Laparoscopic Burch Colposuspension and Overlapping Sphincteroplasty for Double Incontinence

Jim W. Ross, PhD, MD

ABSTRACT

Objectives: 1. To assess the effectiveness of laparoscopic Burch and overlapping sphincteroplasty in treating urinary and fecal incontinence. 2. To determine the importance of unilateral pudendal neuropathy in fecal incontinence.

Method: Forty-six women with proven genuine stress incontinence and anal sphincter tears were treated with a laparoscopic Burch colposuspension. Patients with detrusor instability, intrinsic sphincter dysfunction, idiopathic fecal incontinence, and prior anal surgery were excluded. Objective postoperative testing for urinary continence included a cough stress test and bladder neck ultrasound, with repeat urodynamic studies if either test was positive. Fecal incontinence was graded with a clinical scoring index. The anal evaluation included sonography, sigmoidoscopy, manometry, and pudendal nerve terminal motor latency. Patients were divided into 2 groups. Group I (n = 34) had no neuropathy, and Group II (n = 12) had unilateral neuropathy.

Results: At 1-year follow-up, 40 patients (89%) were objectively dry, but 3 (7%) had recurrent genuine stress incontinence, and 2 (4%) had detrusor instability. Fecal incontinence cure rate was 82% in Group I and 58% in Group II. Group I had greater improvement in anal physiology studies than did Group II. Sphincter breakdown was the most common cause of recurrent fecal incontinence in Group I, but 4 of 5 patients with persistent incontinence in Group II had intact sphincters.

Discussion: Burch colposuspension is effective in treating genuine stress incontinence. Anal sphincteroplasty is effective in treating fecal incontinence due to obstetrical tears in the absence of pudendal neuropathy. Even unilateral neuropathy can significantly impair surgical outcomes.

Key Words: Laparoscopy, Burch colposuspension, Stress incontinence, Fecal incontinence, Anal sphincteroplasty, Pudendal neuropathy.

INTRODUCTION

Genuine stress and fecal incontinence are common problems in parous women.1-4 Fecal incontinence has been reported in women to be as high as 13-66/1,000.5 Sultan et al6, with the aid of anal sonography, found that anal sphincter tears following deliveries were much more common than previously suspected and are a major cause of fecal incontinence. Double incontinence (DI), the occurrence of urinary and fecal incontinence together, has been reported in many studies.5,7-10

Burch colposuspension is considered the gold standard for treating genuine stress incontinence (GSI). More recently, laparoscopic Burch colposuspension has been performed successfully to correct GSI.11 Most investigators prefer overlapping anal sphincteroplasty for treating fecal incontinence (FI) secondary to obstetrical tears.12 The purpose of the following study is twofold: 1. to evaluate the effectiveness of laparoscopic Burch colposuspension and the overlapping external sphincteroplasty in the treatment of GSI and FI; 2. to assess the significance of unilateral pudendal neuropathy on the outcome of anal sphincter repair.

METHODS

Forty-six women, 29 Caucasians and 17 Hispanics, ages 34-81 and parity 2-6, with genuine stress incontinence and fecal incontinence were studied. Twenty-five patients had prior hysterectomies, and 19 had prior bladder repairs. Thirty-two were on hormone replacement therapy.

Urinary Evaluation

Urinary evaluation included taking a history and performing a physical examination, quality of life questionnaires, urine culture and sensitivity, 24-hour urolog, Q-
tip test, cough stress test (CST), bladder neck ultrasound, dynamic cystourethroscopy, and multichannel urodynamic studies. The short forms of the Urogenital Distress Inventory and the Incontinence Impact Questionnaire were used to assess quality of life and symptom distress.\textsuperscript{13} Bladder neck mobility was measured with transperineal sonography. Multichannel urodynamic measurements were done with a dual microtip pressure transducer (Millar, Houston, TX) at a medium fill rate of 75 cc per minute with an Aquarius UD120 (Laborie Medical Technologies, South Burlington, VT) described previously.\textsuperscript{11} Patients with low-pressure urethra, less than 20 cm H\textsubscript{2}O or valsalva leak point pressure less than 60 cm H\textsubscript{2}O, were excluded.Urinary terminology conforms to that proposed by the International Continence Society.\textsuperscript{14}

### Anal Evaluation

All of the patients included had tears in the external anal sphincter demonstrated by anal ultrasound (AUS). Patients with a history of prior anal repairs, hemorrhoidectomy, anal fistulotomy, sphincterotomy, known bowel disease, or proven idiopathic fecal incontinence were excluded. All patients were questioned carefully about episiotomies or extensive tears with prior deliveries. The degree of ano-rectal incontinence was scored numerically according to the Cleveland Clinic Fecal Incontinence (CFI) scoring system (Table 1). Functional outcome was based on the patients’ subjective assessment of surgical outcome (PASS), and by clinical evaluation (Table 2).

