

## ISOLATED POUCH OF THE ANTERIOR GASTRIC WALL

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The isolated Pavlov gastric pouch undoubtedly presents the basic preparation available for the study of the secretory function of the stomach. Therefore it is no wonder that the perfection of the technique of its preparation has occupied the attention of many physiologists. At the present time there are over 20 material modifications of the original operation performed by I. P. Pavlov.

Many of these maneuvers are successful in supplementing each other.

However, with all the seeming diversity of the described modifications, each of them directs itself specifically to a search for a better solution of one or another of the following problems.

1. Simplification and perfection of operational technique.
2. Reinforcement of the barrier separating the pouch from the stomach itself.
3. Assuring the maximum preservation of the pouch innervation.
4. Guarding against or, at least, minimizing the digestive effects of the gastric juices upon the skin around the pouch orifice.
5. Forming the pouch in various portions of the stomach.

M. P. Brestkin and V. V. Savich [1] have shown that a pouch fully separated from the gastric body (Fig. 1, II, A and B) preserves enough branches from the vagus nerve as they pass over the greater omentum. With such a disposition, there is no need for forming such connections as musculo-serosal bridges. The technique of this procedure is simple and differs but little from the Heidenhain operation.

A. I. Manuilov [3] proposed a new method for reinforcing the bridges made during the classical operation. He attains this by means of a few simple submucosal isthmus sutures, which, when tightened, form a continuous muscular cylinder between the vaults of the main stomach and the pouch.

V. N. Boldyrev (for description see article by Ya. A. Egolinsky) introduced interesting modifications into the technique of pouch making. To isolate the pouch, he incised all the layers of the anterior wall along line ab; through this opening he cut the mucosa of the posterior wall along line ba, as shown by dotted line in Fig. 1, III. The upper edge of the incision made in the mucosa of the posterior wall is sutured to the upper edge of the incision made in the anterior wall, while the lower edge of the mucosa of the posterior wall is correspondingly fastened to the lower edge of the incision that has been made in the anterior wall. As a result of this, the openings of both the stomach and the pouch become approximated, the innervation of the latter having been assured (as far as the fibers traversing the posterior wall of the stomach are concerned). Unfortunately, this method destroys that portion of the pouch innervation which connects with the pouch formed from the anterior wall.

