

Autologous Tissue Reconstruction of Ventral Hernias in Morbidly Obese Patients

Edward I. Chang, MD; Robert D. Foster, MD; Scott L. Hansen, MD; Lila Jazayeri, BS; Marco G. Patti, MD

Hypothesis: Separation of components is a safe and effective technique for abdominal wall reconstruction in morbidly obese patients.

Design: Review of a prospectively accumulated database.

Setting: University tertiary care medical center.

Patients: Thirty morbidly obese patients who underwent ventral hernia repair using the separation of components technique between August 1, 2001, and August 31, 2005.

Intervention: Ventral hernia repair using the separation of components technique.

Main Outcome Measures: Postoperative complications and hernia recurrence.

Results: Thirty morbidly obese patients (mean body mass index [calculated as weight in kilograms divided by height in meters squared], 61; range, 35-93) underwent ventral hernia repair by the separation of components technique (mean width of defect, 12.8 cm; mean length,

17.6 cm). Twenty-five patients (83%) had comorbidities. Twelve (40%) had undergone previous repairs (9 had undergone multiple repairs; mean, 2.4 repairs per patient; range, 2-4 repairs) and 6 (20%) had infected mesh. Sixteen patients (53%) underwent simultaneous panniculectomies and 6 (20%) underwent simultaneous bariatric procedures (Roux-en-Y gastric bypass). Postoperatively, cellulitis developed in 2 patients (7%), which was treated with antibiotics; wound infections occurred in 2 patients (7%), which were managed with local wound care; and a seroma developed in 1 patient (3%), which resolved spontaneously. The lone recurrent hernia (3%) was repaired with mesh. The mean length of follow-up was 44 months.

Conclusions: These results show that (1) separation of components is a safe and effective technique for repairing primary and recurrent ventral hernias in morbidly obese patients; (2) performance of a simultaneous panniculectomy or bariatric procedure does not affect the outcome; and (3) comorbidities do not compromise the results.

Arch Surg. 2007;142(8):746-751

Author Affiliations: Divisions of Plastic and Reconstructive Surgery (Drs Chang, Foster, and Hansen and Ms Jazayeri) and General Surgery (Dr Patti), Department of Surgery, University of California, San Francisco.

VENTRAL HERNIA REPAIR IS one of the more common operations performed by general surgeons.¹ Ten percent of laparotomies are followed by a ventral hernia, which means that approximately 150 000 new incisional hernias occur annually in the United States.² The technique of ventral hernia repair has changed substantially over the past 20 years. Because of a high recurrence rate (40%), primary suture repair has given way to mesh repair (recurrence rate for mesh repair, 20%).³ Laparoscopic repairs (recurrence rate, 4%-11%) are even better, and patients experience less postoperative pain and have a faster recovery.⁴⁻⁶

Ventral hernias are especially common following laparotomies in morbidly obese patients (occurring in 40% of cases).^{7,8} As a group, obese patients are even more prone to postoperative hernia formation than are patients taking corticosteroids.⁹ Intra-abdominal pressure is greater by a factor of 2 or 3 in morbidly obese individuals,¹⁰ and wound infections are also more frequent.⁷ Achieving a satisfactory repair in such patients is challenging because of their size and propensity for comorbid conditions. A popular strategy is to delay hernia surgery until the obese patient loses weight, but this is a slow process. Laparoscopic repairs are difficult, particularly when previous surgical

procedures have produced severe adhesions.¹¹ An overlooked enterotomy can be catastrophic. Furthermore, the presence of infection or concomitant bowel surgery precludes the use of mesh.

In 1990, Ramirez and colleagues¹² developed a novel operation for reconstructing abdominal wall defects, which they called the *separation of components technique*. In effect, the separation of components technique expands the muscular abdominal wall surface by medial advancement of an innervated composite of muscle and fascia, which allows the rectus abdominis muscles to be reapproximated in the midline without tension. The technique does not use mesh and is associated with a low recurrence rate (approximately 10%).¹³⁻¹⁸

Our aims were to determine in morbidly obese patients: (1) the technique of ventral hernia repair using separation of components only; (2) whether it is reasonable to use this approach in association with panniculectomy and a Roux-en-Y gastric bypass; and (3) the long-term outcome of the repair.

