Results of Esophagocardioplasty with Gastric Patch in the Treatment of Esophageal Achalasia

TSUYOSHI HIRASHIMA, M.D. HIROSHI SATO, M.D., TERUHIKO HARA, M.D., HIROSHI NAKAMURA, M.D., ISAO KAWAMURA, M.D., HIDEYO TAKEUCHI, M.D., MORIHIKO MUTO, M.D., HARUO OHKAWA, M.D.

From the Second Surgical Department, Chiba University School of Medicine, Chiba, Japan

Since 1968 esophagocardioplasty with gastric patch was employed in 57 patients as a primary operation for achalasia of the esophagus and eight patients with previous operations for achalasia. Satisfactory results were obtained in follow-up studies up to eight years. The results indicate that this procedure is successful in dilating the lower part of the esophagus and esophagocardiac junction without interfering with their proper functions. This provides better passage through the junction with preservation of the mechanism which prevents reflux.

ESOPHAGOCARDIOPLASTY WITH GASTRIC PATCH was devised by Hirashima and Sato[4] in 1968, as a new operative method for severe esophageal achalasia. Since then, the authors have performed this operation on 57 patients as a primary operation for achalasia and in eight patients who had previous procedures. Follow-up studies to eight years indicate that this procedure is effective in elimination of dysphagial symptoms and also in the prevention of postoperative reflux esophagitis.

Methods

The operative procedure of esophagocardioplasty with gastric patch is as follows. The abdomen is opened through an upper midline incision. Absence of stenosis or any other organic change in the abdominal esophagus and cardiac portion of stomach is ascertained. The left hepatic triangular ligament is incised and the left edge of the liver is partially mobilized and reflected to the right to expose the cardiac portion of the stomach.

The abdominal esophagus and the cardia are then carefully freed so as to avoid injury to the vagal nerves. The stomach is retracted caudally and the lower esophagus is pulled down into the abdominal cavity as far as possible. A longitudinal incision is made at the lower esophagus, beginning 5 cm above the junctional ring and extended 1 cm below the ring where the incision is directed to the left toward the fundus of the stomach at a right angle for 5 cm, and then redirected away from the fundus so as to make a tongue-like patch with a base of 2–2.5 cm. Such an incision is first made through all the layers except the mucosa, and the latter is then incised (Fig. 1). With the gastric patch retracted to the right, the contents of the esophagus and the stomach are aspirated (Fig. 2).

The tip of this gastric patch is brought up to the proximal end of the esophagus incision. The mucosal layers are first sutured with continuous stitches of chromic catgut (Fig. 3), and the muscular layer of esophagus and the seromuscular layers of the gastric patch were sutured with continuous silk sutures (Fig. 4). The incision is then closed.

The effectiveness of this operation was evaluated from various points including preoperative duration of the disease, radiologic, esophagoscopic, and manometric classification as well as postoperative complaints. Comparison of the effectiveness of the procedure was performed with those of several other procedures used in our institution including Heller's extramucosal myotomy,[2] cardiac resection, Heyrovsky's esophagocardiostomy, the same operation with pyloroplasty, Wendel's cardioplasty,[11] cardiolysis and others.

Achalasia of the esophagus was classified according to the radiologic findings defined by the Japanese Society of Esophageal Diseases.[10] The disease is divided into three types depending on the form of esophageal dilatation; spindle type, flask type and sigmoid type. In addition the dilatation is graded into three by the maximum diameter (d) of the lower esophagus; Grade I—$d < 3.5$ cm, Grade II—$3.5 \text{ cm} \leqq d < 6.0$ cm, and Grade III—$d \geqq 6.0$ cm.

Esophagoscopic classification of achalasia was previously defined by the authors.[5] A spastic contraction

Reprint requests: Tsuyoshi Hirashima, Second Surgical Department, Chiba University School of Medicine, 1-8-1 Inohana, Chiba, Japan.

Submitted for publication: May 15, 1977.

0003-4932-78-0700-0038-0075

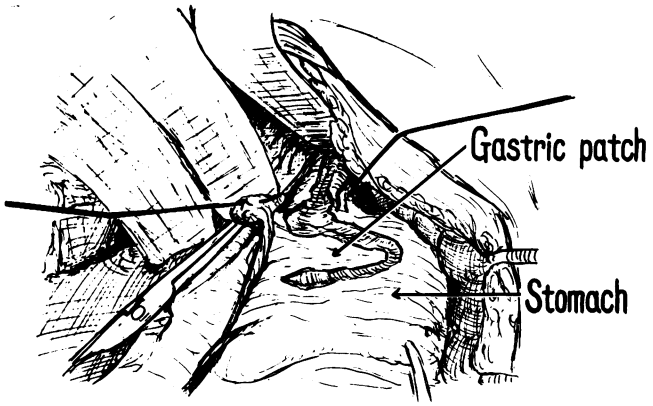

FIG. 1. Formation of the gastric patch with the extramucosal incision on the lower esophagus and fundus of stomach.

