
Achalasia of the Esophagus

Treatment Controversies and the Method of Choice

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During a 15-year period, 62 patients were treated for achalasia of the esophagus. Pneumatic dilation (PD) had been performed initially in 46 and was successful in 23; failures were due to acute perforation of the esophagus, persistent dysphagia, or pathologic gastroesophageal reflux. Esophagomyotomy alone (EM) was performed in 19 individuals resulting in definite improvement in 12; four patients had moderate reflux or dysphagia, and three of these required another surgical procedure. An extended myotomy with an antireflux procedure (M-NF) was performed in 13 patients with symptomatic relief in 12; one patient required reconstruction of a too-tight fundoplication that caused persistent dysphagia. The advantages of pneumatic dilation were the ease of performance, patient acceptability, and an overall efficacy of 50%. Definitive surgical therapy, while more predictably effective in relieving dysphagia, was considerably more expensive in terms of patient discomfort and time. When pathologic reflux was present following a previous procedure, the M-NF was performed; obstruction of the esophagus did not occur if the fundoplication was "floppy." The M-NF deserves consideration as the surgical procedure of choice for achalasia.

ACHALASIA OF THE ESOPHAGUS is a disease of unknown etiology that interferes with esophageal emptying. Palliative treatment is usually recommended when symptoms of dysphagia cause persistent difficulty, when complications such as pulmonary aspiration are noted, or when the esophagus shows evidence of decompensation as shown by dilatation of the body of the esophagus. All available treatment options weaken or divide the dysfunctional lower esophageal sphincter muscles, thereby facilitating gravity-induced swallowing.^{1,2}

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The present study was performed to compare several of the treatments for achalasia commonly employed in order to determine the optimal approach in terms of risk and discomfort. Pneumatic dilation (PD), esophagomyotomy (EM), and extended myotomy with fundoplication (M-NF) were the procedures employed.

Patients and Methods

Between 1970 and 1985, 62 patients with achalasia of the esophagus were seen in consultation or treated at the University of Illinois Medical Center and the West Side Veterans Administration Medical Center in Chicago (Table 1). There were 43 men and 19 women, and the majority of men were greater than 50 years of age (Table 2). The diagnosis of achalasia was usually based on the combination of radiographic and motility findings, and endoscopic investigations were performed in any patient greater than 30 years of age, with an abrupt onset of symptoms, or with any suspicion of infiltrative lesions at the cardia. The patients reported in this series include only those in whom a specific treatment was undertaken. Many of the PDs were performed elsewhere, and patients referred to the medical center represented the subgroup with persistent complaints; therefore, the results of PD are biased toward treatment failure. Almost all of the definitive surgical procedures were performed at the University of Illinois or the West Side Veterans Administration Hospitals; the three patients with cardioplasty had been operated on elsewhere. Patients often had the primary PD performed elsewhere and, when referred to the medical center, had already been selected as candidates for a formal surgical procedure by their primary physician.

TABLE 1. Achalasia: Age Distribution at Time of Treatment

	11-19	20-29	30-39	40-49	50-59	60-69	≥70
Male (43)	1	6	6	9	10	7	4
Female (19)	1	2	5	8	1	1	1

Procedures Employed

Pneumatic Dilation

The Mosher bag pneumatic dilator was employed for PD at our medical center and was inflated within the gastroesophageal junction under fluoroscopic control; usually, a single abrupt distention of the esophagus was performed with a 4.5 cm bag at 12-15 pounds pressure for a period of 2-10 minutes. Forty-six patients had one to four dilation procedures; those having subsequent surgical procedures were followed for 1 to 15 years after the first PD.

Esophagomyotomy (Fig. 1)

A modified Heller cardiomyotomy was performed *via* left posterolateral thoracotomy in the eighth intercostal space. The mediastinal pleura was incised and the esophagus identified, with care to avoid the vagus nerve branches. After distention of the esophagus with a 50 F dilator, the constricted lower esophageal segment was identified, and longitudinal incision of the longitudinal and circular muscle of the esophagus was performed. There was no systematic reconstruction of the antireflux mechanism at the gastroesophageal junction following the myotomy, which extended approximately 5 mm distal to the gastroesophageal junction. The submucosal plane was identified, and the muscles were dissected laterally to expose 180° of the esophageal circumference. Nineteen patients had esophageal myotomy, with an average 4-year follow-up.

