Intrathoracic esophageal perforation

The merit of primary repair

Between 1976 and 1993, 22 patients with intrathoracic esophageal perforations, none associated with carcinoma, underwent primary repair regardless of the interval between perforation and the time of repair. Eighteen perforations were iatrogenic and four were spontaneous. The interval from perforation to operation was less than 12 hours in 10 patients, 12 to 24 hours in 3, and more than 24 hours in 9. Principles of repair included (1) a local esophagomyotomy proximal and distal to the tear to expose the mucosal defect and normal mucosa beyond, (2) debridement of the mucosal defect and closure over a bougie, and (3) reapproximation of the muscle. The repair was buttressed with muscle or pleura in five patients. Associated distal obstruction caused by reflux stricture was treated with dilation and fundoplication in four patients. Of the four patients with achalasia, two underwent esophagomyotomy with a fundoplication and one underwent myotomy alone. There was one death. The esophageal repair healed primarily in 17 patients (80%). Four patients, three of whom underwent repair more than 24 hours after the perforation, had leaks at the site of repair. All four fistulas eventually healed with drainage alone, two with simple tube thoracostomy and two with rib resection and empyema tube placement. In the absence of cancer or an irreversible distal obstruction, meticulous repair of an intrathoracic esophageal perforation is the preferred approach, regardless of the duration of the injury, inasmuch as primary healing is likely, and the morbidity associated with prolonged drainage or diversion may be avoided. (J THORAC CARDIOVASC SURG 1995;109:140-6)

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Patients with esophageal perforation pose a surgical challenge because the condition is relatively uncommon but frequently lethal. Furthermore, the diagnosis is frequently delayed, and the large number of possible interventions has made management controversial. Nonetheless there is an increasing consensus that primary repair affords the patient the best likelihood of survival with minimal morbidity.¹⁻³ It has been suggested that primary repair is appropriate only when the interval between perforation and intervention is short (<24 hours) and that other

modalities such as drainage alone, diversion, exclusion, or a combination of these should be used when the diagnosis is delayed.^{1,4-7} We disagree with this latter approach and present a series of patients that supports the contention that primary repair should be used whenever possible.

At the University of Michigan we have repaired primarily all nonmalignant esophageal perforations when the esophagus has been considered salvageable, regardless of the interval between injury and intervention. In this report we review our results with 22 consecutive attempts at primary repair of nonmalignant thoracic esophageal perforations and present our technique of repair, which stresses complete exposure of the injury and a meticulous two-layer, nonreinforced closure.

Patients and methods

The records of all patients treated for nonmalignant intrathoracic esophageal perforation by the Thoracic Surgery Service at the University of Michigan between 1976

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and 1992 were reviewed. Patients with intrathoracic anastomotic leaks and those with cervical esophageal perforations were excluded. Of the 37 patients who met the stated criteria, two were treated with drainage alone and 13 underwent esophagectomy. The remaining 22 patients underwent primary repair of the perforation.

Primary repair. Of the patients who underwent primary repair, 10 were women and 12 men; the age range was 36 to 83 years (mean 58). The site of injury was in the distal esophagus in 18 patients, the mid-esophagus in 3 patients, and the upper thoracic esophagus in 1 patient. Four perforations were spontaneous; the remaining 18 were iatrogenic. Eight patients had perforation during the course of esophagoscopy, either rigid or flexible, and four patients with achalasia had perforations as a complication of pneumatic dilation. Other causes included dilation of a stricture (1 patient), injury from a transesophageal echocardiogram probe (1 patient), injury from a Sengstaken-Blakemore tube (1 patient), and operative injury (3 patients). Operative injuries occurred during repair of a hiatal hernia in two patients and a pneumonectomy in one patient.

