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## Discussion

DR. MARK A. MALANGONI (Cleveland, Ohio): Thank you, Dr. Nunn, Dr. Copeland, Members, and Guests. Our recent review of experience that is a similar period of time and a similar number of patients as Dr. Spencer and Dr. Pachter really come to same conclusions, and I think the key here is preservation of the spleen, either by operative or nonoperative means.

I note that the failure of most of the patients in our series were adults that had grade III and IV injuries, and I saw, as Dr. Spencer pointed out, that there was a real paucity of these patients in the nonoperatively managed group in the Bellevue series.

The other problem we found has been failures in patients who have co-existing injuries to the liver and the mesentery that are discovered at operation. And these patients, amazingly, at least at our center, present in stable condition, and so we choose to manage them nonoperatively because of the small degree of injury to their spleen. And they do turn out to need operations so we count those as failures.

The last observation I would make is that we have begun to use selective splenic artery embolization to improve our nonoperative salvage rate and have found in a small number of patients it does allow us to save these patients from operation without increasing their morbidity, but this is a very highly selective group. And I would add that our 77% overall salvage rate in managing splenic injuries is very similar to yours.

I'd like to ask the authors three questions. The first is, do you use splenic artery embolization in these patients? The second, can you provide us with some degree of injury severity scoring for this patient group? It's our experience and that of other institutions that infection following any type of injury is related to the overall degree of injury rather than to the degree of injury to a particular organ.

And, lastly, if you were faced with a patient who you found initially stable but had a CT scan that showed a grade IV injury and a large hemoperitoneum, would you take that patient to the operating room to attempt potential splenic salvage or manage that stable patient without operation?

Thank you for the opportunity to discuss the paper. [Applause]

DR. J. DAVID RICHARDSON (Louisville, Kentucky): We certainly agree about the use of nonoperative management, and their data were virtually identical to ours. I think the contrary point that I might make—and I realize this is a very old-fashioned, almost neolithic kind of approach—but I believe that the use of splenorrhaphy in adults has been greatly oversold through the years, while splenic salvage works very well in experienced hands, particularly in trauma centers where there is a cast of thousands, including residents, multiple attendings, trauma fellows, et cetera, who can review the patient frequently. I think we have created a mindset around the country that it's wrong to do anything else, and I think that's potentially dangerous in nontrauma centers, particularly if the solo practitioner in a rural community happened to blunder or stumble onto a ruptured spleen. It seems to me that perhaps the best he or she could do for that would be to remove it.

I think we should be very careful in looking at this paper and attributing any of the infectious complications to anything that has to do with immunology. For sure, if you review the manuscript, all of these patients who had infection — there were three subphrenics, two intraabdominal abscesses — all of them had either a hollow viscous or pancreatic injury, as I read the manuscript, so I don't think it's surprising that they might have in fact had an infection.

We have seen two cases that might have had — and I emphasize might have had — postsplenectomy overwhelming infections in the past 10 years at the University of Louisville. In a large trauma center, we see two or three patients a year, particularly who are transferred in from outlying institutions, who I think would have been greatly served by a simple straightforward extirpation of the spleen. So, I guess I'll close by saying it is all right to do a splenectomy, particularly in this age when most of those patients who can be treated by splenorrhaphy are probably going to be managed nonoperatively. Thank you.

DR. L. D. BRITT (Norfolk, Virginia): I want to commend the authors. Dr. Pachter and Dr. Spencer continue to lead the way as far as operable management of solid organ injuries. There is no

doubt that nonoperative management of the solid organs is here to stay and appropriately so. However, I also feel — and I agree with my discussants, that splenorrhaphy is also here to stay. In fact, these two approaches should be considered complementary. When there is a clear indication for operative intervention in a spleen that's injured, splenorrhaphy should obviously be considered unless the patient is hemodynamically labile and there are associated injuries.

When are patients who are managed nonoperatively allowed to resume contact sports or rigorous activity? Number two, is there a timetable and/or diagnostic modality that is pivotal for this decision?

Number three, you seem to place a great emphasis on CT scan grading; however, the literature, as you know, has reported some inaccuracies with this modality. Your comments.

And the fourth is a clinical question. A Jehovah Witness patient who is hemodynamically stable with a grade III splenic injury, what's the role of nonoperative management with that case?

