Treatment of Advanced Gastroesophageal Reflux Disease With Collis Gastroplasty and Belsey Partial Fundoplication

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Objective: To examine the factors affecting outcome in patients with advanced gastroesophageal reflux disease.

Design: Retrospective analysis.

Setting: University tertiary referral center.

Patients: Thirty-seven patients with advanced gastroesophageal reflux disease and no previous antireflux surgery.

Interventions: Thirty patients underwent Collis gastroplasty for esophageal lengthening and Belsey partial fundoplication. Seven patients with esophageal stricture and global loss of esophageal body motility who underwent primary esophagectomy and reconstruction were used as a comparison group.

Outcome Measures: Symptomatic outcome in all 37 patients was assessed by questionnaire at a median of 25 months (range, 5-156 months) after surgery. In a subset of 11 patients undergoing the Collis-Belsey procedure, outcome was measured using 24-hour pH and results of motility studies.

Results: The Collis-Belsey procedure was successful in relieving symptoms of gastroesophageal reflux in 21 (70%) of the 30 patients. The outcome was excellent or good in 16 (89%) of 18 patients who presented with symptoms other than dysphagia, but only in 5 (42%) of 12 patients with dysphagia ($P = .01$). The outcome was particularly poor if dysphagia was associated with a previously dilated esophageal stricture. Persistent or induced dysphagia was the reason for failure in all but 1 patient. Results of 24-hour esophageal pH studies were returned to normal in 8 (73%) of 11 patients undergoing postoperative evaluation. Contraction amplitudes in the distal esophagus and the prevalence of simultaneous contractions in these segments did not change after the operation. All 7 patients who underwent primary esophagectomy were classified as having an excellent or good outcome and were relieved of their reflux symptoms, including dysphagia. Six of these could eat 3 meals per day and enjoyed an unrestricted diet.

Conclusions: The outcome of the Collis-Belsey procedure in patients with advanced gastroesophageal reflux disease without dysphagia is excellent. It is less so in patients with dysphagia as a preoperative symptom. Esophagectomy can provide a good outcome in patients who have a combination of dysphagia stricture and a profound loss of esophageal motility.

Arch Surg. 1998;133:523-529

The clinical success of the short, loose Nissen fundoplication, coupled with the ability to perform the procedure laparoscopically, has catalyzed renewed interest in the surgical treatment of gastroesophageal reflux disease (GERD).1-3 This has led to the recommendation that all patients requiring long-term medical treatment of GERD be offered the option of antireflux surgery. Most of these patients can be treated with a laparoscopic Nissen fundoplication. There is a subset of patients, however, in whom structural alterations, such as a stricture or a short esophagus often coupled with poor esophageal motility, have developed at the time of referral for surgical therapy. In these patients, most of whom will require an esophageal lengthening procedure, an open transthoracic approach is ideal, as the laparoscopic approach is likely to fail. Rarely, the motility loss is so profound and the structural defects have progressed so far that an open antireflux procedure is no longer applicable, and a primary esophageal resection and replacement becomes the best option.

There are few studies reporting the outcome of antireflux surgery in this particularly difficult subset of patients with advanced GERD. The studies that are available include patients treated from 1964 to 1976, well before proton pump inhibitors were available.4 These agents, although effective in most patients, do not always pro-
SUBJECTS AND METHODS

STUDY POPULATION

The study population consisted of 30 patients (21 male and 9 female; median age, 55 years; age range, 23-81 years) with advanced GERD identified by the presence of a short esophagus or a persistent stricture that prevented the passage of a 36F endoscope. None of the patients had previous antireflux surgery. All were treated with a Collis-Belsey procedure. This constituted 13% of all patients undergoing primary antireflux surgery at the University of Southern California, Los Angeles, from January 1, 1991, to December 31, 1996 (Figure 1). For comparison, the outcomes of a group of 7 patients (4 male and 3 female; median age, 47 years; age range, 36-76 years) who underwent esophageal resection for end-stage GERD, with dysphagia, persistent undilatable stricture, and a global loss of esophageal body motility were studied.