The interval from esophageal injury to repair ranged from 6 hours to 9 months. Ten perforations were repaired less than 12 hours after injury and three patients underwent operation between 12 and 24 hours after injury. Five patients underwent repair between 24 and 48 hours after perforation, and the remaining four patients underwent operation more than 48 hours after injury: 8 days, 10 days, 22 days, and 9 months, respectively. The longest interval from injury to repair occurred in a patient who underwent a right pneumonectomy. Bile was noted to be draining from the chest tube on the third postoperative day. The patient was treated with tube drainage of the pleural space and enteral feeding for 8 months before being referred to this institution for repair of the chronic esophagopleural-cutaneous fistula.

The surgical approach was a left thoracotomy in 17 patients, a right thoracotomy in 4 patients, and an oblique cervical incision with division of the manubrium in 1 patient. Nineteen of the 22 operations were done under the supervision of one surgeon (M. B. O.), and all perforations, except two, were closed in two layers. The inner mucosal/submucosal layer was stapled in nine patients, sewn in nine, and simply patched in one patient (operative notes were not available for review in 3 patients). The repair was buttressed with muscle, pleura, or omentum in five patients, three of whom underwent repair more than 24 hours after injury. Associated distal obstruction caused by reflux stricture was treated with dilation and fundoplication in five patients. Of the four patients with achalasia, two underwent esophagomyotomy with a modified Belsey fundoplication, one had a myotomy and Nissen fundoplication, and one patient underwent myotomy alone.

Drainage or esophagectomy. Two patients underwent drainage of the esophageal perforations. One was an 88-year-old man who was transferred to this institution with an esophagopleural-cutaneous fistula approximately 5 weeks after a spontaneous esophageal perforation. The other was a 73-year-old man who was referred to us 4 weeks after an intraoperative injury to the distal esophagus:

at the time of transfer, he was in respiratory failure and had an undrained empyema on the right side.

An additional 13 patients underwent esophagectomy instead of primary repair. Of these, eight had a long history of dysphagia, including one patient with achalasia, one with scleroderma, and four with peptic strictures. In four patients the esophagus was thought to be unsalvageable at the time of operation. One of these had a perforated Barrett's ulcer; one was found, at the time of attempted repair, to have multiple esophageal webs; one had a 5 cm long segment of severely damaged, unreparable, esophagus; and one had such extensive mediastinitis that esophagectomy, cervical esophagostomy, and delayed gastric interposition were done. Records were unavailable for review on one patient.

Technique of esophageal repair. The patient with a suspected esophageal perforation undergoes an esophagogram with either meglumine diatrizoate (Gastrografin) or dilute barium. In addition to confirming the diagnosis, this localizes the site of injury so that an appropriate operative approach can be chosen. For cervical or high intrathoracic esophageal lesions, a cervical incision provides adequate exposure, and by extending the incision onto the anterior upper chest and splitting the manubrium additional exposure, to the level of the carina, can be gained. Injuries to the middle third of the esophagus are approached through a right posterolateral thoracotomy, whereas lower-third lesions, which were found in the majority of patients in this series, are approached through a left posterolateral thoracotomy in the seventh intercostal space.

The esophageal perforation is exposed, and any necrotic mediastinal tissue is debrided. The mucosal tear often extends well beyond the muscular injury and is completely exposed by performing a vertical esophagomyotomy that extends proximal and distal to the visible muscular injury. To expose healthy mucosa and submucosa for the primary repair, the leading edge of the "pouting" mucosa is grasped with Allis clamps, and the adjacent esophageal muscle is mobilized away from the submucosa until there is a 3 to 7 mm circumferential rim of normal submucosa around the entire tear (Fig. 1). The mucosa and submucosa are then closed over a 40F or 46F intraesophageal bougie. Although an interrupted suture technique with the use of absorbable 4-0 suture is satisfactory, our preference is to use a GIA surgical stapler (AutoSuture, Inc., Norwalk, Conn.) to accomplish closure of the first layer of the repair (Fig. 2, A). After the mucosal/submucosal layer is closed, the adjacent muscle is approximated with either running or interrupted 3-0 suture (Fig. 2, B). The repair is not generally reinforced, but a pedicle of intercostal muscle, pleura, omentum, or anterior pericardial fat can be used. The chest and mediastinum are irrigated; then the incision is closed with one or two intercostal drainage catheters. Nasogastric tube decompression of the stomach is continued until the postoperative ileus resolves, and then diet is advanced as tolerated to a mechanical soft (pureed) diet. A postoperative barium swallow is obtained 7 to 10 days after operation unless a clinical suspicion of a recurrent leak warrants an earlier contrast study.