Thank you. [Applause]

Dr Timothy C. Fabian (Memphis, Tennessee): Thank you, Dr. Nunn. The authors are to be commended. I think one of the most important components of their study is the fact that they demonstrated there was only a 2% failure rate of nonoperative management, which is certainly one of the best reported thus far.

Dr. Kim Davis reported our experience at the AST meeting in September of this year, and our nonoperative rate was similar, two-thirds of those 520 blunt trauma splenic injuries were managed nonoperatively. However, our failure rate was 6%, so I was a little chagrined when I reviewed this manuscript and found that ours was threefold higher.

However, analysis of both reports demonstrates some important differences between New York and Memphis, although I'll bet most of you didn't know there was much difference between Memphis and New York. But there really is a difference between the purely urban population *versus* the urban-rural referral pattern in Memphis.

There is a higher percent of high-speed accidents among the rural referral pattern. Our average ISS was 21 compared with 15 from New York. Seventeen percent of our injuries were grade IV and V *versus* 5% from New York.

The point I'm trying to make is I believe it is really important to recognize such injury pattern differences when analyzing and comparing data. Four percent of grades I through III failed in our experience *versus* 18% of grades IV and V. Similarly, 2 of 5 patients with grades IV and V injuries failed in the NYU series. Those observations point out the potential impact of selection bias when comparing different studies.

My only quibble with the report is that they recommend follow-up CT only if the patient's clinical status changes. In 1995 we found that two-thirds of our nonoperative management failures were due to CT evidence of "vascular blushes," which turned out to represent false aneurysms of splenic artery branches. These were eliminated as a source of failure, and we began routinely recognizing and angiographically embolizing them. However, a key point is that three-quarters of those showed up only on routine follow-up at 2 to 4 days when the patients were otherwise doing well. The reasons are probably related to lysis of thrombus, enlargement of pseudoaneurysm, and technical factors related to the CT scan itself.

We continue to observe at our institution routine follow-up of CT's in essentially all patients, those exceptions being the minor grade I trivial injuries.

I'd like to thank the authors for a fine contribution and the Association for allowing me to discuss this. [Applause]

Dr. J. Alex Haller, Jr. (Baltimore, Maryland): Dr. Nunn, Dr. Copeland, Members, and Guests. I, too, wish to compliment Dr. Pachter and his group on another superb presentation from Bellevue and the use of an eloquent presenter in Dr. Spencer. They have, for us, watched the evolution of the management of splenic injuries very carefully, again, emphasizing the importance of clinical research in the area of trauma and have shown us that the standard of care that we have used for more than 10 years in children, namely, nonoperative management of blunt injuries to the spleen, is appropriate also for selected adults.

I have for some time believed that adults were grown children. But it has taken a while for some of my colleagues who are taking care of younger adults to recognize that even though the forces may be sometimes different, the careful management of the patient will lead to the appropriate management, as has been shown nicely by this study.

There are a couple of things that concern me that were not in the abstract, and I would like to ask Dr. Pachter in closing: The abstract says that there were no enteric injuries that were missed. I'm assuming that that means there were some enteric injuries that were not missed. And one of the things that is of concern to us, and we presented our results before the Southern 2 years ago in a series of children treated similarly, was that we had no enteric injuries in that group of patients. But since then, in the last 3 years, we have had two 1 year and three this last year, children treated nonoperatively initially, who subsequently were shown to have ruptured viscera, specifically the small intestine. All of these were related, we believe, to seatbelt injuries, with the seatbelts being inappropriate in size for that particular child. I would like, therefore, Dr. Pachter, for you to address this worrisome potential complication, and whether you saw it, and how you managed it in this group of patients.

The final question I would like you to address is whether with this approach you believe that diagnostic peritoneal lavage is no longer useful. If you are going to use excellent CAT scanning, if you are going to treat the patients who are stable nonoperatively, what is the role of diagnostic peritoneal lavage (DPL)?

I enjoyed this evolutionary paper very much and appreciate the opportunity of discussing it. [Applause]

Dr. H. Leon Pachter (Closing Discussion): Vice President Nunn, Secretary Copeland. There are a 1000 questions here that I need to answer. Perhaps I can go in a retrograde fashion here and answer Alex Haller's first. In terms of the enteric injuries, what I meant is that in patients managed nonoperatively, we didn't miss any, and neither did Tim Fabian in his study. But I agree that this is a problem. A recent study that just came out in the October issue of *Surgery* from Dr. Powell in the Pittsburgh group, reported they missed three for 2.5 percent. And in the pediatric group that was described in the March 1996 *Annals of Surgery*, Dr. Bond and Eichelberger also missed two for 1%. So that's going to happen; it can't be zero, and we have to be on our toes.