Figure 2 demonstrates the severity of disease in the study population. All patients had a short esophagus and 7 (23%) also had an esophageal stricture. An associated functional failure was present in 18 patients (60%), manifested by the segmental loss of distal esophageal wave progression in 16 and a global loss of wave progression in 2.

DEFINITIONS

The presence of a short esophagus was defined by the need for an esophageal lengthening procedure to achieve a tension-free, intra-abdominal fundoplication after complete esophageal mobilization. Esophageal shortening was suspected before surgery in patients with hiatal hernias of at least 5 cm on results of upper endoscopy or barium roentgenography.

An esophageal stricture was identified by the inability to pass a 36F endoscope with ease. Esophageal body motility was assessed during 10 wet swallows of 5 mL each as previously described. The catheter was positioned with the proximal pressure sensor 1 cm below the upper esophageal sphincter, with 4 further sensors spaced 5 cm apart from each other spanning the length of the esophageal body. Contraction amplitudes for each of the 5 segments and the percentage of simultaneous waves between each segment were calculated. A propagation velocity between 2 contraction peaks of 20 cm/s or faster was considered simultaneous.

Poor esophageal motility was defined as contraction amplitudes in 1 or more of the segments of the distal esophagus of less than 25 mm Hg (25th percentile in 50 normal volunteers) or when 40% or more of the contractions between any 2 segments were simultaneous. A global loss of esophageal contractility was defined by the presence of contraction amplitudes of less than 25 mm Hg and greater than 40% simultaneous contractions throughout the lower esophagus.

SYMPTOMATIC OUTCOME

Symptomatic outcome was assessed using a standardized questionnaire at a median of 20 months following surgery (range, 3-60 months) in the 30 patients. Follow-up was complete in all patients. The median follow-up for the 7 patients treated with primary resection and esophageal replacement was 57 months (range, 10-156 months). The outcome was considered excellent if the patients were completely asymptomatic. Patients whose reflux symptoms were relieved but who complained of minor gastrointestinal tract discomfort not requiring additional therapy were considered to have a good result. Patients whose symptoms were improved but required medical therapy or dilatations were considered to have a fair result. Patients were considered to have a poor outcome if symptoms, including dysphagia, were not improved or if persistent dysphagia developed as a consequence of operative therapy.

STATISTICAL METHODS

Fisher exact test was used for the comparison of prevalence data. Paired Wilcoxon signed rank test was used to compare preoperative and postoperative functional data. A P value of less than .05 was considered statistically significant.
Median hospital stay was 10 days (range, 7-25 days). There was no operative mortality. Minor complications occurred in 9 patients (30%). Dysphagia was the primary presenting symptom in 10 patients (33%) of the study group. In 2 more patients, dysphagia was a major preoperative symptom, although the primary presenting symptom was regurgitation. Heartburn was the primary presenting symptom in 14 patients (47%); respiratory symptoms, in 3 patients (10%); and epigastric pain, in 1 patient (3%). Overall, an excellent or good symptomatic outcome was achieved in 21 (70%) of the 30 patients. Table 1 shows the relationship of outcome to the presence of preoperative dysphagia, stricture, and poor motility. The presence of dysphagia before surgery was significantly associated with a poor outcome ($P = .01$). Conversely, a Collis-Belsey procedure was successful in relieving symptoms of GERD in 16 (89%) of 18 patients who presented with a short esophagus and symptoms other than dysphagia, but was successful in only 5 (42%) of 12 in whom dysphagia was a major preoperative symptom ($P = .01$; Figure 3). The prevalence of persistent esophageal stricture was higher in patients with poor outcome, although this difference did not reach statistical significance. The prevalence of poor motility was similar in patients with good and fair or poor outcomes.