Extended Myotomy + Floppy Fundoplication (Figs. 2 and 3)

The abdominal approach was utilized, and, after identification of the vagus nerves and entry into the periesophageal space,³ the hypertrophied lower esophageal

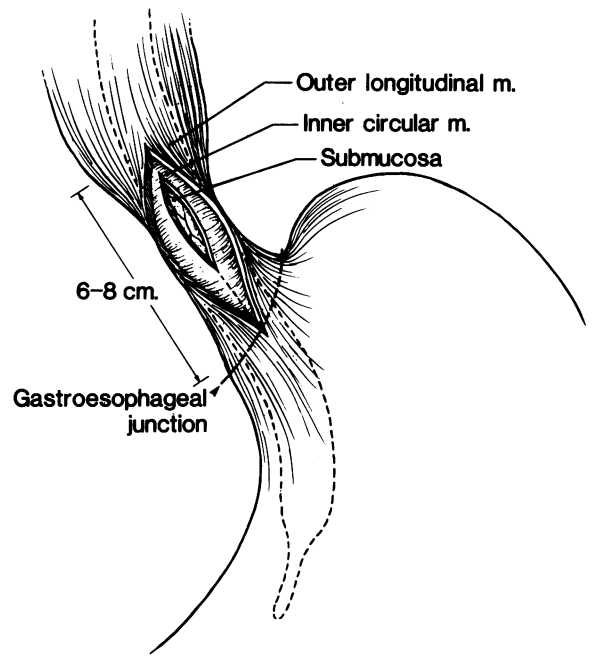


FIG. 1. Esophageal myotomy is performed from the esophagogastric junction below the distended esophagus above, on the left anterolateral surface of the esophagus. The esophagus is distended with a 50 F bougie prior to myotomy, and, after incision of the muscle, the submucosal plane is dissected to allow *circa* 50% of the wall of the esophagus to be free of constricting muscle. Care is taken at the lower end not to divide "too much" of the antireflux mechanism.

segment was identified. After distention of the constricted segment with a 50 F dilator, the myotomy was performed as described above; however, the inferior boundary of dissection was a point 3-4 cm below the gastroesophageal junction. Following the myotomy, the crura of the diaphragm were reapproximated, and a floppy fundoplication performed as previously described (Fig. 4).⁴ The gastric myotomy was completely covered by the wrap at the conclusion of the procedure. Silver clips were then applied to three areas to facilitate later radiographic evaluation of the gastroesophageal junction: two small clips at the proximal margin of myotomy, one large clip at the top-left of the fundoplication, and one small clip at the bottom-right of the fundoplication (Fig. 3).⁵ Thirteen patients had extended myotomy and floppy fundoplication and were followed for an average period of 6 years.

Cardioplasty

Three patients had received cardioplasty at other institutions between 1950 and 1970 and were followed in our outpatient clinic. Each of these patients had free gastroesophageal reflux and esophagitis.

Extended Myotomy Alone

One patient sustained intraoperative complications during a planned M-NF (perforation of the esophageal

TABLE 2. Achalasia: Postoperative Results

	(N)	Good	Fair	Poor
Pneumatic dilation	(46)	18	5	23 (2)*
Heller myotomy	(19)	12	4	3
Extended myotomy + fundoplication	(13)	11	1	1
Cardioplasty or long myotomy alone	(4)			4

* Acute perforation.

mucosa). The surgeon elected to close the perforation with an omental buttress and did not perform an antireflux procedure.

Results

Postoperative assessments were performed by a combination of clinical and objective assessments; the use of broad clinical categories ("good," "fair," and "poor") in describing results is necessitated by the subjective nature of many observations. Patients with a good result were asymptomatic or had only occasional complaints. Fair results after PD or EM include a mixed group with either inadequate myotomy and residual dysphagia or with too-effective myotomy and secondary gastroesophageal reflux. Patients with a poor result were those in whom additional surgical therapy was performed or in whom the patient decided against treatment despite definite indications for further therapy. Additionally, several patients were so infirm that they were not candidates for elective surgical procedures.

