Reduction of body weight lowers mortality in overweight persons, and various disorders that are commoner in the obese can be diminished by slimming.

REFERENCES

- Armstrong, D. B., Dublin, L. I., Wheatley, G. M., and Marks, H. H. (1951). *J. Amer. med. Ass.*, **147**, 1007.
 Banting, W. (1863). *Letter on Corpulence*. Harrison, London.
 Behnke, A. R. (1942). *Harvey Lect.*, **37**, 198.
 Brady, R. O., and Gurin, S. (1951). *J. biol. Chem.*, **189**, 371.
 — Lukens, F. D. W., and Gurin, S. (1951). *Ibid.*, **193**, 459.
 Brugsch, T. (1922). *Allgemeine Prognostik*, 2 Auflage. Berlin.
 Coombs, H. I. (1936). *British Medical Journal*, **2**, 346.
 Danowski, T. S., and Winkler, A. W. (1944). *Amer. J. med. Sci.*, **208**, 622.
 Davis, D., Stern, B., and Lesnick, G. (1937). *Ann. intern. Med.*, **11**, 354.
 Dublin, L. I. (1953). National Vitamin Foundation Nutr. Sym. Series No. 6, p. 106.
 — Fisk, E. L., and Kopf, E. W. (1925). *Amer. J. med. Sci.*, **170**, 576.
 — and Marks, H. H. (1930). *Human Biol.*, **2**, 159.
 Edwards, D. A. W. (1950). *Clin. Sci.*, **9**, 259.
 Faust, R. A. (1946). *New Orleans med. surg. J.*, **98**, 502.
 Gertler, M. M., Garn, S. M., and White, P. D. (1950). *Circulation*, **2**, 696.
 Gilbert, J. A. L. (1949). *British Medical Journal*, **1**, 702.
 Harmon, P. H. (1942). *Penn. med. J.*, **45**, 948.
 Hildreth, E. A., Mellinkoff, S. M., Blair, G. W., and Hildreth, D. M. (1951). *Circulation*, **3**, 641.
 Joslin, E. P., Root, H. P., White, P., and Markle, A. (1940). *The Treatment of Diabetes Mellitus*, 7th ed. Lea and Febiger, Philadelphia.
 Katz, L. N. (1952). *Circulation*, **5**, 101.
 Kerr, W. J., and Lagen, J. B. (1936). *Ann. intern. Med.*, **10**, 569.
 Keys, A. (1949). *Fed. Proc.*, **8**, 523.
 — (1950). National Vitamin Foundation Nutr. Sym. Series No. 2, p. 97.
 — (1951a). *J. Amer. med. Ass.*, **147**, 1514.
 — (1951b). *Bull. Johns Hopk. Hosp.*, **88**, 473.
 — (1953). National Vitamin Foundation Nutr. Sym. Series No. 6, p. 13.
 Fidanza, F., Scardi, V., and Bergami, G. (1952). *Lancet*, **2**, 209.
 — Mickelsen, O., Miller, E. V. O., and Chapman, C. B. (1950). *Science*, **112**, 79.
 Kohlrusch, W. (1930). *Arbeitsphysiologie*, **2**, 23, 46.
 Master, A. M., Dublin, L. I., and Marks, H. H. (1950). *J. Amer. med. Ass.*, **143**, 1464.
 Matthews, H. B., and Der Brucke, M. G. (1938). *Ibid.*, **110**, 554.
 Mayer, J. (1952). *Bull. New Engl. med. Cent.*, **14**, 43.
 Odell, L. D., and Mengert, W. F. (1945). *J. Amer. med. Ass.*, **128**, 87.
 Peckos, P. S. (1953). *Science*, **117**, 631.
 Rathbun, E. N., and Pace, N. (1945). *J. biol. Chem.*, **158**, 667.
 Reynolds, E. L., and Asakawa, T. (1948). *Amer. J. phys. Anthropol.*, **6**, 475.
 Rynearson, E. H., and Gastineau, C. F. (1949). *Obesity*. Blackwell, Oxford.
 Sheldon, J. H. (1949). *Lancet*, **2**, 869.
 Sheldon, W. H. (1940). *The Varieties of Human Physique*. Harper, New York.
 Short, J. J., and Johnson, H. J. (1939). *Proc. Life Ext. Exam.*, **1**, 36.
 Sinclair, H. M. (1948). *Vitam. and Horm.*, **6**, 101.
 Stuart, H. C., Hill, P., and Shaw, C. (1940). *Monogr. Soc. Res. Child. Dev.*, **5**, No. 3, p. 1.
 Welt, I. D., and Wilhelmi, A. E. (1950). *Yale J. Biol. Med.*, **23**, 99.
 Wilens, S. L. (1947). *Arch. intern. Med.*, **79**, 129.