Anal physiology was assessed by sigmoidoscopy, anal manometry, anal sonography, and pudendal nerve terminal motor latency studies (PNTML). Manometry was performed using a micro-pressure transducer and Aquarius anal manometry software (Laborie Medical Technologies, South Burlington, VT). Maximal resting (MRP) and squeeze pressure (MSP) and the length of the high-pressure zone (HPZ) were measured. PNTML was recorded with an M50 nerve stimulator (Teca, Pleasantville, NY) with a St. Mark’s electrode. Stimulation was from 50 to 100 mV, with 0.1-msec duration, until a response occurred. Normal PNTML was defined as 2.2 ± 0.2 milliseconds. Endoanal sonography was performed with a Siemens rotating rectal endoprobe with a 7.5-MHz transducer. Both the internal and external anal sphincters were observed at the proximal, mid, and distal levels.

### Table 1.

| Problem                        | Score |
|--------------------------------|-------|
| Incontinence of Stool          | 0     |
| Incontinence of Liquids        | 0     |
| Incontinence of Flatus         | 0     |
| Necessary to Wear Pad          | 0     |
| Change in Life Style           | 0     |

Possible Total Score = 20

0 – Never, 1 – Rarely (<1 per month), 2 – Sometimes (<1 per week but >1 per month), 3 – Usually (<1 per day but >1 per week), 4 – Always (>1 per day)

### Table 2.

| Outcome | Score |
|---------|-------|
| Poor    | 1     |
| Fair    | 2     |
| Good    | 3     |
| Excellent | 4   |

### Pelvic Reconstructive Procedures

Forty-six patients had a laparoscopic Burch colposuspension and apical vault repair. These techniques have been described in detail.\textsuperscript{11,15,16} Briefly, the space of Retzius is opened with a Harmonic scalpel (Ethicon Endo-Surgery, Cincinnati, OH) and viewed through a Stryker 888 3-chip video camera (Stryker Endoscopy, Santa Clara, CA). The pubocervical fascia is identified lateral to the bladder neck (Figure 1). The retroperitoneal fat is removed to within 2 centimeters of the urethra. Two sutures are placed 2 centimeters lateral to the urethra on each side. The distal sutures are at the level of the midurethra, and the proximal sutures are at the blad-
The anal sphincteroplasty included a levator ani plication, if a gaping levator hiatus existed, along with a posterior vaginal repair as needed. The anal sphincter capsule is identified and opened to expose and mobilize the external and internal sphincters. If scar tissue or a partially intact sphincter was found, it was left in place for added support. Interrupted polyglycolic sutures were used to imbricate the internal sphincter. Then an overlapping sphincteroplasty was performed using interrupted absorbable mattress sutures. Care was taken to make sure the perineal body and the recto-vaginal septum were attached before closure of the vaginal mucosa and perineal skin. In addition to the above procedures, 21 laparoscopic total hysterectomies, 32 paravaginal repairs, and 39 posterior colporrhaphies were done.

Follow-up evaluations for each patient included urology and fecal continence questionnaires, bladder and anal ultrasound, CST, urodynamic and anal manometry testing.

Statistical testing included ANOVA and the Student’s t test (StatView, Berkeley, CA).

RESULTS

Urinary Incontinence

At 6 to 12 weeks, 43 of 46 (93%) patients were objectively dry based on CST results (Table 3). Three patients with leaking had mild detrusor instability and normal pressure transmission ratios on urodynamic testing. Postoperative ultrasound showed bladder neck stability.

| Outcome                        | Preop | 3 Months | 1 Year |
|--------------------------------|-------|----------|--------|
| Hypermobile BN & (+) CST       | 46(100%) | 0          | 3(7)   |
| Detrusor Instability           | 0      | 3(7)      | 2(4)   |
| Objectively Dry                | 0      | 43(93%)   | 40(89)* |

*1 patient lost to follow-up.
Subjectively, these 3 patients indicated improvement on the quality of life questionnaires and decreased pad use. At 1 year, 40 of 45 (89%) were objectively dry. Three patients had recurrent bladder neck hypermobility, positive CST, and abnormal pressure transmission ratios consistent with recurrent GSI. One of these 3 patients requested repeat surgery. The other 2 reported subjective improvement following surgery and elected to wait for further treatment.