Table 2 lists the clinical characteristics and reasons for failure in the patients who had a poor outcome. Dysphagia, induced by the operation, was the main reason for a poor outcome in 2 patients who had an antireflux operation for symptoms other than dysphagia. In 7 patients who had preoperative dysphagia, persistent dysphagia was the main reason for failure in all but 1 patient. Three of these 7 patients had an associated stricture; 3 patients had poor motility; and 1 patient had both. None of the 7 patients with a short esophagus only had a poor outcome.

The outcomes of the 7 patients undergoing esophageal resection and reconstruction were determined for comparison. All of these patients had very severe disease manifested by a global loss of esophageal contractility and persistent dysphagia despite multiple stricture dilations (median, 9; range, 1-30). There was no mortality. All were relieved of their reflux symptoms, including dysphagia. All but 1 patient could eat 3 meals per day. Their meal capacity was at least 75% of a normal meal, and 2 of the 7 could eat a complete meal. Six of the 7 enjoyed an unrestricted diet. Whereas these patients were completely relieved of their dysphagia, 4 (63%) had to eat slowly and reported finishing their meal last. Only 2 patients lost weight following the operation; 1 of them was overweight initially and currently remains overweight. One patient had to sleep in a semireclining position to prevent regurgitation at night.

**OBJECTIVE OUTCOME MEASURES**

Eleven patients agreed to upper endoscopy, esophageal motility, and 24-hour esophageal pH studies at a median of 24 months (range, 7-50 months) after their Collis-Belsey procedures. Endoscopic esophagitis or stricture was pres-
Achieving a consistently successful outcome after antireflux surgery in patients with advanced GERD is challenging. The outcome of antireflux surgery in patients with severe disease and esophageal shortening treated without esophageal lengthening is poor.6-9 In their original description of the Belsey partial fundoplication, Skinner and Belsey8 noted a 40% recurrence rate (P = .01) and returned to normal in all but 3 patients (73%; Figure 4). In 2 of these patients, the composite acid score was just above normal and markedly reduced compared with the preoperative value. Lower esophageal sphincter characteristics were restored to normal in all but 2 patients (82%), including a significant increase (P = .01) in median intra-abdominal sphincter length and resting pressure (Table 3). Sphincter relaxation was normal in all patients. Contraction amplitudes in the distal esophagus and the prevalence of simultaneous contractions in these segments did not change after the operation.

Table 3. Postoperative Changes in Lower Esophageal Sphincter Pressure and Length

<table>
<thead>
<tr>
<th>Lower Esophageal Sphincter Characteristics</th>
<th>Preoperative</th>
<th>Postoperative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall length, cm</td>
<td>3.1 (1.5-4.4)</td>
<td>3.5 (3.2-4.2)</td>
</tr>
<tr>
<td>Intra-abdominal length, cm</td>
<td>1.0 (0.1-1.7)</td>
<td>2.4 (1.4-3.0)*</td>
</tr>
<tr>
<td>Resting pressure, mm Hg</td>
<td>6.4 (2.8-7.6)</td>
<td>11.8 (8.9-13.8)*</td>
</tr>
</tbody>
</table>

*P < .05 compared with preoperative value.

Comment

The prevalence of short esophagus in patients undergoing antireflux surgery is not well-documented. Thirteen percent of our patients undergoing primary antireflux surgery in 5 years required esophageal lengthening. The preoperative identification of a short esophagus is problematic, and a good deal of judgment is necessary to accurately identify its presence. Manometric and endoscopic measurement of esophageal length do not correlate well with the need for esophageal lengthening at the time of surgery (J.H.P., unpublished data, 1997). We have used endoscopic and radiographic measurements of the size and mobility of the hiatal hernia as the best indicators of the need for Collis gastroplasty. Patients with a hernia greater than 5 cm, particularly if it does not reduce on results of an esophagram performed in the upright position, are at high risk.

