

junior resident anxiety. In addition, LA has been primarily performed on one of three general surgery services, allowing experience with open techniques to be gained on the other two services.

We have noted several pitfalls and difficulties in laparoscopic appendectomy:

1. If the patient is positioned on the operating table with the arms outstretched, it will be difficult for the first assistant and camera operator to stand comfortably. The arms should be tucked at the patient's side.
2. Placement of the trocars too close together will make it difficult for the surgeon and first assistant to work together without interference. This is most likely to be a problem in the small, slender patient.
3. Troublesome bleeding can result if trocars are placed through the rectus muscle or inferior epigastric vessels. Avoid this by placing trocars lateral to the edge of the rectus sheath.
4. If the appendix is extremely mobile, it may be pulled into the upper abdomen by the first assistant. This change of field makes eye-hand coordination difficult for the surgeon and decreases the space available for operating. It also forces the camera operator to move toward the foot of the table, crowding the surgeon. This can be recognized by noting the direction in which the laparoscope is pointing. The laparoscope should point into the right lower quadrant. This is easily corrected by pulling the appendix back down into the lower abdomen.
5. A very long appendix may be difficult to retract because the grasper holding the appendix is pushed up against the underside of the abdominal wall. Such an appendix must be regrasped closer to the base, and the tip allowed to dangle, so that the base of the appendix at the cecum can be accurately identified.

In summary, we believe that laparoscopic appendectomy can be safely performed within the context of a training program. Surgical chief residents who are experienced in the techniques of operative laparoscopy, including laparoscopic cholecystectomy, can perform the procedure with the assistance of an experienced attending surgeon. Diagnostic accuracy is excellent and postoperative complications are acceptable. In particular, wound infection rates may be lower in LA.^{15,19} Operative time will probably remain higher than that required for open appendectomy, and postoperative stay, largely determined by length of antibiotic treatment, is comparable.

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DISCUSSION

DR. THOMAS R. GADACZ (Augusta, Georgia): Dr. Ochsner, Dr. Jones, it is a pleasure to discuss Dr. Scott-Conner's paper on laparoscopic appendectomy, and I appreciate a copy of the manuscript. We have had

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experience with this procedure, but I would like to limit my comments to her paper.

I have two technical and a few general questions. You used four cannulas for the procedure. How important was the right axillary cannula and did it help with exposure? The second technical question is the

method of extracting the appendix. We prefer to extract, particularly the large, gangrenous appendix, from the abdomen in a latex bag to prevent contamination of the cannula track, especially if it does not fit in the cannula. Please comment on methods to remove the appendix to prevent wound infection.

The three general questions I have are: What is the role of laparoscopic appendectomy, particularly in children? In this group, it may be better to perform a standard appendectomy, particularly when the diagnosis is much more certain and the time to perform the procedure much less. Would diagnostic laparoscopy be indicated in patients with lower abdominal pain at an earlier stage of the disease, thus decreasing the period of observation? And the final question is, how would the availability of laparoscopy influence your use of computed tomography to diagnose lower abdominal pain? I enjoyed the presentation and congratulate you on a good study.

DR. LESTER WILLIAMS (Nashville, Tennessee): Dr. Ochsner, Dr. Jones, Members, Ladies, and Guests, I asked to discuss this because our experience at Vanderbilt and St. Thomas has been exactly the same as that presented. But I really wanted to ask the question that we now get regularly in our teaching conferences. We almost never discuss the technique or this week's gadget with respect to laparoscopic appendectomy, but want to know what should we do and when should we do it. We cannot come to consensus if diagnostic laparoscopy has been done for apparent appendicitis and the appendix is normal; should we stop or should the appendectomy be continued? There are some data that suggest we should stop. And, in fact, the British have a well-done series in which they now suggest that every woman of childbearing age who is being operated on for appendicitis should routinely have diagnostic laparoscopy and, if they do not find appendicitis, should have nothing further done. Would you suggest that these are reasonable points of view now that we know the procedure can be done, can be done safely, and probably can be done in most patients for whom appendectomy is appropriate? Thank you.

PRESIDENT OCHSNER: Dr. Scott-Conner, would you close, please? And I would like to ask you a question. Why not use an antibiotic bacteriocidal solution, because you are obviously contaminating that area of the stomach?

DR. CAROL E. H. SCOTT-CONNER: (Closing discussion): I think that is an excellent question, and I would like to address that first. Perhaps we were acting as purists and following the dictum that intravenous antibiotics timed properly are as effective or perhaps more effective than local antibiotics in prevention of the major morbidity, which is wound infection. I do not think that there is any harm in adding antibiotics to the irrigation solution. Many people do this routinely in the performance of laparoscopic cholecystectomy. We have tried to keep the procedure as simple as possible. Most of these were done after midnight with an

inexperienced operative crew who did not know how to use the equipment. And so we gave intravenous antibiotics and relied on this alone.

Dr. Gadacz, we used four cannulas as a sort of security blanket for the attending surgeon. This gives the attending the maximum control over the procedure and allows that person to manipulate the appendix and the cecum to provide optimum visualization of the mesentery. This allows the procedure to be done even for the first time by a relatively inexperienced resident with minimal technical complications during the performance of the procedure. There is no question that it can be done with fewer than four cannulas, and probably most surgeons in practice around the country who take up this technique will choose to do it with three and use a two-handed technique by the operative surgeon. We did it simply for security and because it may be easier for us to expose the appendix. The use of a rubber bag to contain the appendix and minimize contamination is an excellent technique and one that we will undoubtedly employ in the future. It had not been described when we began this study, and so we struggled to deliver some of these large and inflamed appendices through first a 10-mm, and then as they became available, the 11- and 12-mm trocars. Most appendices will fit within a 12-mm trocar. The problem that we have had is that the overzealous resident will then try to remove the appendix through the trocar rather than simply withdrawing it into the trocar and removing trocar and appendix together through the abdominal wall. I think the latex bag is going to make this procedure a lot safer and minimize fascial contamination, particularly in the gangrenous appendix.

As far as the pediatric age group, I would be extremely conservative in applying this technique to children. Particularly in very small children in whom the abdominal cavity is small and the diagnosis is certain, appendectomy is a very short and safe procedure done through an incision that can be covered by a single band aid in many cases. In the chunky, muscular adolescent, however, particularly one who is active in college or high school athletics and in whom a wound infection can be a devastating problem, I think that laparoscopic appendectomy may have something to offer.

As far as laparoscopy and the timing of laparoscopy and whether it should be done earlier or whether it should be done in all women of childbearing age, we have not altered our indications for doing appendectomy so far. We have tried to adhere to the same guidelines that we would use during open surgery. We do think that there may be a role for earlier laparoscopy, particularly in women of childbearing age, in whom the rate of negative appendix is high. The stakes are also high in these women, as it has been shown that the sequelae of a perforated appendicitis may be fertility problems down the road. At this point, because we are uncertain of our laparoscopic diagnostic capability in the plus-minus appendix, we go ahead and remove the appendix. This is what we would do during open surgery. We believe that because the patient has gone through general anesthesia, and because we are not always sure whether it is minimally inflamed or a true cold appendix, we go ahead and remove it. What the complications will be of these true negative appendices and whether this procedure is justified remains to be determined. I thank the Association and I thank the discussants for their many thoughtful comments.