Fig. 1. A, Mucosa "pouting" through muscular defect (*inset*) is grasped with Allis clamps in preparation for exposure of entire tear. Right-angle clamp is used to separate muscularis from underlying submucosa, and vertical esophagomyotomy (*dotted line*) is made to expose entire limits of tear. **B,** Procedure described in **A** exposes circumferential rim of normal submucosa that can then be closed.

Relief of obstruction distal to the perforation, which may occur from a variety of causes, is essential. Intraoperative passage of esophageal dilators ensures relief of significant distal obstruction. Reflux strictures are managed by intraoperative dilation in conjunction with an antireflux procedure; achalasia necessitates an esophagomyotomy. If the distal obstruction cannot be relieved, or if there are multiple sites of obstruction, an esophagectomy should be done.⁸ If this is necessary, a cervical esophago-gastric anastomosis is preferred.

Results

Twenty-one (95%) of the 22 patients survived primary repair of the intrathoracic esophageal perforation. One patient died 1 week after operation of an arrhythmia: a postmortem examination showed severe coronary artery disease and no evidence of a recurrent esophageal leak. Seventeen (81%) of the remaining patients had successful primary closure of the injury. Four patients (18%) had recurrent leaks, although all survived this complication. Of the four unsuccessful repairs, two were managed with chest tube drainage alone (1 placed percutaneously and 1 placed at the time of initial repair), and two patients required rib resection and placement of an empyema tube. One of the leaks occurred in a patient in whom the repair had been buttressed with a pedicle of intercostal muscle. Three of the four patients in

Fig. 2. A, Stay sutures, placed into inflamed pouting mucosa, are used to elevate normal submucosa into jaws of GIA stapler. *Inset,* Stapler is placed below inflamed, edematous mucosal edges (*dotted line*). **B,** Repair is then completed by closing muscularis with running suture.

whom the esophageal repair leaked had the initial repair more than 24 hours after injury; in two of these the interval was less than 48 hours and in one the interval was 8 days. Nonetheless, six (67%) of the nine repairs undertaken more than 24 hours after injury and three (75%) of the four done beyond 48 hours healed without leaking.

Patients were discharged from the hospital from 8 to 68 days after operation. The mean duration of postoperative hospitalization for all patients was 21 days, and for those who had successful primary repair it was 16 days (range 8 to 48 days). Functionally, all but two patients did well. One patient underwent esophagectomy 6 weeks after successful repair because of dysphagia from a recurrent stricture. A second patient required a myotomy and Belsey partial fundoplication 6 weeks after initial perforation repair because of spasm, unresponsive to dilation, at the gastroesophageal junction.

Discussion

Esophageal perforation remains a highly morbid condition,^{1,9} the management of which is controversial. The divergent recommendations regarding management include primary repair, diversion or exclusion or both diversion and exclusion, and a number of other techniques, such as continuous