METHODS

We analyzed the data from all morbidly obese patients (having a body mass index [BMI] [calculated as weight in kilograms divided by height in meters squared] ≥ 35) who underwent ventral hernia repairs by the separation of components technique at the University of California, San Francisco, a university tertiary care medical center, between August 1, 2001, and August 31, 2005. After institutional review board approval, information regarding initial presentation, comorbidities, and previous surgical procedures was extracted from the database and studied. The number and type of previous incisional hernia procedures were obtained from operative reports. Patients were excluded from the study for the following reasons: (1) if synthetic or biodegradable mesh was used during the repair; (2) if they required emergent closure of the abdominal wall; (3) if they had sustained significant abdominal tissue loss, such as from trauma or tumor resection; and (4) if the follow-up was shorter than 12 months.

Thirty patients met the inclusion criteria (25 women [83%] and 5 men [17%]; mean age, 47 years; range, 28-77 years). Comorbid conditions, which were present in 25 patients (83%), included hypertension in 11 patients (37%), diabetes mellitus in 9 (30%), sleep apnea in 6 (20%), gastroesophageal reflux disease in 6 (20%), asthma in 6 (20%), hypothyroidism in 4 (13%), atrial fibrillation in 3 (10%), congestive heart failure in 2 (7%), hypercholesterolemia in 2 (7%), endometrial cancer in 1 (3%), and Hodgkin lymphoma in 1 (3%). The mean BMI was 61 (range, 35-93). Twelve patients (40%) had undergone a previous ventral hernia repair (including 9 patients who had undergone multiple repairs; mean, 2.4 repairs per patient; range, 2-4 repairs). Mesh was present in 8 patients and it was infected in 6 of them. Five of these 8 patients (62%) had an enterocutaneous fistula. Preoperatively, 20 patients (67%) had undergone abdominal computed tomography to better characterize the hernia.

Six ventral hernias, 8 umbilical hernias, and 16 incisional hernias were repaired in the 30 patients. Nine of the incisional hernias resulted from a previous open Roux-en-Y gastric bypass, 3 from open cholecystectomies, 2 from colectomies, 1 from an open splenectomy, and 1 from an exploratory laparotomy. The hernia size was assessed in the operating room immediately after the incision. The mean width of the defect was 12.8 cm (range, 3-55 cm) and the mean length was 17.6 cm (range,

3-50 cm). Six small-bowel resections were performed: 5 for enterocutaneous fistulas, and 1 for severe small-bowel damage that occurred during lysis of adhesions. Six patients underwent simultaneous Roux-en-Y gastric bypass procedures and 16 underwent simultaneous panniculectomies (mean weight of the pannus, 5.6 kg; range, 1.7-10.9 kg).

SURGICAL TECHNIQUE

Informed consent was obtained from the patients, and the risks and benefits of the procedures were explained in detail. The surgical procedures were performed with the patient under general endotracheal anesthesia, and epidural catheters were routinely placed at the T8 to T10 level. Sequential compression devices were applied to the lower extremities, and subcutaneous heparin sodium, 5000 U, was administered before making the incision. Postoperatively, the patients were admitted to the postanesthesia care unit or the intensive care unit depending on their clinical status, the complexity of the procedure, and their comorbid conditions.

The general surgeon (M.G.P.) performed the operative exposure, lysis of adhesions, bariatric procedure, takedown of enterocutaneous fistulas, bowel resection, and exposure of the anterior abdominal wall. Subsequently, a plastic surgeon (R.D.F.) performed the panniculectomy and repaired the hernia according to the separation of components and rectus advancement technique. The key technical aspects were as follows: after the overlying skin was elevated, the external oblique aponeurosis on either side of the abdomen was released from its insertion into the lateral border of the rectus sheath and separated from the internal oblique muscle.¹⁹ The rectus abdominis muscles were advanced and approximated in the midline using figure-of-8 sutures of No. 1 nylon. The skin was closed with 3-0 absorbable, interrupted dermal sutures, followed by a running subcuticular suture of a synthetic 4-0 suture material. Drains were routinely left in the subcutaneous space. First-generation cephalosporins were administered until the drains were removed.

FOLLOW-UP

The patients were seen in the general surgery and plastic surgery clinics every other week for the first 2 months and then at 3-month intervals. All patients were interviewed before submitting the data for this study. The mean follow-up time was 44 months (range, 13-66 months).

RESULTS

There were no intraoperative complications. The mean length of the operation was 348 minutes (range, 150-564 minutes) and the mean blood loss was 65 mL (range, 30-300 mL). Five patients with asthma and severe sleep apnea were placed in the intensive care unit (range, 1-3 days) following the operation. The mean hospital stay was 6.6 days (range, 4-11 days).