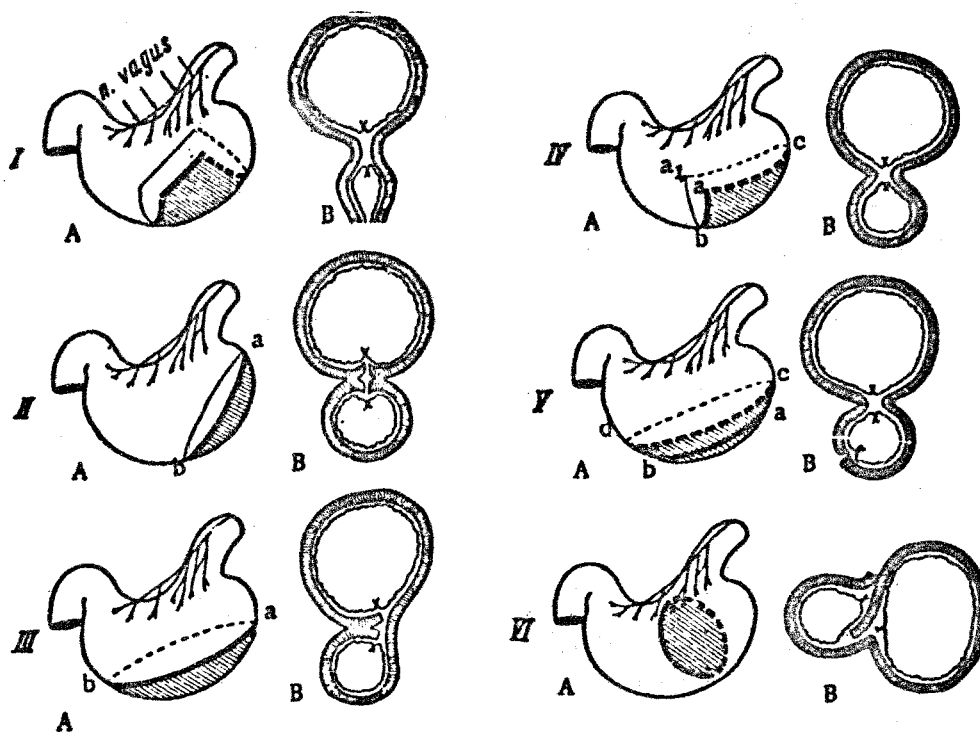


Fig. 1. Basic modifications of the Pavlov pouch. Schemes: A) continuous heavy line — incision through all the layers of the anterior wall; continuous fine line — incision through all the layers of the posterior wall; heavy dotted line — incision through the mucosa (without damage to the muscle and serosal coverings) of the anterior wall; fine dotted line — incision through mucosa of the posterior wall. Schemes: B) diagrammatic transections of the corresponding modifications. I) Operation of I. P. Pavlov, A. I. Manuilov, N. N. Samarin and many others; II) Savich-Brestkin operation; III) V. N. Boldyrev operation; IV) Hollander and Jemerin operation; V) Gregory, Hallenbeck and Code operation; VI) operation described in this article.

In the thirties, numerous modifications were proposed [7, 8, 17], the N. N. Samarin [7] method deserving particular attention. It has technical virtues and an original method for securing the barrier between the stomach and the pouch by means of an omental transplant. The B. M. Sokolov operation basically surpasses the methods proposed many years later by R. A. Gregory, G. I. Hallenbeck and C. F. Code [16], as it preserves an excellent innervation of the pouch. It seems that the attendant technical difficulties have prevented more widespread use of this operation. K. M. Bykov and G. M. Davidov [2] were the first to isolate the lesser curvature of the stomach. The technique of isolating the greater and lesser curvatures of the stomach was perfected by A. V. Solovyev [9, 10]. These studies have permitted clarification of the interrelationships existing in the secretory activities of different stomach regions.

It may be stated that after the above-mentioned studies and techniques introduced by N. P. Pyatnitsky [5], Yu. N. Uspensky [12] and V. E. Robinson [6], the techniques for preparing Pavlov pouches attained a high degree of perfection.

In 1938, there were published new modifications of the Pavlov pouch which took into account the anatomical studies made by Hollander and E. E. Jemerin [18]. These investigators proved that the dorsal and ventral branches of the branch of the vagus nerve in dogs is disposed symmetrically along the lesser curvature, as is indicated in Fig. 1, A. From these basic stems arise secondary branches, which lie perpendicular to the long axis of the stomach. This circumstance has great significance, as at the time that I. P. Pavlov was developing his operation it was thought that only the ventral branch of the vagus coursed along the lesser curvature and that the dorsal branch curved around the stomach following the greater curvature. It now appears that the innervation of the classical pouch is mediated not through a basic dorsal branch, as thought formerly, but by means of some secondary branchings. In order to preserve more of the pouch innervation, F. Hollander and E. E. Jemerin [18] proposed

their modification (Fig. 1, IV, A, B). The incision through all the anterior and posterior wall layers is made from  $a$  to  $a_1$ , in a direction parallel to the course of the secondary branchings. This preserves the basic mass of the parasympathetic fibers.

