Two details may be mentioned. First, the dissection should be done as the incision is made and not at the end of the operation; for some bleeding may be caused, and if this occurs at the beginning of the operation it will have stopped long before the end. But if fresh bleeding is brought on just before suturing it may cause delay or even lead to the formation of haematoma in the wound. Again, if there is much fat just outside the peritoneum, this should be torn or clipped away. If it is not removed this fat may intervene between the edges of the recti when the wound is closed, so preventing direct muscle-to-muscle union.

When closing the wound, the spare peritoneum, freed from fat, is bunched together in the mid-line with a continuous catgut suture. The silkworm-gut sutures for anchoring the dressing are next put in through skin, fat, and fascia. They perforate the fascia outside the redundant portion of the fascia—namely, close to the edge of the exposed rectus muscle. These are left untied and the fascia is united with catgut so that its edges do not merely meet, but overlap or are bunched up sufficiently to draw the rectus muscles into contact in the mid-line. The skin edges are next drawn together with a subcutaneous catgut suture, the roll of gauze is placed over the incision, and the silkworm-gut sutures are tied over it. When this method is used, not only does the abdominal incision do no harm, but the parietes of the average woman are very much improved. She leaves hospital, in short, with one central rectus muscle below the umbilicus instead of two lateral ones with a gap between them.

The position of the umbilicus varies very considerably, and sometimes an incision below it will not permit the delivery of a fibroid or ovarian growth. In these cases, if the abdominal wall is a bad one, the best course is probably to excise the umbilicus completely and unite muscle to muscle throughout the length of the incision required for the extraction of the growth. No doubt a certain aesthetic loss is involved when the umbilicus is removed. But our mother Eve is presumed to have had no navel, and her daughters can afford to dispense with this adornment in exchange for a sound abdominal wall.

The books of the Manchester Royal Infirmary and the St. Mary's Hospitals show that out of the last 1,725 patients whose abdomens I have opened only 12 have returned for repair of the incision. This shows a percentage of 0.7 defective scars. In several of the cases drainage had been used, in a few there was a history of chronic bronchitis, but the chief cause of failure was, I think, the intrusion of portions of extraperitoneal fat between the edges of the recti. There are two women on whom I have refused to operate for a third time; for no sooner are they up and about than their tissues stretch and give forthwith, in spite of the use of good belts. On the other hand, there is one patient whom I have delivered five times by Caesarean section. Her abdominal wall, stretched five times by the growth of large children, required considerable trimming and repairing on the last occasion. But it remains sound and efficient, for the patient still earns her living as a stage dancer. Taking these figures for what they are worth, I believe that less than 1 per cent. of the patients are any the worse for the median incision; but the point I wish to emphasize is that, since I began opening both muscle sheaths, the majority are not only no worse but are much better, as to the abdominal wall, than they were before operation.

Of transverse incisions I have not much experience. I used them nineteen times some years ago and found that making the incision and closing it occupied, on the average, seven minutes longer than using the median incision. It was generally necessary to tie two arteries. Access to the pelvis was fair, but it was not good for other parts of the lower abdomen, or for the removal of growths of any size. Large areas of connective tissue are rawed, and in certain cases might be infected, with serious consequences—as, for instance, if drainage should be necessary. The only obvious advantage is the aesthetic—namely, that the scar is partly concealed by the pubic hair. Judging by the number of these scars that I see, the transverse incision is not popular at present in this country. On the other hand, I see a very large number of lateral scars. In some of these cases the result is good, but in many there is pronounced atrophy of the rectus muscle between the incision and the mid-line of the body. It would appear that the lateral wound does not give good access, for I could give a long list of lesions I have found in patients whose abdomens had previously been explored through incisions that must have been either too small or too far from the middle line. But the main defect of the lateral incision is that it does not improve the abdominal wall of the woman with separated recti. It leaves her with her parietes as bad as before, if no worse.

I think the incision in the mid-line below the umbilicus is the best for gynaecological work, and that it might be used with advantage by general surgeons when the diagnosis is not clear—as, for example, in cases of appendicitis and diverticulitis complicated by the results of infection of the pelvic organs—for the median incision cannot injure the muscle or the fascia as the lateral incision may do. It gives better access to both sides of the lower abdomen, and it can be extended upward as may be desired. Further, it gives the opportunity for improving the patient's abdominal wall in all women whose recti lie far apart.