Postoperative complications occurred in 5 of the 30 patients (17%): cellulitis developed in 2 patients (7%) and was successfully treated with antibiotics, wound infections developed in 2 patients (7%) and were treated with local wound care, and a seroma developed in 1 patient (3%) and resolved spontaneously. A hernia recurred in 1 patient (3%) 14 months after the surgical procedure. This patient had severe comorbidities (gastroesophageal reflux disease, asthma, sleep apnea, diabetes mellitus, and hypertension), had undergone 4 previous ventral hernia

repairs with mesh, and had a huge abdominal wall defect. At the time of the current hernia procedure, she also underwent a Roux-en-Y gastric bypass. The hernia was repaired once more with mesh and was intact 42 months after surgery.

COMMENT

These results show that (1) the separation of components technique is safe and effective for repairing primary and recurrent ventral hernias in morbidly obese patients; (2) a panniculectomy or Roux-en-Y gastric bypass performed in conjunction with the hernia repair does not increase the morbidity or the hernia recurrence rate; and (3) comorbidities such as diabetes mellitus, hypertension, and infection do not affect the outcome.

To our knowledge, this is the first report on the use of the separation of components technique for ventral hernia repair in a cohort of morbidly obese patients. The average BMI of our patients was 61, which means that they are among the most challenging patients with abdominal wall hernias surgeons will face. Forty percent of them had undergone a previous repair (often with mesh), and infection and an enterocutaneous fistula were frequently present. Because of infection or the need for a bariatric procedure, mesh could not have been used in 12 of the 30 patients (40%). A laparoscopic approach was contraindicated in an additional 9 patients (30%) because of the presence of extensive adhesions. Thus, the separation of components technique was applicable and successful in situations where other methods often fail.

The use of rectus abdominis muscle for abdominal wall reconstruction was first described by Mathes and Bostwick¹⁹ in 1977 and was subsequently popularized by Ramirez and coworkers¹² after their 1990 description of the separation of components technique. Many studies have shown that this operation is safe and effective for reconstructing complex abdominal wall defects, with recurrence rates of approximately 10%.¹³⁻¹⁸ Among our patients, 5 (17%) had postoperative complications, which were all easily treated, and only 1 hernia (3%) recurred.

These good results required a team approach whereby each case was discussed preoperatively by a group that included plastic surgeons, general surgeons, and anesthesiologists. An experienced general surgeon performed the exploratory laparotomy and lysis of adhesions, which is the best way to avoid enterotomies.²⁰ Switching the teams did not add time to the procedure. The panniculectomy and the separation of components aspects were performed by the plastic surgeon. Although we recognize that a plastic surgeon, versatile in both plastic and abdominal surgery, probably could perform the entire procedure safely, this is not the usual protocol at our institution. We took steps to prevent deep vein thrombosis, epidural infusions were used to control postoperative pain, and high-risk patients were cared for in the intensive care unit.

We learned several lessons from this experience. First, the decision to repair a hernia and the technique used should not be based solely on the patient's BMI. Second, the considerations in choosing a method of repair for large

hernias are the same for obese and nonobese patients. Third, autologous tissue techniques are particularly useful in patients with infected mesh, contaminated wounds, or hernias larger than 15 cm in diameter. Hernias larger than 15 cm may require mesh in addition to rectus release. Primary repairs without mesh are rarely appropriate. Even in small defects, the tissue surrounding the defect may be weak, requiring that sutures be placed too far beyond the edges of the hernia. In such cases, a components release is indicated for at least 1 side.

CONCOMITANT PROCEDURES

Six small-bowel resections, 6 Roux-en-Y gastric bypasses, and 16 panniculectomies were performed along with the ventral hernia repair. The results show that such concomitant procedures can be done safely, which obviates the need for an additional procedure. In 12 patients (40%), the ventral hernia repair would have been delayed if these requisite intestinal procedures had been done first. This approach decreased the risk for complications, such as small-bowel incarceration and strangulation.²¹ For example, Eid and colleagues²¹ showed that, when the treatment of a ventral hernia was deferred at the time of a bariatric operation, small-bowel incarceration requiring emergent surgery occurred in approximately one-third of patients.