Since the techniques for evaluating esophageal emptying and quantitating gastroesophageal reflux have been in evolution during the period of this study, all of the

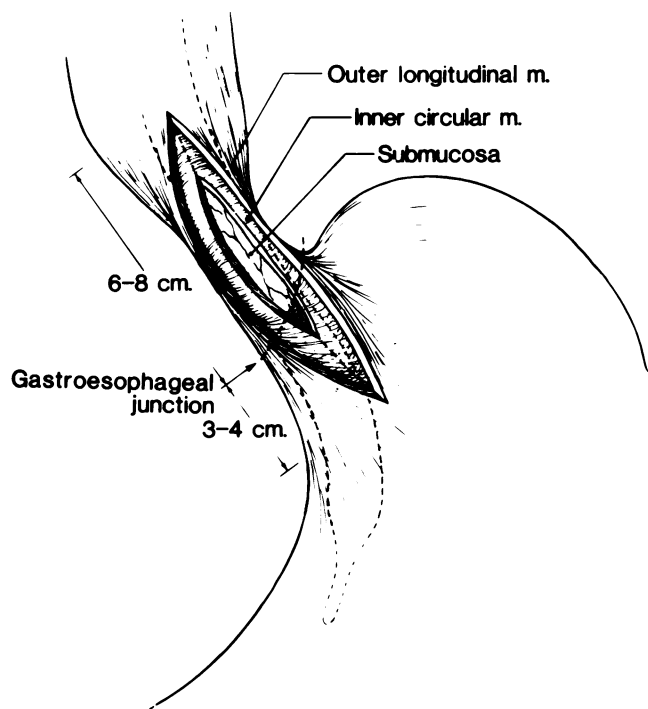


FIG. 2. Extended myotomy plus fundoplication is performed *via* an abdominal approach. The cephalad extent of dissection is determined by the level of distended esophagus, while the caudad extent is defined by a point 3 cm distal to the gastroesophageal junction. The presence of a 50 F bougie within the esophagus allows the submucosal plane to split open spontaneously after the circular muscle has been divided. Preliminary to fundoplication, the upper two or three short gastric vessels are divided.

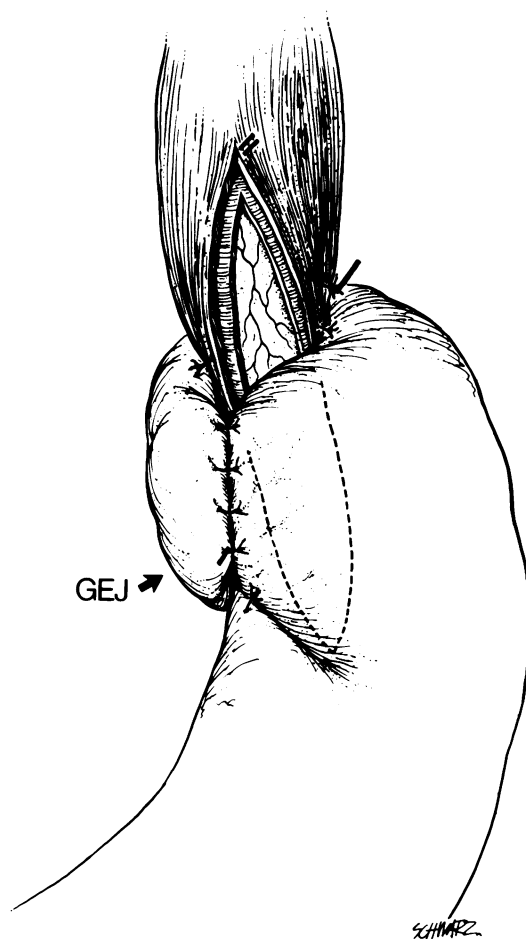


FIG. 3. The floppy wrap is completed, and metallic clips are placed as shown to define the upper limit of myotomy (two small clips), the top left of the wrap (one large clip), and the bottom right of the fundoplication (one small clip). The gastric myotomy is completely covered by the pliated anterior gastric wall.

patients have not had 24-hour pH monitoring or radionuclide swallows, and the precise incidence of reflux is unknown. Symptomatic improvement did not correlate with changes in the radiographic appearance of the esophagus or with changes in the measured radionuclide clearance studies. Postoperative motility studies were performed in those patients with serious dysphagia, stricture at the gastroesophageal junction, or symptoms consistent with gastroesophageal reflux. The average lower esophageal sphincter (LES) pressure following M-NF was less than the average 20 mmHg in control patients in our clinic. One individual had M-NF for free gastroesophageal reflux following PD; pre- and postoperative LES pressure measurements were unchanged (19 and 20 mmHg, respectively) and reflux abated.