EFFECT OF INSULIN ON THE SUGAR CONTENT OF ARTERIAL AND VENOUS BLOOD IN DIABETES.

(Preliminary Communication.)

BY

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THIS investigation was undertaken primarily in the hope of gaining more evidence on the precise place of action of insulin in the body. A large amount of research has already been done on the subject, and it is known that the action does not take place to any great extent in the blood itself. The liver and muscles have been mainly credited with the utilization of sugar and the disappearance caused by insulin. It appeared that the part played by the muscles and general tissues might be further investigated by comparing the sugar content of blood going to and coming from these tissues—that is, arterial and venous blood.

Recent work by Foster[1] has shown that a difference between arterial and venous blood sugar concentration does exist in normal individuals, but no comparison seems to have been made on diabetics. Accordingly it was determined to estimate simultaneously the arterial and venous blood sugar in diabetics to see if the normal difference were present, and to compare this before and after insulin. If any variation in difference were found in diabetics after insulin, it could be inferred that this was directly due to the action of insulin on the muscles and general tissues which lay between the arterial and venous blood.

Methods Used.

As frequent arterial punctures are impracticable, and Foster has shown in the dog that blood from a paw prick and direct from an artery give readings identical within the range of experimental error, capillary blood drawn directly from the ear into a 0.2 c.cm. pipette has been used as representing arterial blood throughout this investigation. Venous blood was obtained from the arm veins by a fine syringe and transferred to a Wassermann tube containing a trace of oxalate, from which the required amount was immediately measured, the whole process being completed within two minutes of bleeding the ear. Cole's method of blood sugar estimation was used, and gave very satisfactory duplicates.

Normal Persons.

A few control experiments on normal students at King's College Hospital confirmed the results obtained by Foster on the difference between arterial and venous blood sugars in normal individuals. He found that the fasting levels of venous and arterial blood were practically identical, but that after the ingestion of 100 or 200 grams of glucose the arterial exceeded the venous on an average by 20 to

50 mg. per cent. The difference was greatest at the highest point of the curve, and diminished as the blood fell to normal at the end of 90 to 120 minutes. The venous was invariably less than the arterial blood sugar, sometimes by as much as 80 mg. This shows that the normal tissues extract sugar from the circulating blood during the post-absorptive rise in blood sugar.

Diabetics.

The results are given in the accompanying table. In column 3 is shown the difference between the arterial and venous blood sugar in milligrams per cent., and in column 4 the variation caused by insulin. The cases are all severe diabetics who could not be rendered sugar-free by the Allen treatment. The results lead to the following conclusions:

Experiment.		Sugar Percentage. Ear.	Vein.	Difference.	Variation.
1	R.—Fasting blood sugar	0.268	0 280	+12	26
	1½ hours after 15 units	0.224	0.210	−14	
2	L.—Fasting blood sugar	0.177	0.179	+ 2	8
	1½ hours after 25 units	0.146	0.140	− 6	
3	R.D.—Fasting blood sugar	0.142	0.148	+ 6	1
	1½ hours after 12 units	0.147	0.152	+ 5	
4	L.—Fasting blood sugar	0.248	0.239	−9	25
	1½ hours after breakfast, no insulin	0.218	0.234	+16	
	2 hours after lunch and 15 units...	0.187	0.178	−9	
5	L.—Fasting blood sugar	.237	0.233	−4	7
	1½ hours after breakfast and 15 units	0.212	0.201	−11	
6	L.—1½ hours after breakfast and 20 units	0.206	0.186	−20	
7	R.—5½ hours after breakfast, no insulin	0.223	0.222	−1	11
	2¾ hours later after lunch and 12 units	0.136	0.124	−12	
8	R.D.—7½ hours after 12 units	0.140	0.140	0	
	1 hour later after 30 grams carbohydrate	0.170	0.163	−7	
	2½ hours later	0.221	0.222	+1	
9	R.D.—7½ hours after 12 units	0.155	0.160	+5	20
	1 hour later after 20 units and 30 grams carbohydrate	0.187	0.172	−15	
	2½ hours later	0.165	0.165		

1. Diabetics have a marked hyperglycaemia in venous as well as arterial blood.

2. The difference between arterial and venous blood sugar is much less in diabetics than in normal persons. As has been said, there is no difference in the fasting blood sugar in normal individuals, and the raised fasting blood levels of diabetics also show little or no arterio-venous difference even at figures of 0.14 and 0.17 per cent.—figures at which normals would show a difference of 30 or 40 mg. This we might expect, as the fasting level of a diabetic, though raised, is comparable in the metabolic cycle with the normal fasting level. But the post-absorptive levels in diabetics also show no arterio-venous difference, or much less than the normal difference. From this we may conclude that the diabetic tissues have lost the power of using or storing sugar brought to them, and the blood flows through with very little change in blood sugar concentration.