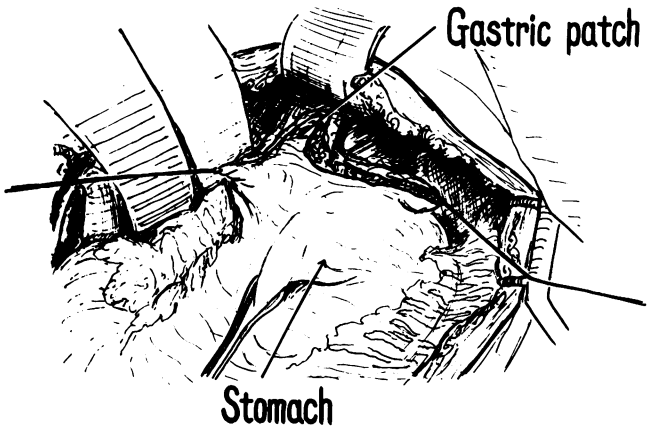

FIG. 3. Completion of mucosal sutures between the esophageal incision and the inserted gastric patch with sutures of chromic catgut.

is observed at the physiological diaphragmatic constriction portion of the esophagus, but permits passage of an endoscope into the stomach (Type SI). A considerable dilatation of the diaphragmatic constriction is present with incomplete closure even in the contraction phase of esophagus (Type SII). The diaphragmatic constriction is opened both in the dilatation and the contraction phase. The esophagogastric junction appears severely stenosed, which may be mistaken for an organic stenosis. This type of achalasia does not permit passage of an esophagoscope (Type SIII).

Manometric examination divides the disease into Type A and B. With a normal esophagus, the pressure obtained during the resting phase is less than zero, but that of the cardiac portion of the stomach is slightly higher. A positive wave is observed in the esophagus during the contraction phase. In the cardiac portion, first negative, then positive waves are recognized in accordance with the dilatation and contraction phases. In Type A a little elevation of the resting pressure is seen both in esophagus and cardia. A positive wave, is present in both the portions, but no negative wave in the cardia. With Type B, a prominent elevation of the resting pressure is seen at esophagus and cardia. There are no waves at any portion. The essential difference between the two types is the presence of the positive wave in the esophagus and cardia of Type A, and its absence in Type B.

Results

From January 1946 to January 1977, 366 patients were treated in our institution. Of these, 228 were operated upon by various methods mentioned in the method section (Table 1). Two hundred and three patients were

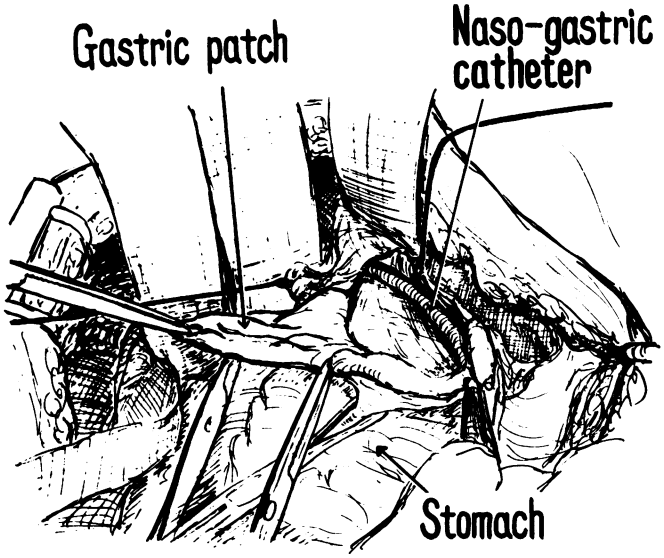

FIG. 2. Retraction of the gastric patch to the right showing the mucosa of the esophagus and stomach.