Pneumatic Dilation (Tables 2-4)

Since many dilations were performed in other clinics, the technique of and end-points for dilation therapy are

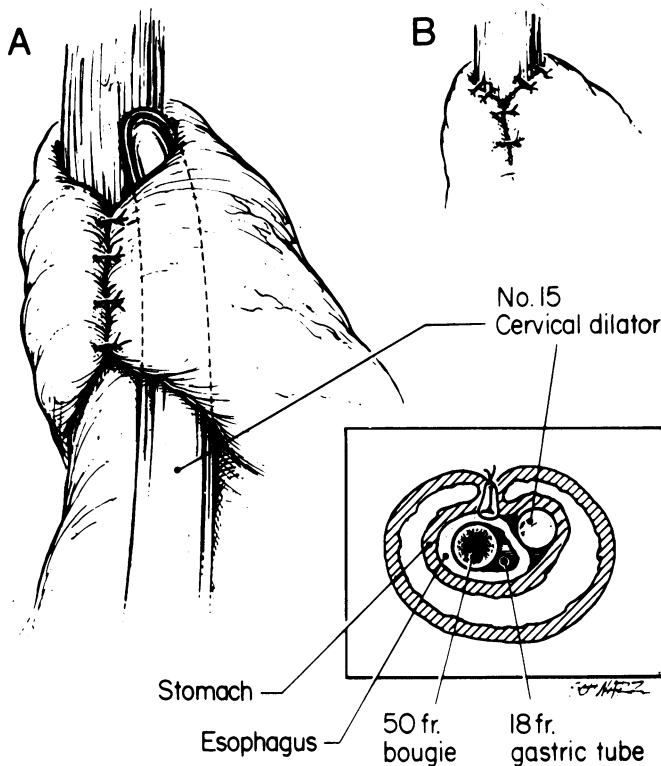


FIG. 4. The floppy wrap is made as loose as possible, as shown by the inset of the distended esophagus. It is impossible to make a fundoplication too loose.

not specified for these individuals. Similarly, it is impossible to determine the true incidence of failure after PD since patients successfully treated at the referring clinic were not sent for further treatment. The 23 patients with poor results included the two with perforations and 21 with recurrent/persistent dysphagia or pathologic gastroesophageal reflux. Free gastroesophageal reflux was uncommonly recognized; one individual had massive hemorrhage from esophagitis in the early post-PD interval, and one had erosive esophagitis that required M-NF. Long-term success was usually achieved by the first or second PD, while antecedent PD did not compromise the success of subsequent surgical procedures (Tables 3 and 4).

Esophageal Myotomy (Table 2)

Complaints of dysphagia were the most common finding in those with fair or poor results after myotomy alone.

TABLE 3. Surgical Results: Antecedent Dilatation

	(N)	Good	Fair	Poor
Heller myotomy	(12)	7	2	3
Extended myotomy				
— fundoplication	(8)	6	1	1
Cardioplasty	(2)		1	1
Long myotomy	(1)			1

TABLE 4. Outcomes vs. Number of Pneumatic Dilations

	Good (18/46)	Fair (5)	Poor (23)*
1	14	3	15 [2]
2	4	1	4 [2]
3	—	—	1
≥4	—	1	3 [1]

* Surgical revision advised. [Refused further therapy].

Heartburn, belching and obvious reflux of sour-tasting gastric contents were a serious problem in two patients, but eight of the 12 patients with good results had mild symptoms consistent with gastroesophageal reflux. One patient had persistent dysphagia due to periesophageal fibrosis; this individual had had perforation of the esophageal mucosa during a previous esophagomyotomy followed by a persistent sinus tract in the early postoperative period (in the tables this patient is considered only once, as a failed EM).

Extended Myotomy with Fundoplication (Table 2)

Twelve of 13 had satisfactory relief of preoperative symptoms. The one failure was a patient with persistent dysphagia who subsequently had revision of the M-NF at another medical center. One other patient with pre-existing esophageal stricture (following earlier PD) had no symptoms, but the results were considered fair because of persistence of the stricture; perhaps the inclusion of this individual in the "fair" category is misleading.