3. A venous blood sugar higher than the arterial may occasionally be obtained (experiments 1 and 4 are definite, and 3 and 9 suggestive of this). It would therefore appear that there are times when the tissues are discharging more sugar into the venous blood than they are receiving from the arterial blood; the sugar must have been temporarily retained in excess in the tissues. Some experiments of Foster[1] with galactose are interesting in this connexion. He found that, unlike other sugars, galactose induced in normal individuals both a prolonged arterial and venous hyperglycaemia and a much smaller difference value between the two than any other sugar. Indeed, after ingestion of 100 grams of galactose he got two readings on the decline of the curve in which the venous exceeded the arterial sugar by 18 and 9 mg. respectively. However, he does not appear to have noticed these figures specially, or at least makes no remarks upon them. But he concluded that galactose, unlike glucose, cannot be absorbed or stored as glycogen by the muscles. These diabetic cases also suggest that the venous sugar may temporarily exceed the arterial where sugar cannot be stored by the tissues. So far this has been observed only in cases being treated by insulin, but at a time when they were not under the effect of insulin; it would suggest that insulin enables the tissues to store more sugar than they can retain when the insulin action has passed off, so that they excrete more sugar into the venous blood than they are receiving from the arterial.

4. In the few other cases of milder diabetes so far investigated the arterio-venous difference has been less than normal, but greater than in severe diabetes.

The Effect of Insulin.

The effect of insulin has been to increase the difference between arterial and blood sugar content, making it approximate in all cases towards the normal relation. In some cases the variation caused by insulin is slight, just outside the range of experimental error, but the variations are constantly in the same direction. Experiments 1 to 3 show effects on fasting blood sugar levels without food. Experiment 3 shows no variation, but the blood sugar also remained practically constant. Experiments 4 to 6 are all strictly comparable, being carried out on the same patient on a fixed diet within four days of each other. Without insulin the venous sugar exceeded the arterial by 16 mg. one and a half hours after a standard breakfast, while after insulin it was respectively 11 and 20 mg. less. Experiments 8 and 9 show after one hour a variation of 20 and 7 mg. respectively with and without insulin, but no variation after two and a half hours.

It is felt that a very extensive investigation will be required to discover at what time and under what conditions insulin shows its maximum effect on arterio-venous variation, as the questions of dose, rate of absorption of insulin and food, and previous diet and carbohydrate stores in the tissues all have to be taken into account. But the results so far obtained seemed to warrant this preliminary communication.

Summary.

1. The normal post-absorptive difference in arterial and venous blood sugar, the venous being usually 20 to 40 mg. less, is much reduced in diabetes. Higher venous than arterial figures may occasionally be found in severe diabetes.

2. Insulin increases the arterio-venous difference and approximates it to the normal. From this we may conclude that, whatever part the liver and other organs play, insulin acts largely in the muscles or general tissues, or both.

Further investigations are being undertaken in the arterio-venous difference to see how it varies in different grades and types of diabetes, in renal glycosurics, etc., in the hope of obtaining a test of value in the diagnosis, prognosis, or differentiation of various types of diabetes and hyperglycaemias.

REFERENCE.

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MECKEL'S DIVERTICULUM STRANGULATED IN A FEMORAL HERNIA.

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MECKEL'S diverticulum, when present, as it is in one person in fifty, not infrequently causes danger to life by becoming adherent at its tip and forming a band under which the intestine becomes strangulated; or it may itself become acutely inflamed and perforated; or, thirdly, it may form the starting point of an intussusception, but it is most unusual to find it strangulated in a hernial opening, as in the case here recorded, which I consider to be one of great interest and rarity. I have consulted the textbooks