"Health in Hot Countries" is the title of a British Council study booklet, edited and introduced by Professor J. M. Mackintosh. It is based on a series of broadcasts given in the Overseas Service of the B.B.C., and is intended for the use of medical and auxiliary staff training for public health work. The booklet presents British Commonwealth experience and achievement in the field of tropical medicine. The opening chapter by Professor G. Macdonald, director of the Ross Institute of Tropical Hygiene, is concerned with the collection and interpretation of community health statistics. Then follows a chapter by the professor of physiology at Khartoum, Professor Dean Smith, on nutrition and health, which discusses the causes of malnutrition and their conquest. Dr. C. G. Pandit, secretary of the Medical Research Council for India, contributes a chapter on tropical diseases in which he gives a brief account of the treatment of malaria, plague, filariasis, kala-azar, and leprosy. The health services of Pakistan and Nigeria are the subject of the fourth chapter, the former being described by Lieutenant-Colonel Muhammed Jafar, director-general of health for Pakistan, and the latter by Dr. Oladéle Ajosé, professor of preventive and social medicine at Ibadan. Finally there is a chapter on "health engineering," written by Mr. J. W. Wright, a sanitary engineer, and Dr. J. A. Logan, director of medicine and public health, the Rockefeller Foundation, London. This chapter deals with the control of the environment and the vital problem of enlisting local co-operation in such work.

THE MAYLARD-SONNENBURG METHOD OF INTESTINAL ANASTOMOSIS

BY

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In 1951 Kimbarovskij proposed "a new method of anastomosis of the small and large intestine." We believe that this method was devised and practised many years ago by Professor Sonnenburg, of Berlin, possibly in the late 'nineties, as told to us in a personal communication by the late W. D. Macfarlane, who was with Sonnenburg at that time.

Unaware of Sonnenburg's work, Maylard (1913) practised and developed the technique independently in Glasgow in the early part of the present century, probably about 1910. He introduced the method on account of its simplicity, safety, rapidity of execution, and immunity from leakage at the line of suture. The possibility of the establishment of a valve action comparable to the ileo-caecal valve of Talpius was regarded as a physiological possibility. Early sealing of the suture line was anticipated. His views were confirmed by post-mortem examinations. He found, in a patient who died of cardiac complications, that as early as six hours after operation the line of junction was sealed, no leakage had occurred, and regenerative processes had already begun.

His interest in this form of anastomosis was originally aroused by the difficulty he had experienced in dealing with faecal fistulae, especially those associated with the caecum and lower third of the ileum. He extended its use to cases in which he hoped to perform a partial or complete colectomy at a later date. In cases where there was an irremovable colonic tumour he performed an ileo-colic anastomosis in preference to any type of colostomy. He preferred it to a lateral or end-to-side anastomosis, the main reason being that by this method the possibility of leakage was substantially reduced.

With the exception of Bickham (1924), who gave a relatively accurate description of the method, no one appears to have described the technique.

The method is applicable to any condition in which the receiving tube is of greater calibre than the entering one. It may be practised as the first stage to colectomy, the colon being removed either in part or as a whole at a subsequent operation. It has been found useful in the treatment of ileo-caecal fistula, where it is necessary to re-route the intestinal flow from the ileo-caecal junction, as also in the treatment of obstruction of the alimentary canal proximal to the pelvic colon. It may be employed with advantage as a preliminary to subsequent operative procedures.

Principles

Technical simplicity, speed in execution, and immunity from peritoneal contamination owing to rapid sealing of the cut edges are the special attributes of this method. The

passage of the intestinal contents helps to tighten the union rather than to strain it. One row of sutures only being necessary, the amount of foreign material introduced is lessened. Only one, or at the most two, clamps are required; therefore tissue trauma is kept to a minimum and interference with the normal peristaltic action largely eliminated. The valve action tends to prevent regurgitation of the intestinal contents, and thus diminishes the incidence of post-operative complications.

Da-Costa (1931) states that at least 250 methods of intestinal anastomosis have been described, and he gives the essentials of a good method as one which can be speedily performed, which leaves an even and reliable line of suture, which avoids a considerable permanent septum, and which reduces to a minimum the use of mechanical contrivances. It is hoped to show that the Sonnenburg-Maylard method fulfils these requirements.

