The mean serum growth hormone level of the non-diabetics was 1.98 m μ g./ml., and that of the juvenile diabetics 7.26 m μ g./ml.—that is, three to four times higher.

FIG. 3.—The 24-hour serum growth hormone level in five healthy males.

DISCUSSION

The results reported here show that the blood of male, non-obese patients with recently diagnosed, classic, untreated juvenile diabetes contains more growth hormone than that of non-diabetics, and, moreover, that the level fluctuates much more wildly. As expected, the serum insulin did not rise after meals, but it was of interest that a rise occurred in relation to the evening walk in some of the diabetics. No consistent variation in serum glucagon was found. A detailed report of all the observations will be published elsewhere.

The high level of growth hormone observed in the juvenile diabetics could result from a higher secretion rate or a lower

disappearance rate. The diurnal growth hormone pattern, characterized by numerous high peaks, makes the latter alternative most unlikely. In other studies an abnormality in growth hormone response to glucose and exercise in juvenile diabetics has been found (Yde, 1969; Hansen, 1969).

The significance of these findings in the pathogenesis of diabetes mellitus could be elucidated by studying the 24-hour growth hormone pattern in classic juvenile diabetes after the metabolic abnormalities had been restored to normal in "mild juvenile diabetes" (Johansen and Lundbæk, 1967) as well as in prediabetes.

Such studies are in progress at the moment.

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Medical Memoranda

Penetrating Intra-abdominal Injury Caused by High-pressure Water Jet

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Increasing application is being found in industry for the high-pressure water jet. One use is to clean complicated plant (Fig. 1). The jet is delivered from the tip of a steel lance at a pressure of between 6,000 and 7,000 lb./sq. in. (420 and 490 kg./sq. cm.). Strict safety precautions apply when using this equipment, including the wearing of a full suit of polyvinyl chloride clothing. A recent accident is described below.

CASE REPORT

The accident occurred on 7 March 1967 when the patient, a man aged 25, was cleaning a heat-exchanger tube bundle. As the lance was withdrawn the water jet was accidentally directed towards his abdomen. He was not wearing any protective clothing. Although he did not experience any immediate symptoms he attended the

works medical department and was referred to hospital for further assessment.

He was seen at Park Hospital half an hour after the accident, when he complained of a little right-sided abdominal pain and said that he had vomited once. He appeared to be a healthy young man; the only abnormalities were minimal tenderness and guarding in the right iliac fossa, and a semicircle of 5 cm. radius comprised of tiny pin-point puncture wounds of the skin low in the fossa, the appearance closely resembling a superficial abrasion. The bowel sounds were normal, his pulse and blood pressure within normal limits, and no abnormality was found on plain x-ray examination of the abdomen. He was admitted for observation.

During the next 48 hours he vomited a small amount on several occasions and then began to complain of more severe generalized abdominal pain. Examination showed widespread tenderness and guarding and the absence of bowel sounds. The haemoglobin level was 15.6/100 ml. (107%) and the white cell count 13,300/cu. mm. (85% neutrophils). X-ray examination showed distended loops of small bowel containing fluid levels.

A diagnosis of perforated abdominal viscus producing generalized peritonitis was made, and 48 hours after the injury the abdomen was explored under general anaesthesia through a right paramedian incision.

The findings were: (1) fluid faeces in the peritoneal cavity; (2) two ragged holes in the ileum 1 cm. in diameter and surrounded by many smaller perforations; the larger holes were situated 60 and 15 cm. respectively from the ileocaecal junction; (3) multiple small perforations of the caecum; and (4) a shallow crater wound 4 cm. in diameter on the peritoneal aspect of the anterior abdominal wall, which was deep to and in communication with the external semi-circular wound. It was plugged with omentum.

FIG. 1.—High-pressure water-jetting equipment in use.

The proximal 3 cm. of ascending colon, the caecum bearing the appendix, and the distal 30 cm. of ileum were resected and an end-to-end ileocolic anastomosis was fashioned. The more proximal ileal wound was treated by resection of 15 cm. of bowel and end-to-end anastomosis. The peritoneal cavity was irrigated with saline. Two Ragnell drains were placed one through the entry wound and the other through a stab incision in the left iliac fossa. Post-operatively the patient was given intramuscular cephaloridine, and, except for a wound abscess, made a straightforward recovery. He went home on the twenty-second day after operation. He was last seen in the outpatient department six months later, when he was observed to be well and back at his previous work.

COMMENT

Gaston and Mulholland (1955), in discussing the treatment of penetrating abdominal wounds, advise that "the optimum time to repair damage in the abdomen is before there are overt signs, and that therefore if the possibility of penetration exists, operative exploration should be made."

In the present case the possibility of penetration was belied by the paucity of early symptoms and signs. We feel that this danger should be stressed, particularly in view of the severe penetrating ability of high-pressure water jets (see Fig. 2). It is postulated that the jet of water, having pierced the skin, was subjected to a divaricating effect, and on entering the peritoneal cavity exerted its damaging effect at several sites simultaneously.

There is one other report of abdominal injury by high-pressure water jet (Gardner, 1966). This jet was at a pressure of 6,000–6,500 lb./sq. in. (420–460 kg./sq. cm.), and

again the accident occurred as the lance was being withdrawn. The patient was wearing a suit of polyvinyl chloride. He felt only that he had been struck; nevertheless, examination revealed a wound 10 cm. long situated in the left lower abdominal quadrant. Surgical emphysema was present and an x-ray film confirmed this. The wound appeared to have been at a tangent to the abdominal wall. The patient was treated in the works medical department and recovery was uneventful. Although, as Gardner (1966) concludes, such cases can be successfully

FIG. 2.—Effect of high-pressure water jet on a wooden railway sleeper when fired vertically downwards from about 12 in. (30 cm.).

treated as outpatients, it is equally obvious that others will require admission to hospital.

Such accidents as these may be expected to increase in frequency and also severity as the pressures used rise; pressures as high as 40,000 lb./sq. in. (2,810 kg./sq. cm.) are envisaged. Strict observation of comprehensive safety regulations is advised, and these include the wearing of a full set of protective polyvinyl chloride clothing by personnel concerned and the use of a fail-safe valve.

We should like to thank Mr. James Heslop, under whose care the patient was admitted, for his permission to publish this case and for his encouragement to do so. We also wish to thank the directors of Shell Chemicals U.K. Limited for their permission to publish this paper. We are grateful to Mr. N. Usher for the photographs.

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