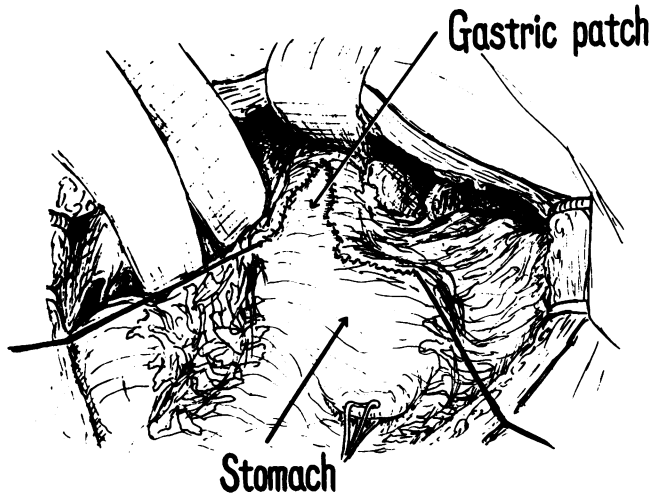

FIG. 4. Completion of suture line between the muscular layer of the esophagus and seromuscular layer of the stomach with continuous silk.

followed for more than 6 months. Overall postoperative results indicated that 130 patients (64.0%) were good, 44 (21.7%) improved, and 29 (14.3%) unchanged. Making comparison of the different type of operations, esophagocardioplasty with gastric patch was best (Table 1). In 55 patients of the 57 operated upon with this method as a primary operation, 50 patients or 90.0% showed good results. The remainder of the patients in this group were all improved. Results obtained from the other operative procedures were worse than the above, and similar to each other ranging from 66.7% of Heller's myotomy to 42.1% for cardiolysis.

From the point of preoperative duration of the diseases, postoperative results were compared between Heller's myotomy and esophagocardioplasty with gastric patch (Table 2). Fourteen to 20% of patients who had suffered more than one year prior to Heller's operation did not show any improvement. By esophagocardioplasty with gastric patch, however, 100% of patients became well or improved even after five years suffering.

The relationship of the results with the two kinds of radiologic classification are depicted in Tables 3 and 4. Heller's myotomy was good in the spindle type, but poor in the flask type. In contrast, esophagocardioplasty

TABLE 1. *Follow-up Results of Various Operative Procedures for Achalasia (January 1946–January 1977)*

Procedures	No. of patients total	No. of patients followed-up*	Good (%)	Improved(%)	Unchanged (%)
Cardiolysis	21	19	8 (42.1%)	3 (15.8%)	8 (42.1%)
Heller's extramucosal myotomy	21	18	12 (66.7)	4 (22.2)	2 (11.1)
Wendel's cardioplasty	60	52	26 (50.0)	14 (26.9)	12 (23.1)
Heyrovsky's esophagocardiostomy	36	31	17 (54.8)	11 (35.5)	3 (9.7)
Heyrovsky's Ope. with pyloroplasty	6	6	3 (50.0)	1 (16.7)	2 (33.3)
Cardiac resection	27	22	14 (63.6)	6 (27.3)	2 (9.1)
Esophagocardioplasty with gastric patch	57	55	50 (90.9)	5 (9.1)	0
Total	228	203	130 (64.0)	44 (21.7)	29 (14.3)

* More than 6 months.

TABLE 2. *Follow-up Results Versus Duration of Suffering*

Procedures	Duration suffering	Cases total	Cases followed-up	Good (%)	Improved (%)	Unchanged (%)
Heller's extramucosal myotomy	−1 yr.	7	6	4 (66.7%)	2 (33.3%)	0
	1–5	6	5	4 (80.0)	0	1 (20.0)
	5	8	7	4 (57.1)	2 (28.6)	1 (14.3)
	Total	21	18	12 (66.7)	4 (22.2)	2 (11.1)
Esophagocardioplasty with gastric patch	−1 yr.	7	7	6 (85.7)	1 (14.3)	0
	1–5	24	21	20 (95.2)	1 (4.8)	0
	5	26	27	24 (88.9)	3 (11.1)	0
	Total	57	55	50 (90.0)	5 (9.1)	0

TABLE 3. *Follow-up Results Versus Type of Dilatation*

Procedures	Type of dilatation	Cases total	Cases followed-up	Good (%)	Improved (%)	Unchanged (%)
Heller's extramucosal myotomy	Sp.	8	7	6 (85.7%)	1 (14.3%)	0
	F.	7	6	3 (50.0)	1 (16.7)	2 (33.3)
	S.	0	0	0	0	0
	Total	15	13	9 (69.2)	2 (15.4)	2 (15.4)
Esophagocardioplasty with gastric patch	Sp.	27	26	25 (96.2)	1 (3.8)	0
	F.	16	14	13 (92.9)	1 (7.1)	0
	S.	14	15	12 (80.0)	3 (20.0)	0
	Total	57	55	50 (90.9)	5 (9.1)	0

with gastric patch was excellent for any type of the disease including the sigmoid type often seen in the advanced patients (Table 3). Regarding the grade of dilatation defined by x-ray examination, the results are similar to the above (Table 4). Esophagocardioplasty was good even for the advanced Grade III.

