Although the exact therapeutic range of anticoagulation with heparin is not known, it is generally accepted that the desired level is a whole blood clotting time of two to three times normal (Allen, Barker and Hines, 1947; Wood, 1961; Poller, 1962). At this level there is ample experimental evidence that "red thrombus" formation is prevented by an action on all three stages of coagulation (Wessler and Morris, 1955; Carey and Williams, 1960; Hoak, Connor and Warner, 1966).

Arterial embolism may occur during heparin therapy and it has even been suggested that heparin might initiate embolization (Fontaine, 1957; Weismann and Tobin, 1958; Roberts, Rosato and Rosato, 1964). Another possible explanation, however, is inadequate anticoagulation.

Olsson, Lagergren and Ek (1963) have shown that the half-life of 100 and 200 units of heparin/kg. body weight given intravenously is 56 and 96 minutes respectively. This report supports the previously shown evanescent effect of intermittent intravenous heparin (Wynn and Goodwin, 1952). The complete inadequacy of giving heparin intravenously at six hourly, or even four hourly intervals is shown in the figure. Most patients will be "unprotected" for the last 2½ hours of the six hour period.

A further hazard of intermittent intravenous heparin therapy is that of haemorrhage following the injection (Murray, 1947; Duff, Linman and Birch, 1951). The danger is especially great in the immediate post-operative period, in the presence of a peptic ulcer, in recent myocardial infarction or in patients with cerebral embolism and infarction. Recently, adrenal haemorrhage has been shown to be an occasional complication of heparin therapy (Botteri and Orell, 1964; Amador, 1965). The grossly prolonged clotting times within an hour of an intravenous injection may explain some of the haemorrhagic complications of heparin therapy.

Estimating the whole blood clotting time thirty minutes after an intravenous dose, as recommended by one pharmaceutical firm for estimating adequate anticoagulation, must necessarily result in inadequate anticoagulation. Conversely if heparinization is controlled by measuring the clotting time just before each intravenous dose, larger doses of heparin will be used with a greater risk of haemorrhage.

Deep subcutaneous, intramuscular and intramuscular depot injections produce a more uniform level of anticoagulation (Abrahams, 1950; Baker, Warren and Belko, 1951; Dollerup, Hejgaard and Holten, 1957) but are now less commonly used on account of local complications, delay in reaching adequate levels of anticoagulation and since the advent of the Gordh needle.

The dosage of heparin necessary to provide adequate anticoagulation varies considerably from person to

person. The need for a heparin tolerance test as a guide to therapy was stressed by McCleery and Yarborough (1951). Continuous intravenous heparin therapy ensures immediate anticoagulation and allows dose titration to be carried out on each patient. We believe the method described here to be both safe and efficient. It is similar to that advocated by Harden (1963).

When a decision has been taken to use intravenous heparin, a No. 20 indwelling Seldinger needle is inserted into a forearm vein and used to withdraw blood for control and subsequent clotting time estimations. An intravenous drip is set up in the opposite arm and 500 ml. of 5% dextrose in water containing 20,000 units of heparin is infused at a rate sufficient to maintain the whole blood clotting time at two to three times the patient's control level. The initial drip rate is 10 drops a minute. This is equivalent to approximately 1,100 units of heparin per hour. It is important to use a gate clamp to ensure accurate drip control. Clotting times are measured hourly for the first four hours. Subsequently six hourly estimations usually suffice. The clotting times are done at the patient's bedside and after the initial period of stabilization these can be supervised by the nursing staff or even an intelligent patient.

Summary

The history is described of a 49-year-old man who developed an aortic bifurcation embolus following a myocardial infarct whilst on intermittent intravenous heparin therapy. It led us to explore the danger and inadequacy of intermittent intravenous heparin therapy.

The advantages of a continuous heparin drip are stressed in contrast to intermittent administration by the intravenous, subcutaneous and intramuscular routes.

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STRANGULATED FEMORAL HERNIA— A RICHTER'S TYPE CONTAINING CAECUM AND BASE OF APPENDIX

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STRANGULATED femoral hernia is common, but a strangulated Richter's femoral hernia of caecum with base of appendix resulting in gangrene of the involved parts is rare. The following is the report of such a case.

Case Report

Mrs. M. E. R. (79 years), unipara, presented on 3rd April, 1964, to her own doctor for sudden increase in the size of a five-week-old lump in her right groin. This was associated with local pain and tenderness but no abdominal pain. There was no nausea or vomiting. Appetite was fair. Bowels had been constipated for the past twenty-four hours. Her own doctor treated this as an inguinal adenitis and incised it as an abscess on 5th April, 1964, when he found some evil-smelling pus. A physician attended the same evening for this patient's fibrillating heart and he advised surgical opinion for the lump in the groin. On 6th April, 1964, she was brought to the Casualty Department and the writer examined her there.

Examination: A frail lady. Temperature, 99.2°F. Pulse, 92 per min., fibrillating. Per abdomen - soft: no masses felt. No tenderness except in the right groin. Bowel sounds normal and present all over. Per rectum - no mass, tenderness or discharge. The lump measured 2½ inches by 1½ inches—situated mostly below the inguinal ligament and lateral to the pubic tubercle and was fluctuant. Overlying skin was partly necrotic. Femoral arterial pulse felt but was feeble. No significant findings in spine or lower limb. Admitted as a case of strangulated right femoral hernia with gangrenous contents, possibly of Richter's type.

The writer operated upon her the same evening and the following is a brief summary of the operation.

Operation: APPROACH.—Modified McEvedy, as advocated by Ogilvie (1959). FINDINGS.—(Diagram)

- (1) Femoral hernia containing a part of caecal wall and the base of the appendix.
- (2) Oedema of peritoneum surrounding the femoral ring for an area of two inches in diameter.
- (3) No significant free peritoneal fluid.
- (4) That part of the caecum and appendix lying in the main peritoneal cavity was viable.

Procedure: The general peritoneal cavity was carefully packed. The groin lump was then exposed by incising the partially necrotic skin and the femoral hernial sac exposed. The sac contained masses of faecal matter and nearly sloughed-out gangrenous portions of caecum and base of appendix. The contents were cleared and the cavity washed with normal saline. Attention was then directed to the abdominal aspect of the wound, when the rest of the caecum and congested appendix were drawn up easily onto the surface. The rest of the appendix was excised. The caecal wall was then repaired in two layers; the femoral ring closed with one purse-string suture of catgut from above; the groin wound drained and the upper wound closed in layers.

Progress: The patient made a satisfactory recovery and six weeks later was found to be well.

Discussion

Strangulated femoral hernia is a common surgical emergency. The incidence of colon in femoral hernia is about 2% (quoted in Maingot, 1955) that of appendix about 1% (Wakeley, 1938). The latter found one case of strangulation of the appendix out of five cases of femoral appendicitis. Frankau (1931), in a series of