Technique of Operation

Maylard's *métier* was abdominal surgery, and he is rightly regarded as one of its foremost pioneers. At an early stage in his career he showed an originality in thought and practice which brought him international recognition. For a time he practised the orthodox methods of the day, but it was not long before he developed a technique which did much to eliminate the risks of abdominal surgery. The first of his many refinements and innovations was the introduction, in 1901, of the transverse abdominal incision, which he consistently used until his retirement in 1923. Upon the situation of the lesion depend the position and extent of the incision. An incision of adequate length allows of greater precision and of economy in operating-time.

The advances of modern radiology have largely eliminated the exploratory laparotomy, but it still has its place, for the abdomen remains the "temple of surprises." In obscure cases a transverse incision at the umbilical level gives free access and, by adjustments in the position of the patient, renders all regions of the peritoneal cavity operatively accessible.

Stage 1

With the patient in the recumbent position on the table, a transverse incision of the requisite length is made through the skin and subcutaneous tissue. Should it be necessary, there should be no hesitation in dividing the rectus muscle transversely. Haemorrhage is then controlled by passing a ligature on a round needle through the rectus sheath, embracing the muscle and tied upon the anterior wall of the sheath, thereby fixing the muscle at the line of section. In the upper two-thirds of the abdomen the posterior wall of the sheath is incised transversely, but in the lower third the sheath is deficient posteriorly. The peritoneum is incised transversely and the abdominal cavity entered.

Stage 2

The lesion is now located. When it is at the ileo-caecal junction the terminal portion of the ileum may be implanted into the ascending or transverse colon according to circumstance. Should the lesion be in the transverse or descending colon the ileum is anastomosed with the iliac or pelvic colon.

The portion of ileum chosen for anastomosis is stripped and doubly clamped at an appropriate distance from the ileo-caecal junction. The intestine is divided so as to leave 6-8 in. (15-20 cm.) of the ileum free for anastomosis with the colon.

The proximal portion of the divided ileum is closed by a temporary purse-string suture—the ends of which are left long—and the part wrapped in gauze, which is lightly fixed. The distal portion is permanently closed by a Lembert suture, invaginated into the caecum, and the serous coat is overstitched with a fine silk suture for further safety.

The part of the colon chosen for ileac implantation is immobilized by placing two pairs of tenaculum forceps 4 in.

(10 cm.) apart on the taenia coli. Any appendices epiploicae which may be present in this area are removed. The colon is incised in its long axis exactly in the middle line to the extent of 2 in. (5 cm.). At each end of the incision a No. 2 catgut suture is placed (Fig. 1).

The suture temporarily controlling the proximal extremity of the divided ileum is threaded into an intestinal needle, which is introduced into the lumen of the colon and brought out two inches beyond the distal end of the incision in the colon and held by forceps. The free end of the ileum is guided in the colon until about two inches lies free within the lumen (Fig. 2). The ileum is now fixed in position by the sutures which were previously placed at each end of the colonic incision. It is advisable to reinforce this suture at the upper and lower extremities of the wound by a Lembert mattress suture as a further safeguard against possible slipping (Fig. 3).

FIG. 1.—Sutures at each end of the longitudinal incision in the colon for the reception of the ileum.

FIG. 2.—The ileum invaginated.

FIG. 3.—Transverse section of the colon, showing the invaginated ileum.

The suture holding the free end of the ileum in the lumen of the colon is now withdrawn and the needle puncture in the anterior wall of the colon closed by a purse-string Lembert suture.

Stage 3

The incision in the abdominal wall is closed in layers by continuous catgut sutures, and the skin by interrupted silk-worm-gut sutures or Michell's clips. If the rectus muscle has been divided the posterior and anterior walls of its sheath are closed by continuous catgut sutures: the muscle itself is not stitched and tension sutures are unnecessary.

Comments

The advantages of the transverse abdominal and of the electro-surgical incision have been fully described elsewhere (Moore, 1922; 1940). As only two clamps are used to control the intestinal contents, tissue trauma is largely avoided. The transverse incision affords free and adequate exposure of the peritoneal cavity.

The peristaltic action of the ileum and the colon being similar, the passage of the contents is not adversely affected, and this diminishes the possibility of regurgitation and of the development of ileus.

Leakage does not occur at the anastomotic line, for the greater the pressure of the contents of the ileum the tighter the union. The peristaltic waves travelling in the same direction still further lessen the risk of leakage and regurgitation.