Cardioplasty (Table 2)

There were no long-term successes in patients who had operative construction of a free communication between the esophagus and the stomach. One patient had stricture at the gastroesophageal junction, one had Barrett's esophagus with eventual progression to adenocarcinoma, and one had persistent serious dysphagia.

Long Myotomy Alone (Table 2)

This individual had severe esophagitis with hemorrhage during the 6 months following the operation and required surgical therapy elsewhere.

Discussion

The ultimate success of any procedure depends on the composite analysis of morbidity and mortality figures, patient satisfaction and long-term efficacy.

The reason for the difficulty in arriving at consensus regarding therapy is that multivariate analysis simply does not show a clear advantage for any one treatment from a medical point of view. First, since all of the treatments

are palliative and esophageal emptying after therapy is completely dependent on gravity, residual dysphagia of some degree is anticipated, even though unwelcome. Secondly, because there are no objective end-points such as tumor recurrence or death, the analysis of success or failure depends on subjective data in many instances and is therefore imprecise. The newer modalities of assessing the efficacy of esophageal emptying, furthermore, do not appear to provide more reliable information than the clinical history has in the past.

Although several groups have shown that effective PD results in a *circa* 60% decrease in LES pressure, the change in pressure alone does not guarantee a successful outcome.^{6,7} Radionuclide esophageal emptying studies have proven less satisfactory than a clinical history in predicting which patients will agree to further therapy for their disease process. For example, when Holloway et al. evaluated esophageal emptying with a radionuclide labeled solid meal in typical patients, they found a correlation between the percentage change in lower esophageal sphincter pressure and percentage change in esophageal emptying, and between both these measurements and an interview-based esophageal symptom score.⁸ However, there was enough scatter in the data to prevent prediction of an individual's success based on a test result; furthermore, no patient was willing to undergo further treatment based on the outcome of the test.

As to the comparison of data from different medical centers, there are several considerations that warrant attention: differences in the technique of PD, different opinions about the operation of choice, variations in operative technique, and different lengths of follow-up.⁹⁻¹² This last consideration is of some importance, since the success reported with pneumatic dilation may tend to be overestimated in reports with relatively short follow-up periods. Since the pneumatic dilations presented in this study were performed in many different clinics, the data might not be representative of PD in general; on the other hand, since the reported efficacy of PD ranges from 45 to 75%, our data might best be viewed as the type of result that is expected when the techniques are not standardized.^{10,11,13,14} It seems clear, however, that individuals who do not improve after several (one or two) dilations are unlikely to be improved by subsequent attempts. The patients who had operative procedures following PD were convinced that something else had to be done if possible and had often had more than one dilation before reaching that decision. We believe that the success rate of 50% for PD, viewed in light of the above considerations, is acceptable and attractive. PD is relatively easy to perform, is well accepted by the patients, and was done with an average hospital stay of 1 day.

The EM procedures were performed by several different clinical services without a rigorous operative protocol; the

results after EM were generally good, and even the partially successful patients rated the dysphagia or heartburn as less troublesome than the original complaint. The operation of esophageal myotomy does have some inherent variables that deserve consideration, however, and it is sometimes difficult to determine how different surgeons have addressed these anatomic details.¹⁵⁻¹⁷ Perhaps the major difference between the "general" results reported after EM and the outstanding results obtained by individuals who have been able to standardize their procedure in large numbers of patients is the "experience" factor, which may include details that are not easily translated into the sentence structure of a textbook of surgery or a figure legend. Another commonly performed modification of esophageal myotomy, the Belsey antireflux procedure, was not performed in our clinic during the study period; thus, we cannot make specific references to this operation.^{16,18} We can support, however, the concept that an antireflux procedure is of use in patients undergoing operative therapy for achalasia, since the myotomy must disrupt part of the antireflux mechanism if satisfactory relief of dysphagia is to be achieved after operation.