Two patients with leaking at 1 year had a stable bladder neck, positive CST, and detrusor instability on filling cystometrogram. One of these patients had DI at 6 weeks and another had de novo DI at 1 year. One patient received medical therapy. The other 2 patients with DI at 6 weeks declined treatment and had spontaneous resolution at 1 year.

**Fecal Incontinence**

Patients with fecal incontinence (FI) were divided into 2 groups based on PNTML results. Group I had bilateral

| Table 4. | Physiologic and functional outcome of anal sphincteroplasty with or without pudendal neuropathy. |
|----------|------------------------------------------------------------------------------------------------|
|          | SUCCESSFUL |
|          | N = 27    |
|          | PRE-OP   | 3 MONTHS | 1-YEAR | P   | FAILED |
|          | N = 6    |
|          | PRE-OP   | 3 MONTHS | 1-YEAR | P   |
| GROUP I  | N = 34*  |
| CFI      | 14.3     | 2.4      | 2.6    | 0.001 |
| PASS     | 1.1      | 3.5      | 3.3    | 0.01  |
| MANOMETRY|          |          |        |      |        |
| MRP      | 32.2     | 47.4     | 45.1   | 0.02  |
| MSP      | 51.1     | 69.7     | 72.8   | 0.03  |
| HPZ      | 1.2      | 3.0      | 2.8    | 0.006 |
| PNTML    | < 2.5 ms | 34       |
| GROUP II | N = 12  |
| CFI      | 15.7     | 9.7      | 7.6    | 0.04  |
| PASS     | 1.3      | 2.3      | 2.1    | 0.05  |
| MANOMETRY|          |          |        |      |        |
| MRP      | 39.2     | 37.5     | 41.0   | NS    |
| MSP      | 46.8     | 54.1     | 49.7   | NS    |
| HPZ      | 1.4      | 2.3      | 2.1    | 0.05  |
| PNTML    | > 2.4 ms on one side only | 12 |

Preop – preoperative, Group I – no pudendal neuropathy, Group II – unilateral pudendal neuropathy, CFI – Cleveland Clinic Fecal Incontinence scoring system, PASS – patients assessment of surgical success, MRP – maximum resting pressure, MSP – maximum squeeze pressure, HPZ – high pressure zone, PNTML – pudendal nerve terminal motor latency, P – ANOVA for repeated measures, NS – nonsignificant.
normal PNTML values, and Group II had unilateral normal PNTML values. Patients were excluded if PNTML was abnormal bilaterally.

The cure rate for FI in Group I was 88% at 3 months and 82% at 1 year (Table 4). In Group II, the success rate was 83% at 3 months and 58% at 1 year. The overall success of sphincteroplasty for both Group I and II was 76% at 1 year. The PASS score at 1 year, for functional testing, was 3.3 and 1.9 in Group I and II, respectively. A fourfold improvement occurred in the CFI in Group I and a twofold improvement occurred in Group II, suggesting a strong correlation between functional and clinical outcome. The CFI decreased and the PASS increased with sphincteroplasty success, and the opposite was seen with persistent FI. The major complaint in the cured group was difficulty in controlling flatus, whereas in all of the failures loss of solid stool was still present.

A significant increase occurred in maximal resting and squeeze pressure and high-pressure zone in Group I at 3 months and 1 year (Table 4). No significant changes occurred in MRP or MSP in Group II, but the increase in HPZ was significant at 3 months and 1 year. No significant changes occurred in manometry in patients with continued loss of solid stool.

Anal ultrasound demonstrated 31 of 34 (84%) intact external anal sphincters at 3 months and 27 of 33 (82%) at 1 year in Group I (Table 5). All patients with torn external sphincters had persistent loss of solid stool. In Group I, 2 patients at 3 months and 3 at 1 year had evidence of torn internal sphincters. No patient had a torn internal sphincter only. In all Group II patients, the internal anal sphincter was intact, and only 1 had a torn external sphincter at 1 year. Two patients had persistent stool loss following repair, and 3 developed recurrent solid stool loss during the first year, in Group II. One of these 5 had a disrupted sphincter on anal ultrasound and digital examination.

**DISCUSSION**

Pelvic disease is often present in all 3 pelvic compartments simultaneously, with varying degrees of severity. In evaluating patients with pelvic organ prolapse, it is important to look for both urinary and fecal incontinence. In this author’s clinic, more than 20% of patients with significant pelvic organ prolapse or GSI have some degree of fecal incontinence. These findings necessitate a complete evaluation of the entire pelvis when a patient presents with prolapse or symptoms of urinary or fecal incontinence.