We found that a panniculectomy could be performed safely in conjunction with the ventral hernia repair and other procedures. Sixteen patients (53%) underwent extensive panniculectomies (mean weight of the removed pannus, 5.6 kg), and they all did well. The complications were limited to 5 patients who had minor wound complications, such as wound cellulitis or infection, which were managed without readmitting the patient. Finally, comorbid conditions did not impair the operative results.

ROLE OF THE SEPARATION OF COMPONENTS TECHNIQUE IN VENTRAL HERNIA REPAIR

A recent large, population-based study²² on the surgical treatment of ventral hernias between 1987 and 1999 showed that the use of mesh, which almost doubled (from 34%-65%) during the study period, decreased the recurrence rate by 24%. During the latter years of the study, laparoscopic repairs, with their improved results, came into widespread use. Nevertheless, of 10 822 patients who underwent incisional hernia repairs between 1987 and 1999, the 5-year reoperation rate was 24% after the first operation, 35% after the second, and 39% after the third, and the results did not improve during the study period. The type of hospital where the surgical procedure was performed (rural vs urban, profit vs nonprofit, and teaching vs nonteaching) did not affect the outcome. The authors were at a loss to explain the absence of progress, but the major point was clear: ventral hernias are a source of substantial morbidity and expenditures.

In summary, we believe that the overall surgical strategy for treating ventral hernias should be as follows:

- Primary suture repairs should be abandoned in favor of those involving mesh.³

• When adequate expertise is available, the repair should be performed laparoscopically. Evidence shows that recurrences and overall morbidity are optimal with laparoscopic repairs.^{4-6,11,21}

• The separation of components technique is particularly appropriate when infection is present or when concomitant bowel surgery is indicated. It is also the technique of choice for abdominal wall hernias that have recurred several times.²³ A team approach that includes a general and a plastic surgeon working together offers the best chance for success.

Accepted for Publication: March 28, 2007.

Correspondence: Marco G. Patti, MD, Department of Surgery, University of California, San Francisco, 521 Parnassus Ave, Room C-341, San Francisco, CA 94143 (pattim@surgery.ucsf.edu).

Author Contributions: *Study concept and design:* Foster, Hansen, and Patti. *Acquisition of data:* Chang, Jazayeri, and Patti. *Analysis and interpretation of data:* Chang and Patti. *Drafting of the manuscript:* Chang, Hansen, Jazayeri, and Patti. *Critical revision of the manuscript for important intellectual content:* Foster and Patti. *Statistical analysis:* Chang and Jazayeri. *Study supervision:* Foster and Patti. **Financial Disclosure:** None reported.

Previous Presentation: This paper was presented at the 78th Annual Meeting of the Pacific Coast Surgical Association; February 18, 2007; Kohala Coast, Hawaii; and is published after peer review and revision. The discussions that follow this article are based on the originally submitted manuscript and not the revised manuscript.

REFERENCES

1. Mudge M, Hughes LE. Incisional hernia: a 10 year prospective study of incidence and attitudes. *Br J Surg.* 1985;72(1):70-71.
2. Popovic JR, Hall MJ. 1999 National hospital discharge survey. *Adv Data.* 2001; (319):1-20.
3. Luijendijk RW, Hop WCJ, van den Tol MP, et al. A comparison of suture repair with mesh repair for incisional hernia. *N Engl J Med.* 2000;343(6): 392-398.
4. Park A, Birch DW, Lovrics P. Laparoscopic and open incisional hernia repair: a comparison study. *Surgery.* 1998;124(4):816-822.
5. Heniford BT, Park A, Ramshaw BJ, Voeller G. Laparoscopic repair of ventral hernias: nine years' experience with 850 consecutive hernias. *Ann Surg.* 2003; 238(3):391-400.
6. Pierce RA, Spittler JA, Frisella MM, Matthews BD, Brunt LM. Pooled data analysis of laparoscopic vs. open ventral hernia repair: 14 years of patient data accrual. *Surg Endosc.* 2007;21(3):378-386.
7. Puziferrri N, Austrheim-Smith IT, Wolfe BM, Wilson SE, Nguyen NT. Three-year follow-up of a prospective randomized trial comparing laparoscopic versus open gastric bypass. *Ann Surg.* 2006;243(2):181-188.
8. Strzelczyk JM, Szymanski D, Nowicki ME, Wilczynski W, Gaszynski T, Czupryniak L. Randomized clinical trial of postoperative hernia prophylaxis in open bariatric surgery. *Br J Surg.* 2006;93(11):1347-1350.
9. Sugerman HJ, Kellum JM Jr, Reines HD, DeMaria EJ, Newsome HH, Lowry JW. Greater risk of incisional hernia with morbidly obese than steroid-dependent patients and low recurrence with prefascial polypropylene mesh. *Am J Surg.* 1996; 171(1):80-84.
10. Nguyen NT, Lee SL, Anderson JT, Palmer LS, Canet F, Wolfe BM. Evaluation of intra-abdominal pressure after laparoscopic and open gastric bypass. *Obes Surg.* 2001;11(1):40-45.
11. Novitsky YW, Cobb WS, Kercher KW, Matthews BD, Sing RF, Heniford BT. Laparoscopic ventral hernia repair in obese patients: a new standard of care. *Arch Surg.* 2006;141(1):57-61.
12. Ramirez OM, Ruas E, Dellon AL. "Components separation" method for closure