Most patients with GERD have no mucosal injury and normal esophageal body motility. Despite the presence of a hiatal hernia in 80% of patients, the esophagus can usually be reduced below the diaphragm, and a tension-free fundoplication can be constructed. At presentation, about 40% of patients will have erosive esophagitis; 10%, an esophageal stricture; and 5% to 10%, an acquired short esophagus.12-15 Antireflux surgery in the setting of advanced disease is particularly challenging, and when the abnormalities are not adjusted for, the results can be less than satisfactory.16

We believe that patients with advanced disease are best treated with an open transthoracic approach, allowing for optimal esophageal exposure and mobilization. Complete esophageal mobilization, without vagal injury, is difficult, if not impossible, through the hiatus. Our data suggest that in approximately half of the patients in whom a short esophagus is suspected, full esophageal mobilization alone is sufficient to allow construction of a tension-free, intra-abdominal fundoplication, obviating the need for a Collis lengthening procedure. This fact argues for the transthoracic approach in such patients. Although laparoscopic and thoracoscopic techniques of Collis gastroplasty have been described, experience is limited, outcome is uncertain, and the technical difficulty is high.17,18 Although these alternate approaches deserve further study, they should not be recommended as the procedure of choice without suitable comparison to the well-documented outcome of transthoracic Collis gastroplasty and Belsey partial fundoplication.
Most reports on large series of laparoscopic Nissen fundoplications do not address the possibility of a short esophagus and rarely include patients with advanced disease. Those that do document a prevalence similar to that found in our study. Swanstrom et al \( ^1 \) reported that, despite extensive mediastinal dissection with a laparoscopic approach, it was not possible to sufficiently reduce the gastroesophageal junction below the diaphragm in a substantial number of patients. These patients represented 14% of 238 patients undergoing antireflux surgery in 4 years, a prevalence similar to that in our report.

The outcome of antireflux surgery in patients requiring Collis gastroplasty is also not well-studied. In 1987, Pearson et al \( ^4 \) published the last large series describing the surgical management of complex reflux problems. Although all patients in that report underwent a Collis-Belsey procedure, the use of an esophageal lengthening procedure was quite liberal, and it is likely that many of those patients would not require Collis gastroplasty by present standards. In addition, most patients (64%) were treated from 1964 to 1976, well before the general availability of histamine blockers or proton pump inhibitors. A good symptomatic outcome was achieved in 90% of patients with esophageal stricture \( (n=138) \) or esophagitis \( (n=77) \). The success of that study is likely related to differences in the nature of esophageal stricture seen in patients with GERD in the past 3 decades. Inflammatory edematous swelling of the esophageal mucosa was often a prominent finding before the availability of histamine blockers or proton pump inhibitors. At present, most patients with advanced GERD undergoing surgical treatment have had multiple trials with potent medication, and when strictures occur they consist of a rigid ring of fibrotic tissue. Whereas the swelling, which results from the healing of ulcers that penetrate below the muscularis mucosa, usually resolves following the creation of an effective antireflux barrier with subsequent cessation of the inflammatory process, the stricture results from the tissue healing that occurs from repetitive dilation.

We have shown that, overall, 70% of patients presenting with advanced disease and a short esophagus were relieved of their symptoms. Failure occurred predominately in patients with dysphagia as a major symptom before surgery. The dysphagia in these patients is likely an indicator of the combined effects of structural and functional deficits. In contrast, most patients presenting with heartburn and regurgitation and no dysphagia are relieved of their symptoms despite underlying functional and anatomic deficits. The presence of dysphagia thus serves as a clinical indicator of the combined effects of the underlying deficits in any given patient.

In both groups, treatment failure nearly always results from induced or persistent dysphagia. This suggests that patients with advanced disease manifested by preoperative esophageal shortening and dysphagia should be considered for primary esophagectomy.