Later, this operation was modified by O. Cope, C. E. MacMahon, A. Hogströmer, R. H. Thompson [15], Neuwelt, Olson, Necheles (1940) [20], as well as others: Gregory, Hallenbeck and Code (1942) [16]. This latter modification is distinguished by its relative simplicity and the excellent preservation of the pouch innervation. The lumen of the stomach is opened widely by an incision along the line  $ab$ , and then the mucosa is incised along the anterior and posterior walls following the line  $cd$  (see Fig. 1, V, A). The mucosal edges made in the anterior and posterior walls are sewn to each other, thus isolating the pouch from the stomach itself. The integrity of the pouch is restored by a double row of sutures placed in the first incision. In order to prevent hemorrhages, soft compresses are placed (before beginning the operation) upon the greater omentum, and along the line paralleling the expected incision in the mucosa.

As a rule, in these later modifications the muscular bridge is formed by the entire gastric wall. This is quite irrational, as it furnishes no advantages when the lesser curvature is isolated. As can be seen from Fig. 1, V, B, the barrier between the pouch and the stomach itself is least dependable in the last two instances. Their great advantage lies in their excellent innervation.

It is not difficult to observe that, in the majority of instances, either the entire greater curvature or a portion of it is isolated [1, 3, 5, 6, 7, 9, 12, 14].

The majority of the authors employ the classical incision.

It appears to have been firmly established that the innervation is best preserved when the pouch is taken from the most distal portion of the stomach possible.

In all the operative variations it is feasible to apply metallic fistulae to the pouch. This protects the anterior abdominal wall from the corrosive action of the gastric juice and thus avoids the need of introducing drains into the pouch lumen.

After the studies made by K. M. Bykov, G. M. Davidov and A. V. Solovyev, it is difficult to believe that the isolated pouch taken from the greater curvature reflects accurately the secretory activities of all the different portions of the stomach. At the present time, as a rule, the research worker does not see either the region of the lesser curvature or the broad region lying between the greater and lesser curvatures.

It might be thought that it would be more rational to so modify the classical operation that the pouch would embrace both the greater and lesser curvatures with the intermediate regions and could also be made in different portions of the stomach. This is the goal of the operation about to be described. It should be remembered that attention has to be paid to preserving a reliable isolation with an innervation as intact as possible.

Differing from previously advanced operations, we propose to make our pouches from various regions of the anterior wall only and do not demand a direct association with the greater and lesser omenti. Essentially, we form an artificial fold in the anterior wall of the stomach. Figure 2 depicts the beginning and completion of the operation while Fig. 3 shows diagrammatically all the stages of the operation.

After the usual midline incision, the stomach is lifted from the wound. The portion destined to form the pouch is drawn ventrally, the left hand being used, and the fold which forms as a result of this maneuver is clamped at its base with a rubber covered soft clamp. Figure 2, A shows the external view of such a portion of the stomach while Fig. 3, 1 gives a transverse view. Special attention must be paid to having the upper pole of the pouch be slanted towards the pylorus while its lower pole points towards the body of the stomach, as in such a situation there is the least damage done to the innervation of the isolated pouch. At a distance of 4-5 mm above and parallel to the clamp, an incision is made through all the stomach layers directed to the pylorus and greater curvature (Fig. 2, A). The other wall remains untouched and serves later as the source of the nutrition and innervation of the isolated pouch (Fig. 1, VI, A). The next step is to infiltrate, from the mucosal side, the submucosa of the intact wall of the pouch in such a manner that, parallel to the clamp, there is raised a ridge having a thickness of 1.5-2 cm. The exact technique has been detailed elsewhere [12]. As a result of infiltrating the submucosa with novocaine or physiological saline, the mucosal rugae unfold, and there is formed between this and the underlying muscle layer a thick stratum of indifferent tissue (Fig. 3, 2). The scalpel is used to make incisions