of abdominal-wall defects: an anatomic and clinical study. *Plast Reconstr Surg.* 1990;86(3):519-526.

13. DiBello JN Jr, Moore JH Jr. Sliding myofascial flap of the rectus abdominus muscles for the closure of recurrent ventral hernias. *Plast Reconstr Surg.* 1996;98(3): 464-469.
14. Giroto JA, Ko MJ, Redett R, Muehlberger T, Talamini M, Chang B. Closure of chronic abdominal wall defects: a long-term evaluation of the components separation method. *Ann Plast Surg.* 1999;42(4):385-394.
15. Shestak KC, Edington HJ, Johnson RR. The separation of components technique for the reconstruction of massive midline abdominal wall defects: anatomy, surgical technique, applications, and limitations revisited. *Plast Reconstr Surg.* 2000;105(2):731-738.
16. Mathes SJ, Steinwald PM, Foster R, Hoffman WY, Anthony JP. Complex abdominal wall reconstruction: a comparison of flap and mesh closure. *Ann Surg.* 2000;232(4):586-596.
17. Reid RR, Dumanian GA. Panniculectomy and separation-of-parts hernia repair: a solution for the large infraumbilical hernia in the obese patient. *Plast Reconstr Surg.* 2005;116(4):1006-1012.
18. Gonzalez R, Rehnke RD, Ramaswamy A, Smith CD, Clarke JM, Ramshaw BJ. Components separation technique and laparoscopic approach: a review of two evolving strategies for ventral hernia repair. *Am Surg.* 2005;71(7):598-605.
19. Mathes SJ, Bostwick J III. A rectus abdominis myocutaneous flap to reconstruct abdominal wall defects. *Br J Plast Surg.* 1977;30(4):282-283.
20. Lowe JB III, Lowe JB, Baty JD, Garza JR. Risks associated with "components separation" for closure of complex abdominal wall defects. *Plast Reconstr Surg.* 2003;111(3):1276-1283.
21. Eid GM, Mattar SG, Hamad G, et al. Repair of ventral hernias in morbidly obese patients undergoing laparoscopic gastric bypass should not be deferred [published correction appears in *Surg Endosc.* 2004;18(2):355]. *Surg Endosc.* 2004; 18(2):207-210.
22. Flum DR, Horvath K, Koepsell T. Have outcomes of incisional hernia repair improved with time? a population-based analysis. *Ann Surg.* 2003;237(1):129-135.
23. Giroto JA, Chiamonte M, Menon NG, et al. Recalcitrant abdominal wall hernias: long-term superiority of autologous tissue repair. *Plast Reconstr Surg.* 2003; 112(1):106-114.

DISCUSSION

William Schecter, MD, San Francisco, California: This remarkable series of 30 morbidly obese patients with an average BMI of 61 who were treated with the separation of parts technique for ventral herniorrhaphy, with a 3% hernia recurrence rate and only 5 relatively minor wound complications, speaks to the skill of Drs Patti and Foster and their team. These patients had all the usual comorbidities of the morbidly obese, yet only 5 required postoperative intensive care, none for more than 3 days, a testimony to the skill of the anesthesiologists. These were complex cases. Forty percent of the patients had recurrent hernias, 5 patients had enterocutaneous fistulas associated with a previous mesh abdominoplasty, 6 had concomitant bowel resection, an additional 6 had Roux-en-Y gastric bypass procedures, and 16 had concomitant panniculectomy, yet the average blood loss was only 65 mL, a truly remarkable accomplishment.