Does an antireflux procedure cause obstruction of an aperistaltic esophagus? Although the theoretical possibility of interfering with gravity-induced swallowing exists, there are no series that have done a rigorous analysis of the question. There is agreement that, when an antireflux procedure is performed, it must not constrict the gastroesophageal junction; specifically, the concept of the floppy fundoplication must be followed.⁴ Importantly, the Nissen fundoplication has been performed successfully in patients with aperistalsis of the esophagus. For example, Rossetti, Menguy, and Duranceau have reported successful application of the Nissen procedure in patients with achalasia without causing obstruction of the esophagus.¹⁹⁻²¹ Authors favoring the use of antireflux measures uniformly believe it is necessary to extend the myotomy onto the stomach for several centimeters, and that a complementary antireflux procedure must not obstruct the esophagus.

The chance for pathologic reflux is greater if a partial fundoplication is performed, as shown by Orringer who performed this operation in patients with scleroderma of the esophagus. He favored 360° fundoplication, because it was more effective in preventing gastroesophageal reflux than a partial fundoplication.²²

We believe that the best overall approach to the patient with achalasia should involve all of the elements considered above, and that an initial (and perhaps a second) pneumatic dilation is the initial procedure of choice.^{11,23} When patients have an adverse outcome following PD, they should be offered the possibility of definitive surgical therapy; indeed, if properly informed at the initial treatment, the patient will already be aware that a definitive surgical procedure offers an excellent chance for good re-

sults. Individuals for whom previous PD has failed or who prefer a more effective procedure initially should know about all of the surgical alternatives. When pathologic gastroesophageal reflux is present, the M-NF is the obvious procedure of choice and can be performed with confidence that obstruction of the esophagus is a remote possibility. In patients with dysphagia, the choice of EM or M-NF must depend on the experience and bias of the surgeon; both of these procedures are effective, and both are acceptable treatments based on all available evidence. Importantly, esophagomyotomy with fundoplication can be successfully performed without obstruction of the esophagus if a floppy fundoplication is performed.

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DISCUSSION

DR. DAVID B. SKINNER (Chicago, Illinois): Dr. Hutson, I apologize for rising again, but it would not have been neighborly to refuse to discuss this paper after Dr. Nyhus and colleagues sent me the manuscript and asked me to open the discussion. The data obtained by Drs. Donahue, Bombeck, et al. are excellent and make a strong case for their approach, and the presentation by Dr. Nyhus was both informative and illuminating. Not surprisingly, in view of the healthy interchange we have in Chicago between our two departments, I generally agree with their thesis and their observations. Our approaches are slightly different, but the rationale behind them is similar.

The major controversy in this field is whether to add an antireflux repair to the myotomy or not. I think we both are in agreement on the need for a long myotomy. In terms of analyzing whether you should add an antireflux repair or not, we have looked at those cases that were sent to us because they had a failed previous operation for achalasia. I have operated on 17 such patients in recent years. Fifteen just had a Heller myotomy of the type that Dr. Nyhus described. In seven, the reason for reoperation was a peptic stricture from reflux esophagitis, and in eight the reason was an inadequate carrying of the myotomy down onto the stomach. In those 15 patients out of the 17, reoperation would have been avoided had the approach described today been employed at the first operation. That is, carry the myotomy onto the stomach, do a long myotomy, and then add a fundoplication of some type.

The other two failures were patients who had a total fundoplication but not enough floppiness, and it was made too tight. Actually, one of them, I think, may have come from a neighboring institution in Chicago, and that points out the only disagreement I have with this paper. That is, you can and should do a partial fundoplication as we showed on the slide in our earlier paper and avoid the risk of getting the Nissen too tight. I have used that operation, long myotomy with partial fundoplication, now in 35 consecutive primary operations for achalasia, and none of them has had to have reoperations for failure of that first operation to control his symptoms or reflux.

I do have a couple of questions. What was the rationale for carrying the myotomy so far down onto the stomach? After you knew you were actually on the stomach, you went down 3 or 4 cm farther.

I would like some further comments on this question of pneumatic dilatation interfering with further surgery. It depends on whether Dr. Nyhus put the fair results from the Heller with the good or with the poor. As I looked at his slide, if he lumped fair and poor together, it was a 50% failure with a previous pneumatic dilatation. If you lumped fair with the good, then the results looked better. Perhaps, the answer relates to DRGs, and how many dilatations with a net profit on each does it take to make up for the deficit for one good myotomy?

DR. ROBERT E. CONDON (Milwaukee, Wisconsin): Let me just take a moment to iterate comments that I made last evening and indicate to