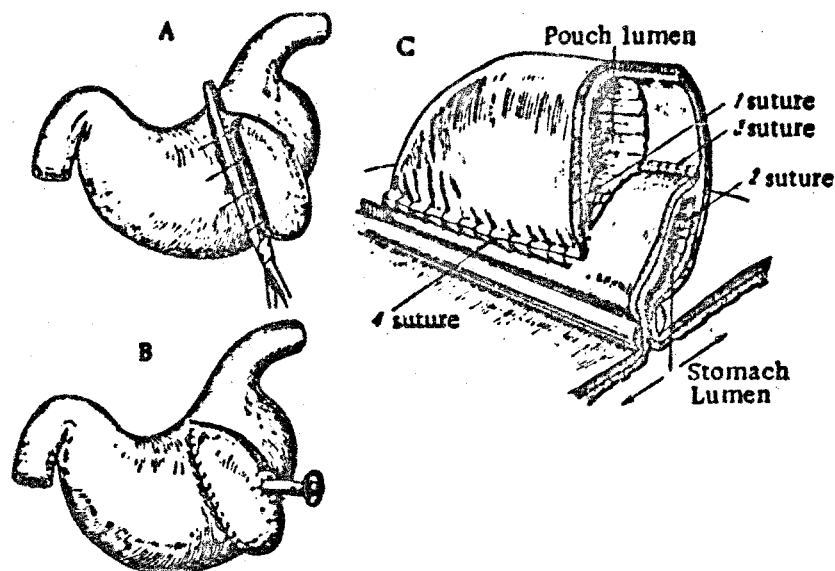


Fig. 2. Beginning and completion moments of the operation. A) Stomach with the fold of the anterior wall compressed by the clamps; arrows point to incision through all the layers of the wall, facing the greater curvature and pylorus; B) external view of the isolated pouch at the end of the operation; C) partially schematic view in transection. Shown are the interrelationships of the different layers of the stomach and the pouch and the location of the four rows of sutures relative to each other.