The successful outcomes of patients undergoing primary esophagectomy and reconstruction support the fact that esophageal resection may be the preferred treatment of patients with dysphagia and anatomic and functional deficits associated with advanced disease. All patients treated with primary esophagectomy and reconstruction were completely relieved of their preoperative symptoms, including dysphagia. This occurred with no operative mortality and a dramatic improvement in quality of life. Whereas we have heretofore reserved esophagectomy for patients with the complete loss of contractile function in the distal esophagus, these results suggest that it should be considered in patients with advanced GERD manifested by a short esophagus who present with dysphagia and a less dramatic loss of esophageal function. Advanced GERD manifested by the presence of a short esophagus, with or without a dilatable stricture, develops in a subset of patients during medical therapy. It is usually associated with functional disturbances in esophageal motility. Patients with advanced disease and symptoms other than dysphagia can be successfully treated with a Collis-Belsey procedure. However, patients presenting with dysphagia have a substantial risk that there will be no improvement in their dysphagia following antireflux surgery. These patients may have end-stage disease, and esophagectomy may be the preferred treatment option. Preoperative dysphagia and contractile failure combined with an esophageal stricture may be important criteria in the selection of patients with end-stage disease for treatment with primary esophagectomy and esophageal replacement. The recognition of patients with advanced and end-stage GERD before antireflux surgery is particularly important, given the rising use of laparoscopic Nissen fundoplication.

REFERENCES


**DISCUSSION**

Lawrence W. Way, MD, San Francisco, Calif: This report describes the surgical treatment of 37 patients with GERD who had severe esophageal dysmotility, esophageal stricture formation, short esophagus, or a combination of these abnormalities. As a group, they are referred to as end-stage reflux disease. The rationale for considering these conditions together is the belief that standard methods for treating reflux, such as laparoscopic fundoplication, are so unlikely to succeed that more aggressive procedures should be used instead. The authors define end-stage disease as when (1) the amplitude of esophageal peristalsis is less than 25 mm Hg; (2) dilation of a stricture does not eliminate dysphagia; or (3) the hiatal hernia is 5 cm or more, and it is difficult to reduce at the time of surgery. They report that 13% of patients with reflux for whom they recommend surgery exhibit end-stage disease and qualify for these more aggressive operations as opposed to laparoscopic fundoplications.

Treatment of the 37 patients consisted of Belsey fundoplications with a Collis gastropexy, or esophagectomy.

The authors have made an important contribution by singling out for attention some of the more recalcitrant forms of GERD, but I am not prepared to accept some of their recommendations without more data. An example is their advocacy of esophagectomy as initial treatment for a patient with poor motility and dysphagia. Why not perform a laparoscopic fundoplication instead and reserve esophagectomy for those patients who do not improve with this much simpler operation? Poor esophageal motility does not guarantee that a fundoplication will fail, as demonstrated by the success of fundoplication as an adjunct to Heller myotomy for patients with achalasia and complete absence of peristalsis in the esophagus. We recently compiled data (unpublished) concerning 55 patients with nonobstructive (ie, the patients did not have strictures) dysphagia and GERD on whom laparoscopic partial (Guarrer) fundoplications had been performed. Dysphagia was completely relieved postoperatively in 90% of these patients. Heartburn and the reflux score also improved, just as in GERD patients without dysphagia. Similar arguments in favor of a laparoscopic fundoplication as the first treatment could be made for some of the patients in other categories. For example, in our experience, most 5-cm hernias can be reduced and a laparoscopic fundoplication performed without a gastropexy with excellent results.

In general, therefore, I have difficulty accepting the idea that esophagectomy or a Collis gastropexy is appropriate as the initial treatment of as many as 13% of patients with GERD who require an operation.

In addition to these issues of treatment philosophy, I have 1 other question. Why did you choose to do an open transhi-locoscopic Belsey fundoplication in these patients instead of a laparoscopic partial fundoplication, adding a Collis gastroply as needed? It is easier in our view to completely reduce a large hernia from the abdominal than from the thoracic approach, so this might have avoided some of the gastroplasties, and the gastroplasties that were necessary might have been done laparoscopically instead of through an open thoracotomy.