The postoperative results in connection with the preoperative esophagoscopic findings are shown in Table 5. Heller's operation was associated with poor results for the later cases of achalasia. Contrarily esophagocardioplasty with gastric patch was effective for any stage of the disease including the severe type of S III.

Similar relationships between the effective operation and the severeness of achalasia were also obtained from the classification with manometric criteria (Table 6). Thus, the follow-up studies provide the following conclusions: both Heller's myotomy and the esophagoplasty yield better results in earlier stages of the disease, though the later operation was still highly effective for the late and severe types. The esophagocardioplasty with gastric patch produces good dilatation of the cardiac portion of the stomach, and at the same time prevents postoperative reflux esophagitis.

As an example, a 37-year-old woman who had been symptomatic for two years was treated with esophagocardioplasty with gastric patch in 1969. The preoperative film indicated the flask type and the Grade III of dilatation (Fig. 5 left). Six years after operation, the esophagogram revealed remarkable shrinkage and a very good flow through the esophagocardiac portion (Fig. 5 right). Esophageal resting pressure measured at that time was remarkably lower, and pH curves

TABLE 4. *Follow-up Results Versus Grade of Dilatation*

Procedures	Grade of dilatation	Cases total	Cases followed-up	Good (%)	Improved (%)	Unchanged (%)
Heller's	1	7	6	5 (83.3)	1 (16.7)	0
extramucosal	11	9	8	5 (62.5)	2 (25.0)	1 (12.5)
myotomy	111	1	1	0	0	1 (100.0)
	Total	17	15	10 (66.7)	3 (20.0)	2 (13.3)
Esophagocardio-	1	4	4	4 (100.0)	0	0
plasty with	11	30	29	28 (96.6)	1 (3.4)	0
gastric patch	111	23	22	18 (81.8)	4 (18.2)	0
	Total	57	55	50 (90.9)	5 (9.1)	0

TABLE 5. *Follow-up Results Versus Endoscopic Classification*

Procedures	Endoscopic Classification	Cases total	Cases followed-up	Good (%)	Improved (%)	Unchanged (%)
Heller's	S1	4	3	3 (100.0%)	0	0
extramucosal	S11	11	10	6 (60.0)	2 (20.0)	2 (20.0)
myotomy	S111	2	2	1 (50.0)	1 (50.0)	0
	Total	17	15	10 (66.7)	3 (20.0)	2 (13.3)
Esophagocardio-	S1	13	12	11 (91.7)	1 (8.3)	0
plasty with	S11	36	36	33 (91.7)	3 (8.3)	0
gastric patch	S111	8	7	6 (85.7)	1 (14.3)	0
	Total	57	55	50 (90.9)	5 (9.1)	0

TABLE 6. *Follow-up Results Versus Manometric Classification*

Procedures	Manometric classification	Cases total	Cases followed-up	Good (%)	Improved (%)	Unchanged (%)
Heller's	A	10	9	7 (77.8%)	2 (22.2%)	0
extramucosal	B	6	5	3 (60.0)	0	2 (40.0)
myotomy	Total	16	14	10 (71.4)	2 (14.3)	2 (14.3)
Esophagocardio-	A	38	37	35 (94.6)	2 (5.4)	0
plasty with	B	19	18	15 (83.3)	3 (16.7)	0
gastric patch	Total	57	55	50 (90.9)	5 (9.1)	0

