TABLE I

Operation	Cases	Deaths	Contra-Lateral Disease			Broncho-Pleural Fistula	Empyema
			Present	Spread	Reactivity		
Lobectomy	38	0	8	0	0	0	0
Lobe + Segment Resection	4	1	2	0	1	0	1
Pneumonectomy	8	0	0	0	0	0	2
Totals	50	1	10	0	1	0	3

These results extend over a period of six to twelve months after operation.

was one death occurring 24 hours after operation. The patient complained of a sudden pain in the chest, sat up and died within a few seconds. There was no evidence of a pulmonary embolus and unfortunately an autopsy was refused.

Conclusions

Resection treatment, which closely approximates a cure for the disease, is favourably regarded today by thoracic surgeons as it offers a means of actual removal of permanently damaged lung tissue.

A short period only of hospitalization is neces-

sary, which is of great importance in these days of bed shortage.

The patient welcomes this form of treatment which, to him, shows a reasonable line of approach, and psychologically he benefits as he no longer considers himself 'a tuberculous outcast.'

This paper deals with the indications for resection in pulmonary tuberculosis, the technique of resection and the complications that may arise.

The post-operative physiotherapy, the convalescence and the follow-up of the patient are briefly outlined.

ANNOTATION

Glucose Tolerance Tests

A reduction of the body's power to dispose of ingested carbohydrate results in its failure to maintain the blood sugar concentration constantly within normal limits. In order to reveal such a deficiency, sugar metabolism as a whole may be strained by the imposition of a glucose load upon it, abnormally high blood sugar levels afterwards showing that glucose tolerance is reduced. Glucose tolerance tests are designed with this object, and in the past 30 to 40 years the methods and results, in normal and abnormal states, have been standardized by various investigators.

The most commonly employed test involves the estimation of the blood sugar at half-hourly, and the urinary sugar at hourly intervals for two hours after the administration of 50 gm. glucose by

mouth. Criteria of normality have been established for this test by its performance upon series of healthy young adults. The blood sugar should be below 120 mg. per 100 ml. with the subject fasting, and findings above this level indicate reduced tolerance (Mosenthal, 1947; Moyer and Womack, 1950). It is agreed by most that the venous blood sugar two hours after taking the glucose should not normally exceed 120 mg. per 100 ml. (Hale-White and Payne, 1926; Langner and Dewers, 1942). Many consider that this particular blood sugar level is the only accurate criterion of sugar tolerance. The blood sugar level attained at the intermediate times during the test is of debatable significance. Joslin (1946) considered that non-fasting sugar concentrations above 170 mg. per 100 ml. in venous blood and 200 mg. per 100 ml. in capillary blood indicated diabetes mellitus, and hence reduced tolerance if accompanied by glycosuria. Spence (1920), MacLean and de Wesselow

(1920) and Moyer and Womack (1950) thought the height of the blood sugar curve to be of no value in assessing sugar tolerance.

To avoid delay and the inconvenience of multiple venepunctures in testing for reduced sugar tolerance, the fasting blood sugar is often estimated, results above 120 or 130 mg. per 100 ml. being taken to indicate reduced tolerance. In a series of 1,582 standard tolerance tests, the fasting blood sugar exceeded 120 mg. per 100 ml. in seven cases in which normal tolerance was shown by a return of the venous blood sugar to 120 mg. per 100 ml. two hours later (Friend, 1951). If the fasting blood sugar exceeded 130 mg. per 100 ml., the later results of the test invariably confirmed a reduced tolerance. Despite this slight inaccuracy of one standard of fasting blood sugar, these levels might be accepted as a guide to sugar tolerance if they could be guaranteed to be sensitive. This analysis of tolerance tests showed that a fasting blood sugar of 120 mg. and 130 mg. per 100 ml. was found in only 73.2 per cent. and 63.2 per cent. respectively of subjects whose tolerance was reduced, as shown by the two-hour blood sugar level. Moyer and Womack (1950) found that only 17 of their 26 diabetics had a fasting blood sugar above 118 mg. per 100 ml.

It was shown also that the height of the blood sugar concentration during the test afforded no evidence on the sugar tolerance. Blood sugar levels greater than 200 mg. per 100 ml. one hour after taking glucose were followed at two hours by a reduction to below 120 mg. per 100 ml. in 17 cases. The insensitivity of the one-hour blood sugars was demonstrated by the fact that 8.8 per cent. and 18.5 per cent. of curves showing reduced tolerance at two hours did not reach blood sugar levels of 180 and 200 mg. per 100 ml. respectively one hour after taking glucose. 'Random' blood sugars cannot be relied upon to yield accurate information if blood is examined less than two hours after the ingestion of food.

