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Mass Ligation of the Pancreas Near the Head in Diabetes Mellitus.

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The surgical approach to the treatment of diabetes mellitus has taken 4 routes in the human. Goldjanitski[1] and others ligated the parotid duct but with little success. Dubious results have been obtained by adrenal denervation (Ciminata[2]) and by liver denervation (Depisch *et al*[3]). Mansfeld's[4] studies in dogs established the pancreas as the fourth method of approach. He ligated the tail of the pancreas in dogs and obtained results which indicated an increase in sugar tolerance. DeTakats and Wilder[5] modified Mansfeld's technique and instead of ligating the tail of the pancreas, they isolated it by section with cautery and wrapped it in omentum. This operation was performed in one case of juvenile diabetes. Subsequently DeTakats[6] employed the original Mansfeld technique in 2 other cases of juvenile diabetes but used a piece of fascia for the ligature. In none of his cases did he get any noteworthy improvement.

Four years ago, we studied the effects of mass ligation of the pancreas about one inch from the head of the gland in dogs. Histological examination of the pancreas 6 to 8 weeks after this operation revealed a shrinkage of the caudal portion to about one-tenth of the original size, due to extensive fibrosis in the entire acinar tissue of that portion. The only remaining parenchyma consisted of markedly hypertrophied islet tissue.

We felt that patients with diabetes mellitus might be improved if the ligation were nearer the head of the pancreas. The consequent acinar atrophy would be of greater extent and the concomitant changes in the islet tissue of greater magnitude. Three patients suffering from severe diabetes mellitus were therefore treated in this manner.

For several weeks before operation, the patients' carbohydrate

[1] Goldjanitski, quoted by Depisch *et al.*

[2] Ciminata, A., *Arch. di pat. e clin. med.*, 1929, **8**, 79.

[3] Depisch, F., Hasenohl, R., and Schonkauer, L., *Wen. klin. Worchschr.*, 1930, **43**, 321.

[4] Mansfield, G., *Klin. Wochschr.*, 1924, **3**, 2378.

[5] DeTakats, G., and Wilder, R. M., *J. Am. Med. Assn.*, 1929, **93**, 606.

[6] DeTakats, G., *Surg. Gynec. and Obst.*, 1931, **53**, 45.

tolerance was studied. They were operated under spinal analgesia. Two pieces of cotton binding tape, one-quarter inch width, were passed around the pancreas immediately caudal to the point of entrance of the superior pancreatico-duodenal artery into the gland and they were successively tied as tightly as possible. The wound was then closed without drainage.

Our criteria of carbohydrate tolerance was the glucose-insulin quotient previously discussed (Collens[7]). All studies were made under identical conditions of diet and insulin intake.

No deleterious effects of the operation could be noted. In the first case there was no obvious improvement in the glucose-insulin quotient during the first year. In the second and third years after the operation the glucose-insulin quotient rose slightly. Three and a half years after the operation, the patient still has a marked hyperglycemia and glycosuria. The glucose-insulin quotient shows little improvement since it was 2.7 before the operation and is now 4.7. Clinically the patient showed improvement very early and today appears in a very good state of nutrition.

The second and third cases likewise showed very little change in their tolerance to carbohydrates, although only 3 months have elapsed since operation.

These results tend to indicate that if there is a hyperplasia of the Islands of Langerhans in man as in the dog following ligation near the head of the pancreas, this does not improve the patient with diabetes mellitus. This operation should result in the production of a larger amount of insulin than if only the tail of the pancreas were ligated. But hyperplasia of a large part of the islet tissue did not produce a commensurate increase in the production of insulin, or the increased amount of insulin is inactivated by a factor responsible for the disease. This suggests confirmation of the thesis that diabetes mellitus may be due to some extra-pancreatic disturbance.

[7] Collens, W. S., and Grayzel, H., *Am. J. Dis. Child.*, 1929, **38**, 275.