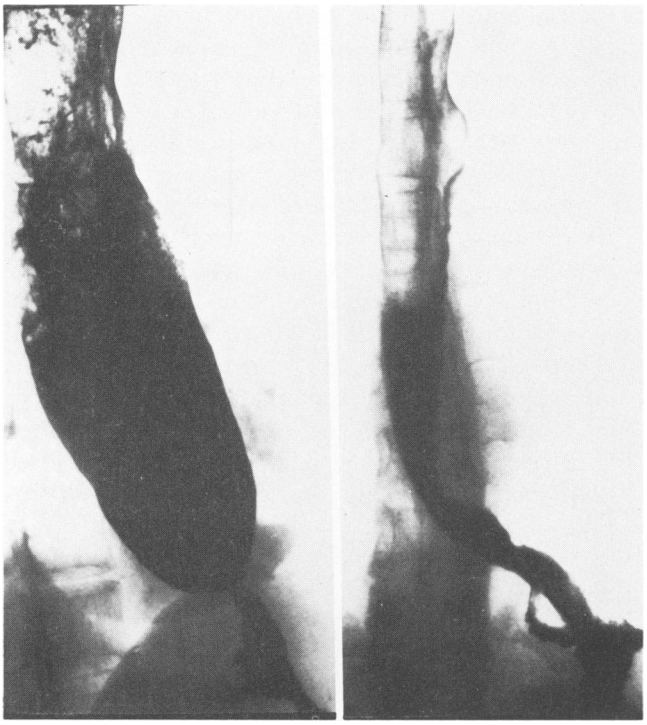

FIG. 5. Pre- and postoperative esophagograms of esophagocardioplasty with gastric patch. Case T. Y., 37-year-old woman with two years duration of suffering. (left) Preoperative (F 111) (right) Postoperative in 6 years.

showed a very rapid shift of pH from 2.0 in the stomach to 6.0 in the esophagus, suggeting prevention of esophagocardiac reflux.

Discussion

From 1946 to 1964, the authors performed various kind of surgical procedures on esophageal achalasia without considering the grade of the disorder. In 1956, we realized the necessity of selecting the method in evaluating the postoperative results and in studying the pathophysiology of the disorder.[6] Thus, between 1956 and 1967, we performed the procedures as follows: Heller's myotomy or Wendel's cardioplasty was for patients of the early stage with short duration of suffering, that is, for Type I or II in our radiologic classification[9] and Type A in manometry. Heyrovsky's esophagocardiostomy with pylorplasty was for the advanced stage usually with a long duration. This corresponded to Type II and III in x-ray examination and Type B in manometry. By the end of 1967 it was concluded that cardiolysis was not effective and that cardiac resection was not suitable for greater risk to this benign lesion. Since 1968 we have performed Heller's myotomy for the early stage of the disease and esophagocardioplasty with gastric patch for patients with *advanced* disease.

The factor most responsible for dysphagia in achalasia is the lack of relaxing mechanism or negative pressure at 3 or 4 cm oral to the functional lower esophageal high pressure zone.[7] Thus, it is necessary for the purpose of treatment to extend the esophageal lumen for a long distance from the esophagocardiac junction to the lower esophagus. Heller's extramucosal longitudinal incision of cardiac muscle, Ellis' transthoracic esophagomyotomy[1] of lower esophagus, or Petrovsky's diaphragmoplasty[8] is excellent in preseving the sphincteric mechanism with a small risk. We accept these procedures as being sufficiently effective for the early stages. However, with these methods the extension of the esophageal lumen is limited, and they are not appropriate for the advanced grade of achalasia.

References

1. Ellis, F. H. Jr., Olsen, A. M., Holman, C. B., and Code, C. F.: Surgical Treatment of Cardiospasm (Achalasia of Esophagus), Considerations of Aspect of Esophagomyotomy, JAMA, 166:29, 1958.
2. Heller, E.: Extramukoese Cardioplastik beim Chronischen Cardiospasmus mit Dilatation des Oesophagus. Mitteil. Grenzgeb. Med. Chir., 27:141, 1914.
3. Heyrovsky, H.: Causatik u. Therapie der Idiopatischen Dilatation der Speiseroehre. Oesophagogastroanastomose. Arch. f. Klin. Chir., 100:703, 1913.
4. Hirashima, T. and Sato, H.: Evaluation of a Method for Reconstruction of the Esophagogastric Junction, and Application to Achalasia, Ann. Surg., 172:897, 1970.
5. Hirashima, T., Sato, H., Shiota, A., et al.: Esophagocardioplasty with Gastric Patch in the Treatment of Achalasia. Jap. J. Surg., 4:189, 1974.
6. Hirashima, T., Hirota, K., Otsubo, U., et al.: Evaluations on Operative Methods for Achalasia from the Viewpoint of Pathophysiology and Follow-up Results. Shijutsu (Operation), 19:847, 1965.
7. Hirashima, T. and Sasaki, M.: On the Proper Range of the Incision Line in Heller's Operation for Achalasia in the Functional Viewpoint on the Esophagogastric Junction. J. Clin. Surg., (Tokyo) 25:1221, 1970.
8. Petrovsky, B. V.: Cardiospasm and its Surgical Correction. Ann. Surg., 155:60, 1962.
9. Sakai, M., Ikeda, S., Kato, Y., et al.: Surgical Treatment of Cardiospasm, Shujitsu (Operation), 11:627, 1951.
10. Uchiyam, H. (ed.): Descriptive Rules for Achalasia of Esophagus. November 1974. Japanese Society of Esophageal Diseases.
11. Wendel, W.: Zur Chirurgie des Oesophgus. Arch. Klin. Chir. 93:311, 1910.