I think we can get into a major debate on DPL. Suffice to say, we hardly use it anymore. Perhaps in a situation that we need to get someone up to the operating room in a hurry, we need just to see

if there is blood in the peritoneal cavity in someone who is similarly unstable and has a neurological injury.

Going to Dr. Britt's question about the contact sports, you know, everybody talks about this 6 months. It's like cancer, you know, you got 6 months to live. Pulmonary embolism, how long do you anticoagulate? For 6 months. Everything is 6 months. People quote 6 months for a time to going back to active sports, but there is no scientific data to support that. In fact, the work by Scott Bochavski in the lab anyway clearly shows that the wound-bursting strength, both in the liver and the spleen, which is a result of a dense fibroblastic reaction in the parenchyma, that the organ such as the spleen, the wound-bursting strength at 6 to 8 weeks is as strong if not stronger than the original organ. Therefore, I think 8 weeks should be it, but I would get a CAT scan beforehand, just to make sure that the injury has resolved.

In terms of CT grading, I agree, although statistically, the higher grade you go up the greater the chance of failure. But, you definitely cannot predict success or failure based on CT. In terms of the Jehovah's Witness with a grade III treated nonoperatively, I would go ahead and manage that patient nonoperatively. And I might answer one of the questions from Mark Malangoni on that grade IV who is stable, I think currently I would go ahead and do an angiogram, as advocated by Sal Scalfani, and if there is no extravasation, then I think I would go ahead and manage that patient nonoperatively.

J. D. Richardson, I certainly agree that in a nontrauma center splenectomy is certainly an acceptable if not preferable approach. In our own hands, as you noted, we had 143 splenorrhaphies with only 3 failures, and I think that that should be done if you know how to do it. But, nevertheless, splenectomy is okay.

In terms of infection, certainly, we cannot attribute that to splenectomy. Those were all associated injuries, enteric injuries, pancreatic injuries, although the risk of infection if long-term. The overwhelming postsplenectomy sepsis, it's rare, perhaps in adults maximum .2%, but unfortunately we have had three cases and it has been a sobering experience.

Tim, I heard that paper in Hawaii, and I must say that I was taken aback by the fact that 75% of the blushes occurred not originally, not on the first CT scan, but the one that was done 2 to 4 days later, and that is of some concern. And I think that more work needs to be done in that area before we routinely advocate it. Because in the first 3 years of our series, we did that, and we didn't find it useful. And now we have abandoned it, and it's hard to go back, especially in light of cost saving and administrators down your back. But nevertheless, this angio embolization for a blush is a major advance. And if I might just have that one discussion slide, closing slide.

This is one of our failures, and as you see here, these are the vessels. But here is a blush and here is blood. I didn't recognize the significance of this.

Our next slide.

And this is a lower cut, and this is what we are talking about, this vascular blush. This patient went on failure from nonoperative management, but if I had been smart enough, I would have gone ahead and angioed that patient, if the patient was hemodynamically stable, with the idea of embolizing that lesion.

Mark Malangoni, you know, we manage patients both with splenic and with liver injuries nonoperatively. I think I have just answered your question in regard to angio embolization. The success rate that we had, 98%, I would submit, Tim, that that's not too different than yours. Sal Scalfani who reported his data in the *Journal of Trauma* in November of 1995, had a 97% success rate. Smith and Pete Muka, reported in *Surgery* October 1996, also had a 97% success rate. So I think that that's in the same ballpark.

ISS, I think Tim answered that for me. Our mean ISS was 15 and, clearly, you are seeing patients in Tennessee that we do not see. And what you have and what we don't have is Elvis Presley.

In terms of splenorrhaphy or splenic preservation, you know, we have gone away from splenectomy because of the lifelong risk of septic complications. That's for real. It may be small but, nevertheless, it's for real, and I would only say to you, J. D., is what King Lear said. "Give her a child of spleen so that she might live." Thank you very much. [Applause]