

the size as well as associated pancreatic pathology enter into the choice of management:

Asymptomatic pseudocysts less than 6 cm in diameter often can be followed with an expectation of complete resolution in most cases and with a low incidence of complications.

Small symptomatic pseudocysts that occur in association with a dilated pancreatic duct can be decompressed and incorporated into a lateral pancreaticojejunostomy used for ductal drainage.<sup>28</sup> Occasionally, smaller cysts in the tail may be associated with little or no ductal dilation. Because of their location, they are difficult to drain internally or externally and carry a risk of hemorrhage because of the close proximity to the spleen and its pedicle. We have resected these, along with the spleen, and drained the transected pancreas with a caudal pancreaticojejunostomy with success.

Because of their location, large pseudocysts preclude any definitive approach to the underlying pancreatic inflammatory disease, and our management preference is PCD. This approach should be undertaken recognizing that subsequent operative correction of underlying pancreatic pathology may be required. We continue to use internal drainage when PCD is not possible because of pseudocyst location.

The principal disadvantages related to PCD include prolonged external pancreatic fistula and secondary infection of the catheter track. Both of these problems may be in part correctable using somatostatin analogs to promote early fistula closure and fastidious attention to the prevention of drain track infections.

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### DISCUSSION

DR. GEORGE JORDAN (Houston, Texas): Dr. Bland, Dr. Jones; Drs. Anderson and Adams very kindly sent me a copy of their manuscript, and I recommend careful reading of this manuscript to all of you because

it contains a lot of information that Dr. Anderson did not have time to present in his report today. The initial treatment of pseudocyst was primarily by external drainage. And as all of you know, a number of techniques were developed. This included marsupialization, which is a highly morbid procedure, really. Most commonly, the external drainage was

by catheter drainage. The problem with external drainage in those days was the fact that everyone developed a pancreatic fistula, as was true in this series, and, secondly, there was a 20% incidence of recurrence of the pseudocyst; the development of internal drainage tended to prevent both of those late problems.

There are a number of items to note in this report. One is the tremendous increase in pancreatic pseudocysts that have been treated by Dr. Anderson and Dr. Adams in recent years. It took them 27 years to get 42 internal drainage procedures and only 8 years or so to get 52 radiographic catheter drainages. I am curious as to whether there has truly been an increased incidence of this problem or whether there is interest in putting catheters in, in circumstances where we would not have subjected the patient to an operation for drainage. The problem, obviously, with catheter drainage has been primarily the development of the fistula. And in the substance of the paper, it is pointed out that the chronicity of the fistula after this procedure has been much greater than anticipated.

Dr. Anderson did not discuss the handling of the catheter, and I would ask him to do that in his closing remarks. These are pigtail catheters, and I have always believed that once a fistula has developed that the drainage tube or catheter should be moved away from the pancreas. It should not be totally removed because the skin may close prematurely, but it should be moved away from the pancreas because I firmly believe that a catheter remaining in contact with a fistula prevents fibrous development and closure of the fistula.

The absence of mortality is certainly impressive and, it is hoped that will continue. In the management of the chronic fistulas, they apparently have only recently started using somatostatin and its analogs. Our own experience has been limited with it. As you know, there are those who feel that this is the answer to pancreatic fistulas. I have not found it to be so. Some people seem to respond; other people just do not seem to have any change in the course of their disease. Dr. Anderson did not mention the use of endoscopic retrograde cholangiopancreatography or sinograms in the management of these patients, and in our experience there are many patients with whom these tests are helpful, both in defining pathology and in directing surgical treatment, as well as in evaluating the possible cause of the prolonged drainage when a fistula occurs. As was true in his experience and has been in ours, the fistulas do close, but some of them do stay open for a long time. Surgical repair, however, is virtually never required. Thank you.