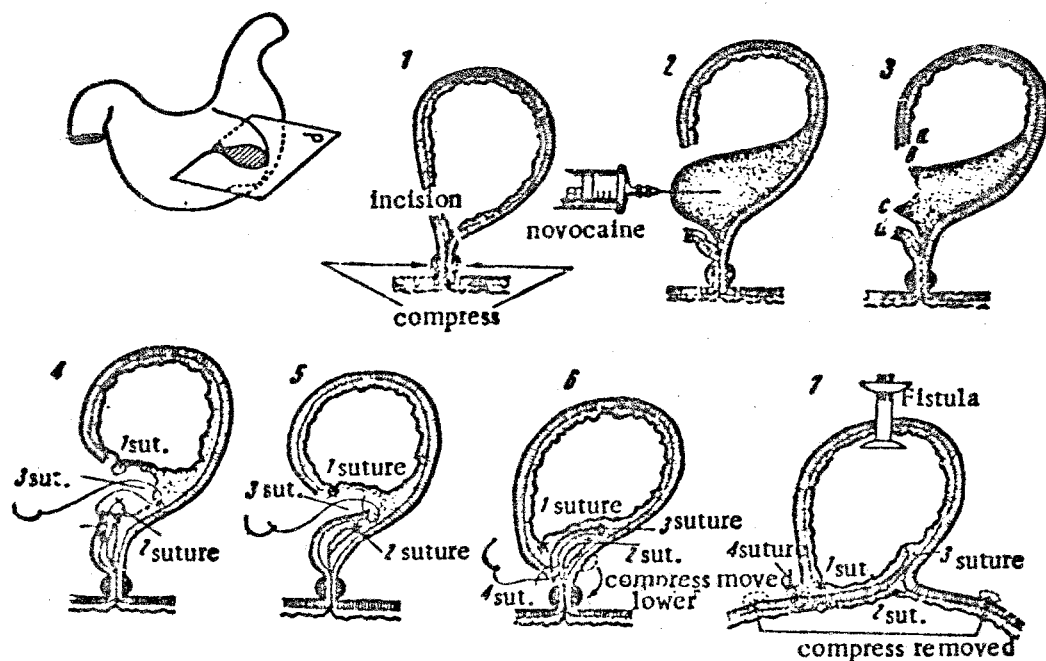


Fig. 3. Basic steps of the operation shown in diagrammatic transections. 1) Section through all the layers of one wall; 2) infiltrating the submucosa of the other wall; 3) a portion of the mucosa is removed; 4) the lumen of the pouch is closed (1st stitch) as is the lumen of the stomach (2nd stitch) and the 3rd (isolating) stitch is applied; 5) formation of an additional muscle barrier between the pouch and stomach as the 3rd row of stitches is tightened; 6) hermetic sealing of the serosal-serosa suture line; 7) transverse view after removal of the clamps and formation of the pouch fistula. In the left upper corner are shown the projections (P) from which the planes of the diagrams are taken.

(both parallel to the clamp and separated from each other by 3-4 mm) which cut through the mucosa and partially also through the infiltrated submucosa. This is shown diagrammatically in Fig. 3, 3.

In this fashion, there are formed four free mucosal edges from which two (a and b) will, in the future, form the dome of the pouch, while two others (c and d) will form the vault of the stomach. The usual scanty mucosa-to-mucosa suture unites edges c and d. Such a suture line cannot pretend to have a hermetic seal. The edges of the mucosa forming the pouch (a and b) are joined with a scanty mucosa-to-mucosa suture; this forming the lumen of the pouch and the first suture line (Fig. 3, 4). A complete hermetic seal is assured by two continuous sutures: serous-submucosal and submucosal and serosal-serous. The first of these gives dependable isolation of the pouch from the stomach, the sutures being taken in the infiltrated submucous stratum and the cut edge of the serous and muscular coats of the stomach (Fig. 3, 4; 3rd stitch). When this suture row is tightened, the mucosa of the stomach becomes buried deeply, the innervation of the pouch remaining unaffected. The second of the two, the last serosal-serous suture line, is placed at the edge of the cut layers of the muscle and serosa of the pouch and the imaginary line traversing the serosa muscle coverings of the stomach, parallel to the preceding stitch and 3-4 cm away from it (Fig. 3, 4th suture row). Usually, after application of the serosal-submucous row of stitches, the clamp is moved some 2-3 cm further from the pouch (Fig. 3, 6). As a result of the application of the last two rows of sutures, the mucosa stitch lines in both the pouch and stomach move and separate from each other, while between them are insinuated the serosal and muscle coverings coming from the stomach side (Fig. 2, B; 3, 6; 3, 7). As a result, there is formed a very adequate barrier composed of two mucosal and one serosal-muscular layer.\*

In instances when a large gastric area requires isolation, two clamps may have to be applied. The one or both clamps remain closed until the 4th suture row has been placed, this assuring a clean operative field and hemostasis. This makes it unnecessary to place preliminary vessel sutures. In this operation, the vessels most frequently injured are those coming from both curvatures to the edges of the first incision and they are sealed when the 4th (serosal-serous) row of sutures is tightened. When the clamps are removed, hemostasis is usually excellent. Only in occasional instances is it necessary to apply an extra stitch or two.

Through the opening into the pouch a fistula tube is inserted to the center of the pouch; the inner lumen of the tube has a diameter of 5-8 mm. In most cases the ordinary intestinal fistula cannula sufficed. After insertion of the cannula, the area of the serosal-serous row of stitches is peritonealized by being covered with the greater omentum.

The operation is relatively simple and can be performed in 25-35 minutes. The postoperative course must follow the diets accepted for use after gastric surgery.

The pouch functions well and clearly shows that it has intact innervation. The latent period of secretion in response to meat and bread is 3-7 minutes. When stimulated with meat, the conditioned-reflex response in the pouch produces a secretion of acid and gastric juices. The secretion curve differs from the classical response by being somewhat greater in the first 2-3 hours.

## SUMMARY

Another modification of the original Pavlov pouch is presented. The exact details are given. The operation is described as being simple, and the innervation seems to be maintained intact.

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\* Profound thanks and full credit must be given to the artist, V. N. Lebedev, who drew the figures accompanying the present study.

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