transesophageal irrigation¹⁰ and nonoperative management.¹¹

Our practice has been to attempt primary repair whenever possible, but we exclude from this approach patients with malignant disease and those with esophagi we regard as being nonsalvageable. This relatively nonselective approach to primary repair is at variance with most published reports up to a decade or so ago,⁴⁻⁶ which recommended selective management whereby patients seen within 24 hours of esophageal injury undergo primary repair and those in whom the diagnosis is delayed (>24 hours) undergo an alternative form of treatment. The reasoning behind this includes (1) the apparent increased mortality seen in patients with delayed diagnosis and primary repair and (2) the technical difficulties encountered in closing the edematous, inflamed, infected esophageal tissues. More recent reports¹⁻³ confirm the 1975 recommendation of Grillo and Wilkins¹² that primary repair be undertaken whenever possible, regardless of the interval from injury to operation. Our experience supports this approach. In contrast to earlier thinking, morbidity and mortality are decreased after primary repairs in cases of delayed operation and, in many cases, the interval from injury to repair does not affect outcome. The evolution of this controversy is interesting in that the 1986 report by Nesbitt and Sawyers¹³ strikes middle ground in recommending primary repair within 48 hours, not the traditional 24 hours, and drainage or diversion in more delayed injuries.

The technique of esophageal repair that we recommend includes a two-layer closure with wide exposure of the mucosal defect. Staple closure is generally possible and is preferred, although suture closure, which is a bit more time consuming, appears to work as well. Staple closure of esophageal injuries has been reported twice, once in a case report¹⁴ and once in a series.¹⁵ In the series reported by Gayet, Briel, and Fekete,¹⁵ 13 patients underwent primary repair with a stapled inner layer, a sewn outer layer, and, in 10 patients, a reinforcing flap. Successful results were obtained in 11 patients: 2 patients (15%) had leaks, and 1 of these died.

In contrast to other reports,² we do not advocate routine use of a reinforcing flap of autologous tissue. Although we have used such techniques in five patients, they did not appear to affect outcome. Much more important to a successful repair is meticulous technique that ensures an airtight closure and complete elimination of distal obstruction.

Most patients swallow comfortably if the esophagus can accept at least a 40F bougie. For this reason we perform the repair over a 40F to 46F dilator. This ensures both that there is no distal obstruction and that the repair itself does not result in undue narrowing. This is particularly important in stapled closures because a substantial amount of mucosa and submucosa must be brought into the jaws of the stapler to effect a complete repair.

In an analysis of our results of primary repair of esophageal perforations, it must be emphasized that we have limited this approach to patients with nonmalignant, intrathoracic esophageal injuries. Other series,^{7, 13, 16} the results of which have been tabulated by Jones and Ginsberg,¹ frequently combine a number of management strategies in a heterogeneous group of patients; some with cervical injuries and some with thoracic or abdominal injuries. The combining of patients with cervical injuries with those with more distal injuries makes analysis of various techniques difficult. For example, although they do not recommend transesophageal irrigation as the primary mode of treatment for all esophageal ruptures, Santos and Frater¹⁰ describe its successful use in seven of eight patients. It must be noted, however, that four of these patients had cervical injuries that would commonly be treated with drainage alone, and three had drainage instituted after a failed attempt at primary repair.

It is important to realize that primary repair is not applicable to all esophageal perforations inasmuch as it is clearly unwise to attempt salvage of a poorly functioning esophagus as can be seen in achalasia or scleroderma. Similarly, repair of an esophagus proximal to an undilatable stricture is unwise because failure of the repair is likely, and, even if the repair were to be successful, persistent dysphagia will result.

In conclusion, primary repair is applicable to many nonmalignant intrathoracic esophageal perforations regardless of the interval between injury and operation. Complete exposure of the limits of the mucosal injury, a meticulous two-layer closure, and total elimination of distal obstruction are essential. This approach should be taken whenever possible because it results in low mortality, a short hospital stay, and good functional results.

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Discussion

Dr. Alex G. Little (*Las Vegas, Nev.*). This is clearly a timely and important paper in that it points to modern treatment of esophageal perforations in an approach I agree with even though a paper I was a coauthor on several years ago has now been classified as being from the Dark Ages. I agree things have changed, results are

different, and I personally agree with the authors' approach to perforation.

Clearly the essence of a good result has been outlined by this presentation. It involves careful débridement and cleaning of the pleural cavity, the mediastinum, and of the esophagus itself, which means not excessive but certainly appropriate débridement of necrotic muscle, identification of the extent of the mucosal injury, and careful closure. Left unknown is the role of reinforcement with some sort of wrap.