**DR. ROBERT HERMANN (Cleveland, Ohio):** Dr. Bland, Dr. Jones, Members and Guests, I would like to congratulate Dr. Anderson and Dr. Adams for this excellent review and comparison study of pseudocyst management. The manuscript is rich in detail, as Dr. Jordan mentioned, and I appreciate the opportunity to have reviewed it for this discussion. The principal message of the report, I believe, is that percutaneous catheter drainage with computed tomography guidance is safe and is equally effective as open-operative drainage in this group of patients.

Although the two groups were similar in almost all parameters, it must be re-emphasized that group 1 patients were treated over a 26-year period whereas group 2 patients were treated only during the past 9 years. This difference in time periods with the many differences in diagnostic and therapeutic modalities that were introduced during that time could well account for the differences in morbidity and mortality rates between the two groups. Furthermore, I think it is important to recognize that all patients were treated electively, and excluded from the study were patients with acute pancreatitis and patients with infected pseudocysts or abscesses. It is important to recognize that this is a selective group of patients, predominantly patients who develop pseudocysts from chronic pancreatitis, although the authors did not identify how many patients in either group had pseudocysts as a result of acute pancreatitis.

Finally, the size of the pseudocyst is an important criteria. The authors state that currently percutaneous catheter drainage is used almost exclusively to treat symptomatic pseudocysts larger than 5 cm in diameter without evidence of pancreatic duct dilatation on computed tomography scans. I have two questions for the authors: First, how many patients in this series had a pseudocyst after an episode of acute pancreatitis, and would you treat this patient with percutaneous catheter drainage as well as the group of patients with chronic pancreatitis? And, secondly, in the patient with chronic pancreatitis who develops a large pseudocyst 5 or

6 cm in diameter but has obstructive changes in the pancreatic duct as seen on an endoscopic retrograde cholangiopancreatogram, would you use catheter drainage as a first approach or as part of a staged approach to the problem? Or just go on with an operative internal drainage as definitive treatment? I enjoyed the paper very much, and I recommend it to you for your reading. Thank you.

**DR. WILLIAM NEALON (Galveston, Texas):** Dr. Bland, Dr. Jones, Members and Guests, I also would like to congratulate the authors on a superb presentation of their retrospective study of 92 patients treated for pseudocysts of the pancreas. As Dr. Jordan mentioned, a well-documented problem with external drainage that surgeons looked at long ago was the high rates of recurrence and pancreatic fistula that resulted. Percutaneous computed tomography directed drainage behavior in a similar manner, and recurrence rates have been quite high. The way to try to reduce those recurrence rates was to leave the catheter in for long periods. The resulting complication with long-term external drainage was a higher rate of infection. Dr. Anderson states that 25 of his patients who were externally drained had infection of the tract, which he distinguishes from sepsis on the basis of an absence of positive blood cultures. I wonder if Dr. Anderson would mind giving us a few more details about the patients with the so-called tract infection and whether any of them actually looked acutely ill.

I notice that ten of the patients who had external drainage had a finding of pancreatic ascites. It has been our experience that with pancreatic ascites, endoscopic retrograde cholangiopancreatogram (ERCP) defines a communication between the pancreatic duct and the peritoneum. We consider these patients poor candidates for external drainage because of the likelihood of continued drainage of the duct and fistula. I wonder if you have any information on your ascites patients, whether they have fared any better or worse than your long-term results overall.

You do not mention any recurrence in the percutaneously drained patients, and I do not know if that means that you had 0% recurrence after the drainage or not. Can you tell us what your information is on recurrence? Obviously, one of the down sides of percutaneous drainage is the fact that you may prolong the hospitalization, and your mean hospitalization of 42 days for your patients who were drained is testament to that fact. I was surprised to see the length of hospitalization for your operatively drained patients, and I wonder if you could give us some information on the reason for those prolonged hospitalizations.

Finally, approximately 4 years ago, I presented to this society some information on prospectively evaluating ERCP information in patients with pseudocysts. As Dr. Hermann mentioned, these could be very valuable in making a strategy, specifically in unanticipated patients with chronic pancreatitis. I wonder if you have any information on ERCP evaluation of these patients. Specifically, were any of the patients treated with a combined Puestow as well as pseudocyst drainage when you had that kind of information before operation? I thank the Society for the privilege of the floor.