Results have fully justified the operation both in the method of approach and in the reconstruction of the alimentary canal. Most prominent of the beneficial effects observed were the early passage of flatus, the absence of marked abdominal distension, the early return of normal peristalsis, the absence of ileus, the diminution of post-operative sickness and vomiting, and the early restoration of normal appetite.

When the operation was performed in the treatment of faecal fistula, but especially that of the ileo-caecal variety, early and permanent closure of the fistula resulted. In cases of colonic obstruction post-operative comfort was notable. The patient was saved the embarrassing discomfort of colostomy, and a second operation could be performed in a clean field.

Conclusion

Maylard made use of the axiom that "there is nothing new under the sun" when it was mentioned that the transverse abdominal incision had been practised by Paulus Aegineta of Alexandria. It is possible that future research may reveal that this method of anastomosis was practised at an equally early date, but it was undoubtedly originated in this country by Maylard of Glasgow in the early part of the present century.

We were Maylard's assistants. That we assisted him with the operation on many occasions refutes any modern claim to priority. Sonnenburg undoubtedly performed the operation in Berlin some years earlier, as was stated by Professor Macfarlane, whom we also assisted. The credit for this excellent operation must be awarded to Sonnenburg and to Maylard, who, working independently and unknown to each other, devised the method in Germany and in Great Britain respectively. Apart from the substitution of the active electrode for the scalpel there has been no modification of the original technique.

REFERENCES

- Bickham, W. S. (1924). *Operative Surgery*, Vol. 4. Saunders, Philadelphia.
 Da-Costa, J. C. (1931). *Modern Surgery, General and Operative*, p. 1027. Saunders, Philadelphia.
 Kimbarovskij, M. A. (1951). *Abstracts of World Surgery, Obstetrics and Gynaecology*, Vol. 9, No. 4: Abstract 697, p. 191.
 Maylard, A. E. (1913). *The Practice and Problem in Abdominal Surgery*. London.
 Moore, W. J. (1922). *Ann. Surg.*, 75, 70.
 — (1940). *Med. Press*, 204, 304.

PENTA-ERYTHRITOL TETRANITRATE IN TREATMENT OF ANGINA

BY

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Penta-erythritol tetranitrate* (P.E.T.N.) is said to be a vasodilator with a prolonged action. It was first used in Sweden during the recent war, when erythritol tetranitrate, which has a similar action, became unobtainable. Subsequently it has been used in France and the United States.

The chemical properties of P.E.T.N. have been described by Van Oettingen *et al.* (1944). At that time this substance, in use as an explosive, was investigated for any harmful effects on its handlers. Its composition is shown by the formula

It is more stable than glyceryl trinitrate and erythritol tetranitrate, and liberates nitrite more slowly than either of these. Absorption from the alimentary tract is slow in animals. In two human volunteers an insignificant rise only was found in blood nitrite up to three hours after the oral administration of 64 mg. No long-term toxicity was noted in animals given P.E.T.N. for one year.

Marche (1950) states that P.E.T.N. acts more strongly on the coronary vessels than on the peripheral circulation; the effect starts 10 minutes after ingestion, and the protective action against angina persists for four to five hours.

Bjerlov (1943) found that the effects of P.E.T.N. in 165 cases were as good as, or better than, those of erythritol tetranitrate. The dose used varied from 45 to 180 mg. daily. Headache appears to have been the most troublesome side-effect. Balatré *et al.* (1949) treated 24 cases, with marked improvement in 12 and moderate improvement in nine. In their series a fall in blood pressure was often seen, and was greater in hypertensive patients. Dailheu-Geoffroy (1950) reported 10 excellent and 69 moderate responses out of 97 cases.

Winsor and Humphreys (1952) gave P.E.T.N. to 125 cases of angina and 125 patients with pain from other causes—arthritis, gall-stones, etc. They found improvement in 78.4% of the anginal patients as compared with 4% of the others. The dose ranged from 10 to 70 mg. daily, averaging 30 mg. (10 mg. thrice daily). Higher doses brought no greater improvement and increased the liability to side-effects (headache, nausea, skin rashes). In three patients with acute coronary insufficiency the resting E.C.G. returned to normal.

Plotz (1952) used 10 mg. three times a day with the occasional addition of 10 mg. at night. He too found that larger doses were not well tolerated. Of 39 cases, 29 were improved (including five in status anginosus), but only four were able completely to discontinue gly-

*The tablets of penta-erythritol tetranitrate used in this investigation were kindly supplied by Bayer Products Ltd., under the name of "mycardol."