There are still a few questions that remain or are perhaps areas that can be clarified. The first and perhaps most important for me has to do with patient selection. There is a statement in the article that if a patient, for example, has a stricture that cannot be dilated, then the appropriate treatment is esophagectomy. Would it not be better to know that before the patient is taken to the operating room? The entire operation might be planned differently. Specifically, an operation you may have some familiarity with, the transhiatal esophagectomy, might be chosen instead of a thoracotomy. How is that judgment made? Can one simply assume that if the esophagus was perforated during a dilation that it is a nondilatable stricture? How are your patients selected?

Dr. Iannettoni. The judgment of a nondilatable stricture was usually made by us in the operating room. Unfortunately, I cannot tell you how Dr. Orringer decides that, but the decision was made in the operating room with an attempt at dilation by Dr. Orringer and clinical judgment. In some of the cases in the paper that he presented in 1990, the surgeons did go directly to transhiatal esophagectomy before they undertook a thoracotomy and in some cases it was not possible to tell this until the thoracotomy had already been done.

Dr. Little. The second question has to do with patients whose esophagus was perforated during esophagoscopy, and I notice that left undefined was the number of perforations that occurred during use of a rigid as opposed to a flexible endoscope. My question is this: How many perforations occurred during a rigid endoscopic examination? With this question I am implying that I would like you to defend the use of rigid esophagoscopy in this day and age for lesions of the distal esophagus.

Dr. Iannettoni. The usage was about split. There was no significant difference between those perforations that occurred with rigid or flexible esophagoscopes. As far as defending rigid esophagoscopy for distal obstructions, I believe most of those patients who had distal obstruction had undergone flexible esophagoscopy first, with rigid esophagoscopy used for an attempt at dilation.

Dr. James B. D. Mark (*Stanford, Calif.*). Let me ask as a follow-up to that whether you have any idea during this period how many rigid and how many flexible esophagoscopies were done? My suspicion is there were many more flexible esophagoscopies done, particularly considering those done by the gastrointestinal tract service. Perhaps if there are equal numbers of perforations, there was a greater incidence with a rigid instrument.

Dr. Iannettoni. I would again agree with you that most of the procedures were done with the flexible esophagoscope. I do not know how many rigid endoscopic proce-

dures were done, but I suspect that all the patients had a flexible endoscopic procedure.

Dr. Little. The third question has to do with the drainage concept of leaks after a repair. You mentioned that you tend to take the chest tubes out after drainage is down to a certain limit and I think that is common practice. On the other hand, there is a suggestion that having a chest tube in place when the leak occurs might decrease the likelihood of reoperation. Is that still your policy? Do you take the tube out or do you tend to leave it in now?

Dr. Iannettoni. We have modified our approach. Once the nasogastric tube is taken out, the patients are eating before an esophagogram is taken. Our belief is that they are swallowing anywhere from 1 L to 1.5 L of saliva a day, so the chest tube probably is not protecting anything. Because we are advancing their diet and the chest tube is already out, we monitor their chest roentgenograms and clinical symptoms. On the other hand, if a fever develops at day 3, we will get the barium swallow early, before the chest tube is removed, to confirm that the fever is not the result of a leak.

Dr. Little. Now I have two quick technical questions, one having to do with the concept of a wrap or a buttress. I agree with you there is no proof that adding some sort of wrap is of benefit. On the other hand, there are a number of clinical experiences from excellent thoracic surgeons that suggest it seems to improve results, particularly if you focus on the pleural wrap technique. This procedure really does not involve a great deal of time or effort, and many now consider it standard. Is that still something you reserve for special cases? If so, when would you use it?

Dr. Iannettoni. We try not to denude the pleura or use a pleural wrap because we use a paraspinous catheter for pain control. Once that is done, this possibility for pain control is eliminated. We have used the anterior pericardial fat pad as a buttress. In reality, in looking at our patients, a number of them had fundoplication, so they may have had a partial wrap of the perforation, but we do not specifically cover the defect with a pleural wrap.