**DR. J. LYNWOOD HERRINGTON, JR. (Nashville, Tennessee):** Dr. Bland, Dr. Jones, Members and Guests, I really have enjoyed this presentation very much, and I would like to congratulate Andy on his experience with percutaneous catheter drainage. I have had the opportunity recently to review numerous papers on the management of pancreatic pseudocysts for a surgical modality that Andy Warshaw and I recently put together. I think the results shared this morning are really superb. They are simply outstanding. There are, however, many groups around the country and abroad who cannot report such excellent results with percutaneous drainage because it is associated with significant complications and not infrequently it does not get the job done. I do think that we should not, by any means, give up internal drainage of the pancreatic pseudocyst because it is an excellent operation with few complications and good long-term cure rates. I would give consideration, however, to performing percutaneous catheter drainage as the initial procedure for the high-risk patient with a symptomatic pseudocyst. As you know, endoscopy-guided catheter drainage has been recently reported with some success in a few centers, but very few clinics, relatively speaking, have had significant experience with this new modality.

Andy, I would like to ask you three questions: In performing a cyst gastrostomy do you ever drain the cyst cavity with a Penrose drain and

bring it out through the anterior gastrotomy incision or closure? I know that some groups advocate that.

Also, some recent authors, particularly in Europe, have reported unsatisfactory results from internal drainage using cyst gastrostomy for huge cysts 10 to 15 cm or more in diameter, even when they present entirely behind the pancreas. I have had good results in my limited experience with huge cysts just using the pancreatic cyst gastrostomy and have used Roux-en-Y drainage only when the cyst presents up against the transverse mesocolon. Now, Andy, how would you manage a patient with an extensive enterocystic hemorrhage from a ruptured pseudoaneurysm of the splenic or the gastroduodenal artery, and what have your results been with this procedure? Again, I enjoyed the paper.

DR. DAVID ADAMS (Closing discussion): Thank you very much, Dr. Jones and Dr. Bland. Let me begin at the beginning with Dr. Jordan and comment on the incidence of pancreatic pseudocysts, which seem to have increased recently. Part of this is related to the fact that we have, in this study, excluded a number of patients who were treated with combined drainage procedures. If you look at the number of pseudocyst patients that Dr. Anderson has been involved with over the past 27 years, there were 160 patients. And so there are a number of patients who we have not identified in this study who were treated during the early study period when percutaneous catheter drainage (PCD) was not used. In addition, I think we will all agree that the use of computed tomography (CT) scans has changed the pattern of the presentation of patients with pancreatic pseudocysts.

The second question of Dr. Jordan's related to handling of the catheter. Dr. Anderson made allusion to the importance of the catheter care. I think in our earlier experience we have been frivolous in managing the skin care and dressing care with these catheters. Another important factor Dr. Jordan identified has to do with the proximity of the catheter to the pancreatic duct. And I think we would agree with him that proximity to the pancreatic duct increases the duration and the volume of the drainage. We have had several patients who have had catheters in the region of the head of the pancreas who, on sinogram studies, have demonstrated direct communication with the duct and the duodenum. These fistulas did not close until the catheter was withdrawn. Our experience with octreotide is limited also. We have reported five patients with prolonged pancreatic fistulas after PCD in whom octreotide has been used. These were patients with fistulas for longer than 4 weeks. We noted that there was diminishment after 24 hours to 52% in the fistula output and found that all these fistulas eventually closed. We currently are looking, in a prospective fashion in patients managed with PCD, randomizing them to treatment with octreotide and treatment without.