I have a number of questions for the authors regarding their technique to help all of us improve our results. First, your patients had a remarkably benign postoperative course, despite their high risk. One of them had a BMI of 93. Do you have any exclusion criteria for these patients?

Dr Patti: We excluded from this study patients with loss of abdominal wall due to tumor or trauma, patients who had a follow-up of less than 12 months, and patients in whom closure of the abdominal wall was done in an emergency situation like a trauma case. Otherwise, these were consecutive patients.

Dr Schecter: Second question: 5 of the 8 patients with mesh abdominoplasty had enterocutaneous fistulas, yet mesh abdominoplasty is now standard treatment for most ventral hernias. Did you learn anything about the placement of the mesh from these patients that might help us to avoid fistulas when repairing hernias with mesh in the future?

Dr Patti: A mesh repair should be the primary form of repair. However, when a hernia has recurred a couple of times, there is not enough omentum that can be interposed between the bowel and the mesh. This is one of the reasons some patients develop an enterocutaneous fistula. In these patients, the separation of components technique should be chosen.

Dr Schechter: Third question: there has been 1 report of a hernia occurring laterally at the point where the rectus sheath has been separated from the external and internal oblique fascia to allow medial advancement of the rectus myofascial unit. Do you think this is a real problem? Should we consider any prophylactic reinforcement of this potential abdominal wall weakness when employing this technique?

Dr Patti: It is a potential problem. However, the incidence is extremely low, so we don't prophylactically add mesh laterally.

Dr Schechter: Fourth question: I was very impressed by your low wound infection rates in these very obese patients. Do you have any tricks for handling the wound, preventing fat desiccation, or other maneuvers that can help the rest of us achieve these excellent results with these difficult patients?

Dr Patti: These results came from a lot of attention to details. As you mentioned, the anesthesiologist plays a very important role in these operations. Patients were monitored by using both an arterial line and a central line, and the urine output was kept at a pretty high level. The panniculectomy actually can help decrease the incidence of wound infection because the parts that are exposed to this risk are the flaps, which you have to elevate to get to the linea semilunaris. Removing the fat that has been desiccated and has poor blood supply helps decrease the incidence of wound infection. We always leave drains in the subcutaneous tissue, and antibiotics are routinely used.

Dr Schechter: My last question: I have had some experience using acellular dermal matrix in place of mesh rather than the separation of parts technique in repair of complex hernias with fistulas, infected wounds, or significant enteric contamination. There is also some literature to support this approach. It's hard to argue with your excellent results. Have you used acellular dermal matrix? If so, under what circumstances would you use this technique?

Dr Patti: We do not have any experience with the acellular dermal matrix.

Julie A. Freischlag, MD, Baltimore, Maryland: You probably are wondering what I am doing up here asking a question about this paper. I have my administrator's hat on now as I have a group that does these large hernias at Hopkins as well, and we are having a major problem getting paid for these procedures. We have a very funny state; we are a rate-controlled state. However, when we have tried to get these cases to be excluded so that the surgeons actually would get a professional fee that was warranted by the extent of the procedure, we have had no success. The hospital fees are fine; they will pay for the hospital stay, except for 2 of the groups that think these can be done as outpatients, but we have been a little successful telling them they can't. I have my California experience to know how to negotiate that but, regarding your professional fees, are you getting them appropriately paid and have you had to negotiate that? Are there things that you could do to help those of us in states far away from here to be able to get better professional fees for our surgeons?

Dr Patti: The plastic surgeon and I have routinely billed as cosurgeons, and reimbursement has not been a problem.

Samuel Eric Wilson, MD, Orange, California: I certainly agree with you that this is the preferable technique for closure of the abdominal wall, especially after total removal of the infected mesh, but, given your excellent early and late results in the most difficult of hernias, why shouldn't this technique be

used primarily instead of routine placement of mesh? After all, many of your patients suffered from complications of a failed mesh repair. My last question is with regard to a personal observation. One of my patients suffered a bothersome lateral abdominal wall neuralgia after such a repair. I thought it may have been due to trauma to a subcostal nerve in the area of the external oblique muscle. Have you seen that in any of your 30 patients?