Dr. Little. The last question concerns the use of the stapler for the mucosal closure. I would certainly agree that is an alternative, but more tissue is used than would be used with suturing. Do you want to defend that as an option or are you suggesting stapling really should be the primary choice in all situations?

Dr. Iannettoni. We do not always use the stapler. Depending on how many traction sutures it takes to close the defect, putting in a few more traction sutures actually closes the wound in the esophagus. Now, some of the defects are stapled and some are sewn shut.

Dr. Harold Urschel (Dallas, Tex.). I would like to ask how much time these patients spent in the hospital after the operation.

Dr. Iannettoni. The average was 16 days for those who had successful primary repair. Right now we are sending them home in less than 10 days.

Dr. Urschel. In our experience, morbidity has been the long-term problem, particularly lengthening the in-hospital stay for those whose condition does not heal from the repair. Since 1963, we have accumulated 109 cases of perforated esophagus. We excluded from this group the

small perforations that did not necessitate drainage. If the perforation necessitated thoracic drainage, then it was included in the 109 cases. There was an 8% mortality rate. We used a fairly standard therapy of exclusion and diversion. In your abstract you alluded to this as being a complicated, fairly large procedure. We believe this is a single, uncomplicated operation. In our experience with the most recent 35 cases we have had no mortality, and excluding two patients we had an average hospital stay of 10 days.

I think the technique that has evolved in our hands has some similarity to yours. We believe the technical closure is important. We wrap the esophagus with omentum, pleura, or muscle flap. We perform our diversion in the neck, side-to-side, between the skin and cervical esophagus. We repair the lesion and then perform distal ligation over silicone rubber artificial pericardium with double No. 2 Prolene sutures (Ethicon, Inc., Somerville, N.J.). These are brought out with a Rumel tourniquet in the left upper quadrant. We create a gastrostomy and jejunostomy of the Moss type. When we are ready to remove the exclusion and diversion we can do everything with local anesthesia as an outpatient procedure. None of these patients has had further leakage. As far as we are concerned this is the simplest technical procedure to ensure a good result with the least stay in the hospital. Many people say, "Exclusion-diversion: that is for the large delayed leak or a failure of the first procedure." We look at it today as the shortest, quickest way to a good result for the patient. The patients whom you excluded from your group with total esophagectomy we included in our group. We have not done a total esophagectomy in any of these patients when the disease was not malignant.

Dr. Mark. I would like to make an observation or two. The most important technical point that has not been previously emphasized is precise identification of the entire length of the mucosal tear. It may be necessary to extend the muscular opening to do this. The rookie mistake is exposing the perforation, seeing the hole, sewing up the mucosa as it lies, and sewing up the muscle over it, leaving persistent openings at each end of the mucosal tear that will leak afterward.

I am puzzled by your timing of feeding, esophagogram, and removal of chest tubes. One would think that the first order of business would be the esophagogram. We do that at about 4 or 5 days after operation. We start with meglumine diatrizoate (Gastrografin) or some water-soluble material. If the repair looks intact with meglumine diatrizoate we then use dilute barium. If it leaks with meglumine diatrizoate, then no further examination is necessary. Only after that do we start feeding, and then after that we remove the chest tubes. I think that is the preferable timing.

Dr. John Benfield (Sacramento, Calif.) There are two diseases we encounter that are particularly frustrating despite the fact that the principles we use are the same as those that you outline, and you did not comment about either of them. One is Boerhaave's syndrome. Regardless of how effective and how careful we are with the closure of the esophagus, we have had a high incidence of leak. I think this is because of the underlying disease that led to the leak in the first place, and I would like your comments

on that syndrome and why it was not included in your report.

Dr. Iannettoni. I did not specifically state Boerhaave's syndrome because we considered it as spontaneous perforation that presented in patients after emesis. Interestingly enough, none of those patients were the patients in whom late leaks developed.

Dr. Benfield. I congratulate you for that outcome.