The conclusion from this analysis of the results of standard, oral tolerance tests was that no isolated blood sugar level had sufficient sensitivity and accuracy to replace the two hour blood sugar in the detection of reduced tolerance. The performance of a complete tolerance test might be re-

placed by the estimation of the blood sugar once, two hours after ingesting 50 gm. glucose by mouth, unless the full test yields additional useful information on, for example, the severity of diabetes mellitus or the so-called 'renal sugar threshold.' The shape and height of a glucose tolerance curve is totally unrelated to the severity of the diabetes, as measured by the daily insulin requirement. The 'renal sugar threshold,' usually defined as the level of blood sugar above which glycosuria occurs, is a poor guide to the renal tubular capacity for the reabsorption of glucose (Mirskey and Nelson, 1943). The glomerular filtrate contains glucose in the same concentration as arterial blood and whilst venous blood sugar levels may be as much as 100 mg. per 100 ml. less than this, venous blood is commonly used in glucose tolerance tests. The tubules can reabsorb a maximum quantity of glucose each minute and glycosuria may result from the overcoming of this reabsorptive capacity either by an increased concentration of sugar in the glomerular filtrate or by increasing the rate of filtration. The majority of diabetics are constantly glycosuric unless given insulin, and in such cases no opinion can be expressed as to their 'sugar threshold.' A 'low threshold' can readily be demonstrated by the finding of a normal blood sugar level associated with glycosuria. The 'high threshold' or 'sugar proof' kidney is uncommon and causes a hyperglycaemia without glycosuria. The 'lag storage' curve is of no significance. Its differentiation from renal glycosuria demands the estimation of blood sugar levels repeatedly after glucose. That the glycosuria resulting from it is not caused by reduced tolerance is proved by the finding of a normal two-hour blood sugar.

As an alternative to the standard two-hour tolerance test, Exton and Rose (1931) introduced the two dose, one-hour test. In this, the subject takes 50 gm. glucose by mouth after an overnight fast. One half-hour later the dose of glucose is repeated. Blood samples are taken when fasting, when the second quantity of glucose is taken, and again one half-hour later. The urine is collected fasting and at one hour. The test is based upon the Hamman-Hirschman effect or Allen's law of the paradoxical utilization of glucose. When glucose is given to a non-diabetic person in two

doses, the rise of blood sugar after the second dose is less than that produced by the first. The criteria of normality for this test suggested by its originators have been modified often. Langner and Dewees (1942) and Connor and Reynolds (1946) considered that the criteria of Matthews *et al.* (1939) were the most acceptable. According to these authors, glucose tolerance may be considered to be normal if (a) the fasting blood sugar is below 120 mg. per 100 ml., and (b) the one-hour venous blood sugar does not exceed 180 mg. per ml. Reduced tolerance in clinical diabetes was invariably accompanied by a one-hour venous sugar exceeding 159 mg. per 100 ml. At one hour a venous blood sugar in the range 159 to 180 mg. per 100 ml. was found in both normals and diabetics. As opposed to the original claims that the Exton-Rose type of test was both reliable and sensitive, it seems now that the test has no great advantage compared with a standard test and that it is of no greater value in cases in which the results of a standard test are equivocal.

The third type of test involves the intravenous administration of glucose and has been used infrequently (Tunbridge and Allibone, 1940; Lozner *et al.*, 1941). The results are affected considerably by the amount of sugar given, its concentration in the solution employed and the rapidity of its injection. The advantage of the intravenous tolerance test is the elimination of possible errors induced by variations of glucose absorption from the intestine. The rate of intestinal absorption of glucose is probably not a common source of error in oral tolerance tests and, at present, intravenous tolerance tests have no great application in clinical medicine.

Glucose tolerance must not be regarded as a fixed or permanent measurement. Tolerance is reduced invariably in diabetes mellitus and occasionally in a variety of other diseases. It is also reduced as a result of starvation and in persons deprived of carbohydrate. Old age (Marshall, 1931; Deren, 1937; Horvath *et al.*, 1947) and prolonged immobility (Blotner, 1945) may be accompanied

by a marked reduction of sugar tolerance. Even in healthy, young adults glucose tolerance may vary spontaneously from normal to reduced tolerance without reason (Lennox, 1927; Soisalo, 1930; Freeman *et al.*, 1942). The results of glucose tolerance tests must be interpreted with caution and with careful attention to the clinical picture presented by the patient. These tests give information limited to the sugar tolerance exhibited by the subject on that particular occasion. They are of no more value than this and the complex methods of eliciting this result can be replaced by estimation of a solitary blood sugar two hours after giving 50 gm. glucose by mouth.

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