J. David Richardson, MD, Louisville, Ky: I have had a longstanding interest in the use of the esophageal lengthening procedure for patients with stricture. I certainly think there is a cohort of patients who exist, I guess unlike Dr Way, in whom this operation is really needed, and at least in our group's hands, the laparoscopic operation would not be able to solve the problem with significant shortening that a lot of these patients have. I am going to report in a couple of weeks at the Southern Surgical Association on 52 patients in whom we did a Collis lengthening procedure. Virtually all of those patients had stricture. All had a significantly shortened esophagus, and not one that could be mobilized from the abdomen. We have an average follow-up of 7 years on those patients. Almost every patient who has a severe stricture will require dilation postoperatively.

However, I am impressed at how many of those patients progress so that they no longer require dilation over time. The questions I have are how much dysphagia did this group have, how many dilations did they have, and how long did you persist with that? Clearly, this is not something, with this transmural scarring, that is going to resolve overnight. I would remind the audience that there is considerable long-term morbidity with an esophagectomy. Depending on what type of conduit you use, those are associated with long-term problems, and while it may clear the dysphagia in the short term, you buy another set of problems with that operation. I am not sure whether the authors are recommending primary esophagectomy for a shortened esophagus, which I think is not usually warranted, but certainly agree that a very small subset exists who will require esophagectomy.

Philip E. Donahue, MD, Chicago, Ill: My questions relate to some of the decision making about choice of operation, because that is the most important element of this whole strategy. Preoperative decisions regarding the amount of shortening of esophagus are particularly difficult in some of these folks, especially with type II and type III hiatal hernia. Are there many type III patients included in this series?

We have a concern about the analysis of successful outcomes according to presenting symptoms. This approach might introduce a number of biases and is something to keep in mind in light of the many preoperative symptoms these patients have. We are more used to analyzing operations in terms of an outcome based on the particular operation employed. The choice of the transthoracic approach complicates tethering of the newly lengthened esophagus beneath the diaphragm; is it possible that the high incidence of residual dysphagia relates to the fact that you really cannot tether that wrap down onto the right crus of the diaphragm the way you might by laparotomy?

Gerard Aranha, MD, Maywood, Ill: When you talk about end-stage GERD, especially those with stricture, there is always a concern of malignancy. In your patients who are not resected, what methods did you use to rule out malignancy?

Dr Peters: Let me point out at the beginning that we are talking largely about a cohort of patients with short esophagus as a measure of advanced disease. I think we would all agree that the presence of a short esophagus, defined by the inability to advance the esophagus into the abdomen after complete esophageal mobilization, is advanced disease. By and large, we are not talking about poor esophageal motility in and of itself, nor are we talking about strictures alone. These precepts are important to the interpretation of the data.

Dr Way suggested that these patients be approached laparoscopically, accepting failure once in a while, with the possibility of esophagectomy in those patients who fail. We are already learning the limits of what we can accomplish laparoscopically in a much more straightforward cohort of patients, that is, those...
who do not need a Collis gastroplasty and those without stricture or poor motility. We all recognize that there have been a number of failures with less advanced disease. I do not think we should necessarily push the “laparoscopic” envelope further. Approaching 80% to 90% of antireflux patients laparoscopically is good enough in my mind. The other reason not to take such an approach is that it is well-documented that a second antireflux procedure has much less chance of success than the first time around. It is important to do it right the first time, particularly in patients with advanced disease. We are certainly not advocating esophagectomy in all of these patients. If you recall from the data, there were only 7 primary esophagectomies in this group. These were included primarily for comparison and were accumulated in a very busy esophageal unit over about a 15-year period. Thus, it is not a common decision.