As for the question regarding the value of the endoscopic retrograde cholangiopancreatography (ERCP), currently our approach is to evaluate the duct from the back side. We use the ERCP in cases of recurrence of pseudocysts or associated complications, biliary obstruction, pancreatic ascites, or other problems. Sinograms are used routinely in the follow-up of the patients with PCD, and all patients who have PCD have either a weekly CT scan or a sinogram. The sinogram has been very important in assessing patients who have been what could be called failures of PCD, in that they required subsequent operations. The problem that has been most common that we have identified are patients who do not have a dilated pancreatic duct but have a localized stricture at the genu of the pancreas.

I appreciate Dr. Hermann's comments. Again, he made reference to the long time period of this study. I think we should be clear to emphasize in this discussion that we really are comparing apples and oranges. These are dissimilar groups of patients. There are, however, many similarities

between apples and oranges. They are both round, both begin with a vowel, and both are fruits. And we have attempted to emphasize the similarities that we could between these two groups of patients. Dr. Hermann asked about the number of patients who have had acute pseudocysts. We have been uncomfortable about classifying these patients as acute or chronic pseudocysts. We believe that most of these patients are chronic pseudocysts. We pay particular attention to the study that Dr. Nealon reported here several years ago, involving nine of 24 patients whom they had initially identified as having acute pseudocyst related to acute pancreatitis. On evaluation with ERCP, they found that they had changes of chronic pancreatitis. So we believe that in most of our patients, these represent chronic pancreatitis. And then again, Dr. Hermann mentioned the question of staging of pancreatic pseudocyst. That may be a euphemism for failed PCD, but I think we should embrace this term. In particular, we have found that patients who have biliary obstruction, who are malnourished, or who are unfit for a major operative procedure may benefit from PCD as a temporizing measure.

Dr. Nealon asked a very important question about infection *versus* colonization. And if you review this subject in the radiologic literature, they will make the point that infection is really not a problem; they have a lot of colonization, however. We have been unable to distinguish the difference in these two characteristics, in that all patients who grew organisms eventually developed fever or leukocytosis. This is a very important aspect of this treatment and will require further study. We have found in an initial group of 28 patients that we reported that the infection rate we identified was only 28%. With improved surveillance techniques, however, which involves weekly cultures, the infection rate is really fairly high.

The question of pancreatic ascites is of interest. What we have identified in this group of patients are localized cysts in the region of the head and body of the pancreas, which we have drained percutaneously. And, in many surprising instances, we have achieved resolution of the pseudocyst. It is interesting that one of our recurrences and perhaps a failure of PCD was a patient with pancreatic ascites who presented 1 year after his initial PCD with a dilated pancreatic duct, also associated with biliary obstruction. And at that time, this patient underwent a lateral pancreaticojejunostomy (LPJ) with cyst incorporation and a biliary enteric anastomosis. The recurrences after PCD can be looked at in a number of fashions. One, you can look at it as failure of PCD, in that patients require a drainage procedure immediately after removal of the catheter. The other is the group of patients who present subsequently, and there have been two patients who have presented more than 1 year later with recurrences of their pseudocysts. The question of the longevity of patients who have internal drainage, and their duration of hospitalization, may relate to historical factors and to the fact that we have kept many of these patients in the hospital a lot longer in the past than we do now, and we also worked under that dictum that a 6-week period of maturation was needed before cyst enterostomy. Again, regarding the question of the ERCP in the evaluation of the pseudocyst: we have been very comfortable in assessing duct diameter with the CT scan. And in a patient who has a dilated duct on CT scan with a moderate-sized pseudocyst, we embark initially on the LPJ with cyst incorporation and do not use PCD in those patients. And, finally, with Dr. Harrington's question related to the cyst gastrostomy, when those are performed we do not bring out a drain through the gastrotomy. A closed suction drain is laid in the region of the pancreatic bed and brought out through a separate incision. The problem with intracystic hemorrhage also was mentioned. Over the past 27 years, there have been 14 patients who have presented with intracystic hemorrhage. There has been one death in that group. We believe that the improvement in the mortality rate in this group of patients has been related to the use of selective mesenteric angiography in both the diagnosis and the management of these patients. Thank you very much.