

A FATALITY DURING THE HOLLANDER INSULIN TEST*

G. A. G. DECKER, M.B., CH.B. (CAPE TOWN), F.R.C.S. (ENG.) AND J. A. MYBURGH, CH.M. (RAND), F.R.C.S. (ENG.),
Department of Surgery, University of the Witwatersrand, and Johannesburg Hospital, Johannesburg

The insulin test is recommended to assess the risk of recurrent ulceration after a vagotomy and drainage procedure.¹ The purpose of this case report is to focus attention on the fact that it is a potentially lethal test.

CASE REPORT

The patient was a White male, aged 64 years, who was admitted to the professorial surgical unit of Johannesburg Hospital in October 1966 for treatment of a duodenal ulcer. General examination revealed no significant abnormality, although the electrocardiograph showed evidence of ischaemic heart disease. The X-ray of chest showed left ventricular enlargement. A barium meal showed the presence of hiatus hernia and a chronic duodenal ulcer. On 27 October 1966 a truncal vagotomy, Heineke-Mikulicz pyloroplasty and a Boerema repair of the hiatus hernia were performed. The patient's postoperative course was uneventful.

Eight months later the patient was seen in the gastric clinic complaining of intermittent diarrhoea, excessive flatulence and the eructation of foul-smelling gas. A barium meal done at this time showed that gastric stasis was present. The patient was readmitted on 4 August 1967. Apart from a succussion splash on examination of the upper abdomen, no other abnormality was found. At this time he weighed 170 lb. The electrocardiogram again showed evidence of ischaemia but no recent myocardial infarction. The following biochemical investigations were done: urea 55 mg./100 ml.; potassium 4.2 mEq./litre; sodium 142 mEq./litre; CO₂ content 21.5 mEq./litre; chloride 103 mEq./litre; random blood sugar 118 mg./100 ml.; SGOT 58 units; SGPT 55 units; and lactic acid dehydrogenase 450 units.

On 14 August 1967 an insulin test was performed after an overnight fast. Twenty units of soluble insulin were given intravenously. The stomach contents were aspirated at 15-minute intervals. As no aspirate was obtained the test was abandoned prematurely after one hour. There were no clinical features of hypoglycaemia at this stage. Ten minutes after the test had been abandoned the patient collapsed while walking to the bathroom. Despite attempts at resuscitation he died.

The results of the blood-sugar estimations obtained on the patient's blood which was taken during the test were as follows: fasting blood sugar 92 mg./100 ml.; 15 min. after insulin 50 mg./100 ml.; 30 min. after insulin 16 mg./100 ml.; 45 min. after insulin less than 10 mg./100 ml. The serum potassium was not estimated during the test.

An autopsy was performed by Dr D. G. Hamilton of the Department of Pathology, University of the Witwatersrand. The heart, which weighed 560 G, was healthy, apart from an area of infarction in the posterior wall of the left ventricle. On histological examination this area showed interstitial fibrosis consistent with an old healed myocardial infarct. The right and left coronary arteries

showed moderately severe atheroma but no recent antemortem thrombosis.

DISCUSSION

In this patient the probable cause of death was a cardiac arrhythmia, precipitated by insulin hypoglycaemia. The patient did not show pronounced symptoms of hypoglycaemia. The underlying ischaemic heart disease probably resulted in increased myocardial irritability.

It is difficult to assess from the literature the risk to life of the insulin test, presumably because an occasional fatality may go unreported. Stempien² reports one death associated with more than 400 tests. This death occurred in a 65-year-old White man. The death occurred 2½ hrs after injection of 15 units of soluble insulin intravenously. This patient also did not demonstrate hypoglycaemic symptoms. Unfortunately no postmortem examination was performed.

Stempien recommends that only patients under the age of 50 years, free of cardiovascular and cerebrovascular disease, with negative electrocardiograms, are considered suitable for the insulin test. He has reduced the dose of insulin to 10 units of soluble insulin to reduce the incidence of hypoglycaemic reactions. In order to ensure that at least this amount is given, the patients are given 11 units of insulin. If the test proves unreliable because of an inadequate drop in blood sugar, it is repeated with 15 units of soluble insulin.

Our current practice is to do the insulin test only on those patients who are being investigated for a possible recurrent ulcer after a previous vagotomy and drainage procedure. Any patient who has cerebrovascular or cardiovascular disease, or who is over the age of 60 years, is excluded.

Before the insulin is given, a slow intravenous infusion of normal saline through a large-bore needle is commenced. An ampoule of 50 ml. of 50% dextrose is available at the bedside. If the patient shows any pronounced hypoglycaemic symptoms the test is immediately terminated by the intravenous administration of a hypertonic dextrose solution. The fact that neither the patient reported by Stempien nor the patient reported in this paper showed hypoglycaemic symptoms before death stresses the need for careful selection of patients if the occasional fatality as a result of the insulin test is to be avoided.

Duke *et al.*³ have used 2-deoxy-D-glucose (2-DG), which stimulates the vagal hypothalamic centres by lowering the intracellular glucose levels, to produce a gastric secretory response in patients with intact vagal nerves and those in whom a surgical vagotomy had been performed. They found 2-DG to be a more potent stimulus of gastric secretion than either histamine or insulin. One of their patients, aged 60 years, developed atrial fibrillation at the completion of the test, at which time plasma (K⁺) was 2.7 mEq./litre. The arrhythmia was reversed by oral potassium.

We have no experience of the use of 2-DG in the

*Date received: 4 November 1968.

assessment of the completeness of the vagotomy. It seems, however, that this drug has no advantage over insulin from the point of view of safety to the patient.

Thomas and Duthie⁴ mention 3 patients who developed severe hypoglycaemia states with decrease in body temperature down to 89°F after the administration of 2-DG. One of these patients became semicomatose.

SUMMARY

A death in a 64-year-old White male after the insulin test for assessment of completeness of vagotomy is reported. It is recommended that the insulin test be done only in patients

under the age of 60 years and in the absence of cerebrovascular or cardiovascular disease. The test is done only in the investigation of dyspepsia after a vagotomy and drainage procedure and not as a routine. Hypoglycaemic symptoms may be absent even although the blood-sugar level is very low.

We wish to thank Dr H. van Wyk, Medical Superintendent of Johannesburg Hospital, for permission to publish this case report.

REFERENCES

1. Decker, G. A. G. (1969): *S. Afr. Med. J.*, **43**, 867.
2. Stempien, S. J. (1962): *Amer. J. Dig. Dis.*, **7**, 138.
3. Duke, W. W., Hirschowitz, B. I. and Sachs, G. (1965): *Lancet*, **2**, 871.
4. Thomas, D. G. and Duthie, H. L. (1968): *Gut*, **9**, 125.