Dr Way also emphasized the importance of poor motility. The importance of poor motility as an isolated factor is currently a question that needs to be further defined. My own mind is moving to the concept that unless you have a named disorder, that is scleroderma or perhaps achalasia, most patients with poor motility may be better served by a well-done full fundoplication rather than a partial fundoplication. These concepts likely will evolve over the course of the next decade or so, as we do more and more antireflux surgery. Again, this study evaluated patients with a short esophagus and not isolated poor motility. Finally, he asked, why not do a Collis laparoscopically when necessary? I believe there are 2 reasons. First, a laparoscopic Collis, for any of you who have tried it, which I suspect is not very many, is technically very challenging. I have tried it a few times, and I find it quite difficult. The second is that there is a significant difference in the ability to mobilize the esophagus laparoscopically vs open transthoracically. The extra centimeter or 2 of esophageal length achieved open through the chest often makes the difference between the need for a lengthening procedure or not and is important. I do not believe we can mobilize the esophagus through the hiatus laparoscopically or even open transabdominally without the risk of vagal injury.

Dr Richardson, we certainly agree with most of your comments. There clearly is a population of patients with advanced disease who are difficult to treat, and ought to be approached open. I look forward to your paper at the Southern next year.

All of the patients who had strictures in this study were refractory to dilation. We did not include all of our stricture patients. There are many patients with strictures who respond reasonably well to dilation and then go on to a straightforward procedure. We included only truly advanced patients, all had been dilated, most failed and had persistent dysphagia. You will notice that almost all of the strictures were in the group with persistent dysphagia.

The message of the paper was that if you have a patient with dysphagia, be careful. If you have dysphagia in advanced disease, be particularly careful.

Dr Donahue’s comments were particularly insightful, especially with regard to the difficult judgment associated with who has and who does not have a short esophagus. I do not have a precise answer for that, Dr Donahue. We struggle with it commonly, and have come to rely largely on the radiography and endoscopy as a guide. We have found that a 5-cm hernia that will not reduce when you stand that patient up on barium esophagram, particularly in the presence of mucosal injury, is perhaps the best indicator of shortening. We would like to find a more objective measure, and we are working to do that. There were no patients in this series who had periesophageal hernias either of type II or type III. I think many of those patients, however, do need gastroplasties.

Finally, Dr Aranha asked how we rule out malignancy. We have the opportunity, desire, and perhaps the blessing of endoscoping all of our patients ourselves ahead of time. The strictures are rigorously biopsied, and malignancy is excluded prior to surgery.

**IN OTHER AMA JOURNALS**

JAMA

A Randomized Trial Comparing Octylcyanoacrylate Tissue Adhesive and Sutures in the Management of Lacerations

James Quinn, MD; George Wells, PhD; Terri Sutcliffe, BScN; Mario Jarmuske, MD; Jennifer Maw, MD; Ian Stiell, MD; Peter Johns, MD

Objective.—To assess the effectiveness of a new tissue adhesive for laceration closure.

Design.—A prospective, randomized controlled trial.

Setting.—An adult teaching hospital.

Participants.—One hundred thirty patients with 136 lacerations who consented to enrollment during a 5-month period. The lacerations included all eligible nonmucosal facial lacerations, as well as selected extremity and torso lacerations (not on hands, feet, or joints). One hundred six lacerations were available for early follow-up, and 98 were available for 3-month evaluation.

Interventions.—Lacerations were randomly allocated to have skin closure with octylcyanoacrylate adhesive or monofilament suture.

Main Outcome Measure.—A 3-month photograph of the wound was assigned a cosmesis score on a previously validated 100-mm visual analog cosmesis scale by a plastic surgeon who was unaware of the method of wound closure.

Results.—There were no differences in the mean visual analog cosmesis scores (67 mm for octylcyanoacrylate vs 68 mm for sutures; \( P = .65 \)). Similarly, there was no difference in the percentage of early (80% vs 82%; \( P = .80 \)) or late (72% vs 75%; \( P = .74 \)) optimal wound evaluation scores. The tissue adhesive was a faster method of wound repair (3.6 vs 12.4 minutes; \( P < .001 \)) as well as being less painful (visual analog pain scores, 7.2 vs 18.0 mm; \( P < .001 \)).

Conclusions.—Octylcyanoacrylate tissue adhesive effectively closes selected lacerations. This relatively painless and fast method of wound repair can replace the need for suturing several million lacerations each year.

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