Dr Patti: Let me answer the easy question first. We have not seen that problem. I am grateful for your question because I don't want to leave you with the impression that we consider this the primary form of repair in every patient with a hernia. I think that the primary suture repair should be abandoned because it has a very high incidence of recurrence. I think that the best way to treat a patient is by the laparoscopic approach, which allows a shorter hospital stay, less discomfort, and a faster recovery. In most of our patients, however, a laparoscopic approach was not indicated. Some had infected mesh, some had enterocutaneous fistulas, and many of them had a concomitant procedure such as a Roux-en-Y gastric bypass or a bowel resection. In addition, a laparoscopic approach requires adequate expertise, as a missed enterotomy can have catastrophic sequelae and there are patients who have died after a laparoscopic ventral hernia repair. When the laparoscopic repair is not feasible, the separation of components technique is the best choice, and a team approach with a plastic surgeon and a general surgeon offers the best chance for success.

J. Craig Collins, MD, Los Angeles, California: Congratulations on these outstanding results. I have a couple of questions for you. The first concerns the choice of sutures. I believe that every surgeon in this room could attest that polypropylene, or in this case nylon, doesn't appear to be prophylactic for recurrence since we have taken out plenty of that stuff from incisional hernias. Have you considered using some of the newer strong, monofilament absorbable sutures, or do you think there is a fundamental difference in patients with morbid obesity that warrants a permanent suture?

Second, regarding the dosing and timing of antibiotics, data suggest that perioperative tissue levels are the most important factor and that there is no benefit to prophylaxis past 24 hours. Did you tailor the doses to the patient weight? Did you redose intraoperatively, and have you considered shortening the course?

Dr Patti: Nylon was routinely used for the repair. Antibiotics were dosed on the basis of the patient's weight. We used intravenous antibiotics while the patient was in the hospital and oral antibiotics after discharge until the drains were removed.

Lawrence A. Danto, MD, Truckee, California: Your approach is excellent. I wanted you to comment a little more about the primary mesh repairs. Do you prefer the laparoscopic approach because you can dump the patients on Dr [Quanyang] Duh, do you prefer it because it is easy, or do you prefer it because the mesh is put in a subfascial plane rather than in continuity with the fascia or above the fascia?

Dr Patti: There is no question that the possibility of asking Dr Duh to help in the very large patient is very nice. The advantages of laparoscopic surgery in many studies have shown that the recurrence rate is around 5% to 10% only. The laparoscopic placement of the dual mesh is ideal because it can be placed a few centimeters lateral to the hernia defect without tension.

Jon M. Greif, DO, Oakland, California: I can attest to what happens when you have done a few of these procedures. You get a lot of referrals, and that is how a breast surgeon is up here talking to you about component separation. We did 1 or 2 of these

every year when I was in San Diego and, in recent cases when we had finished, if there was a little bit of tension bringing together the rectus muscles, we put in one of the new biological meshes and it actually turned out very well. I wondered, just to take the tension off in the middle, if you have had any experience with that and if you would comment on that.

Dr Patti: That it is a great idea, but I do not have any personal experience [with that].

David Hoyt, MD, San Diego, California: I wanted to ask about your technique because you describe the lateral release of the external oblique longitudinally as far as you can get it. The traditional component separation describes subsequent steps, which actually involves incising the rectus sheath and then essentially rolling it up into the wound to get an additional 2 or 3 cm on either side. Of your 30 patients, in how many did you have to do all of the components of the component separation as opposed to simply lateral release?

Dr Patti: We only did the lateral release. However, it probably would have been better to do the additional release of the rectus fascia in the patient who had a recurrent hernia because the defect was huge.

J. Augusto Bastidas, MD, Los Gatos, California: Could you comment on the panniculectomy? How do you plan the pan-

niculectomy? Do you decide how much skin and soft tissue to take preoperatively, or do you just assess it intraoperatively. In the patients who received panniculectomy, was it always planned? Quite often, once you have raised these big flaps, you have huge amounts of extra tissue, and there is always a debate about how much to take.

Dr Patti: The panniculectomy was always planned preoperatively, and patients were properly informed by the plastic surgeon and consented.

Thomas R. Biehl, MD, Seattle, Washington: Is there a maximal width of hernia that can be repaired with this technique? I noticed that one was up to 55 cm wide, I believe. Is that the one that failed? Does computed tomography help you figure out how big the hernias are and how much mobility you can get from release?

Dr Patti: The computed tomography helps very much. If you see that there is a huge defect, you know that you have to do the release on both sides and probably, as Dr Hoyt was suggesting, release also the rectus fascia. I believe that it is safe to repair a defect with a diameter of no more than 20 cm.

Financial Disclosure: None reported.