The second problem occurs in the group of patients who have had previous irradiation, usually patients with head and neck cancers who then have perforations during esophagoscopy, usually at the thoracic inlet. This is a difficult area to approach. Did you have any such patients, and what has been your experience with that entity?

Dr. Iannettoni. We did not have any primary repairs that I am aware of in patients with this condition. I think the group that received esophagectomy comprised those patients also who had, again, nondilatable strictures who had underlying disease such as radiation or scleroderma. In those patients we choose to do an esophagectomy.

Dr. Benfield. Finally, I have just a brief comment. In two patients who had previous irradiation at the thoracic inlet we used video-assisted thoracotomy to assess the nature of the lesion successfully. I made a decision in both instances to proceed with a diversion procedure rather than with an attempt at primary closure on the basis of the findings of the video-assisted inspection.

Dr. Mark. That is a nice wrinkle, doing a video-assisted thoracoscopy to evaluate the perforation. That is good.

Dr. David Dugan (Helena, Calif.). This paper has given me an attack of nostalgia. In my practice with Dr. Paul Samson, for whom this great organization was named originally, he and I had a series of fewer than 500 cases—in fact, it was 10 cases—with spontaneous rupture of the esophagus. This was in the early 1950s, and we were proud of these 10 cases, because they all involved patients who had been out on sort of a binge. They would have a big meal with a lot of alcohol and then have a sudden pain in the chest. The secret to the success of this type of series was in thinking of the diagnosis, because our belief was that if you made the diagnosis within a very short time your chances of success were much better. We did this repair just as Dr. Mark has outlined. We went to operation quickly and closed the leak. Dr. Mark's remarks were potent, because we did increase the musculature tear to be sure that we got the whole leak. We prided ourselves on the fact that we discharged these patients from the hospital within 3 or 4 days. I have always believed that it is better to be lucky than smart, and I think we were very lucky in those cases.

I will take just a moment to discuss the problem of chest pain in thoracotomy incisions. The thoracoscope advocates are telling us all about how wonderful thoracoscopy is, and I am delighted that I am not practicing because I would hate the thoracoscope. The reason I did not like it was that at FitzSimmons Army Medical Center, when I was being trained, we used to do thoracoscopy for intrapleural pneumonolysis for tuberculosis. We had an instrument about like that, without this television stuff. The surgeon looked through the aperture and would find the adhesion and cut and hope there was no blood vessel in it. It was a remote-control situation as far as I was concerned. I know I would be no good at what they are doing nowadays, although I have great respect and admiration for it.

Chest pain is an interesting thing. Younger people do not remember Paul Samson. He was 6 feet, 7 inches tall. He weighed 250 pounds. He had hands like hams. He wore a special green glove, size 10. I am a shrimp and how I ever got associated with that fellow, I will never know, but it is amazing. We practiced for 35 years together and we had one heck of a good time. He was big enough so that he would not strike me and I was small enough so I did not have the courage to strike him, so we got along beautifully. But, the thing about the incision, and I am serious about this, is that I used to make very small incisions. When I did a case, he helped me, and vice versa. He would say to me, "Dave, would you kindly make a decent incision? Why do you make such a small incision?" I would say, "Well, Paul, it is so that you keep your hands out of the chest." He had a hard time getting his hands in under my incision. When he made an incision he would make it from stern to stern, and there was plenty of room for both of us in there at that time. What he would do, and I wish he were here because I would love to put this to him, is when I would make my incision he would sneak around while I was not looking and push on the retractor, and then I would slap his hand, but he liked to get a little exposure. I think exposure is a very potent thing, and that is the thing I am so interested in. These people with the thoroscopes perhaps have better exposure than we ever had, but this remote-control thing really gets me down.

Dr. Mark. You know there is only one thing about the honorary member: he is taking unlimited privileges.

I am going to make one closing comment on this paper. The authors reported on four spontaneous perforations, which they managed successfully. One of these patients was the father of one of our colleagues, and he was treated successfully.