Many procedures have been described for treating GSI. The minimally invasive laparoscopic Burch, used in this study, resulted in an 89% 1-year objective cure.11 An 85% cure rate at 5 years with laparoscopic Burch has been reported.18 These findings suggest that laparoscopic Burch is a feasible treatment for GSI.

There is a low incidence of de novo detrusor instability (4%) with the laparoscopic Burch.11 One possible explanation could be the excellent visibility and magnification obtained with the 3-chip video systems now available. These magnified views allow careful dissection and avoidance of the delicate neuromuscular structures in and around the urethra and bladder neck. Overcorrection can be avoided by observing the height of the repair as the Burch sutures are being tied. Voiding difficulties from overcorrection can elevate bladder pressure and cause obstructive flow and possibly lead to detrusor instability.19 Three patients in which the Burch procedure failed had persistent bladder hypermobility and low-pressure transmission ratios. The recurrence of bladder hypermobility most likely resulted from a breakdown of the Burch sutures, causing poor postoperative scarring and resulting in persistent GSI.

The overlapping sphincteroplasty is an effective means of treating FI due to sphincter tears alone.12,20,21 FI

---

**Table 4.**

| Preoperative | Postoperative |
|--------------|--------------|
|              | 3 Months     | 1 Year      |
|              | IAS EAS      | IAS EAS     |
| GROUP I      |              |             |
| N = 34       | (65%)        | (94)        |
|              | 22 0         | (88)        |
|              | 32 50        | (90)        |
|              | 30 27        | (82)        |
| GROUP II     |              |             |
| N = 12       | (83)         | (100)       |
|              | 10 0         | (100)       |
|              | 12 12        | (100)       |
|              | 12 11        | (92)        |

IAS – internal anal sphincter, EAS – external anal sphincter.

---

**Table 5.**

|                  | Preoperative | Postoperative |
|------------------|--------------|--------------|
|                  | IAS EAS      | IAS EAS     |
| GROUP I          |              |             |
| N = 34           | (65%)        | (94)        |
|                  | 22 0         | (88)        |
|                  | 32 50        | (90)        |
|                  | 30 27        | (82)        |
| GROUP II         |              |             |
| N = 12           | (83)         | (100)       |
|                  | 10 0         | (100)       |
|                  | 12 12        | (100)       |
|                  | 12 11        | (92)        |

IAS – internal anal sphincter, EAS – external anal sphincter.

*1 patient in Group lost to follow-up.*
returned in all patients with recurrent sphincter breakdown. Echoic defects were easily seen with anal sonography in suspected sphincter breakdowns, demonstrating the importance and necessity of sonographic studies.\textsuperscript{21-23} All tears diagnosed preoperatively by anal sonography were confirmed at the time of surgery, with no false positives.\textsuperscript{24} Anal sonography diagnosed 9 external sphincter tears missed on digital examination, demonstrating the superiority of anal sonography.\textsuperscript{24-26}

Bilateral pudendal neuropathy in FI patients\textsuperscript{27-30} has been shown to result in poor cure rates following sphincter repair. Even unilateral pudendal neuropathy can affect surgical outcome\textsuperscript{21,31,32}

Postoperatively, in Group II, 4 of 12 patients with intact sphincters had continued FI. Another Group II patient with FI had a recurrent torn sphincter, obscuring the etiology of her incontinence. A cure rate of 58% at 1 year demonstrates that unilateral pudendal neuropathy can significantly affect surgical outcome.

Pudendal neuropathy appears to prevent improvement in maximal resting and squeeze pressures following anal repair. With normal pudendal innervation, these anal pressures increase following repair,\textsuperscript{12,21,33} as seen in Group I. Reconstitution of the external sphincter resulted in a longer HPZ in both Group I and II, secondary to increased muscle mass.\textsuperscript{12,21} In Group II, the absolute functional length of the HPZ was half that of Group I, suggesting that even with increased muscle mass poor muscle function is present in patients with neuropathy.

The CFI and PASS scores were significantly improved in patients without pudendal neuropathy. The most significant complaint following surgery in Group I was incomplete control of flatus. Group II had improved scores at 1 year, but the outcome was roughly half of that achieved in Group I. More than a fivefold improvement occurred in the CFI in Group I verses a twofold improvement in Group II. Similarly, improvement in PASS scores was threefold in Group I and twofold in Group II. Almost all of the patients in Group II had trouble controlling flatus, and several had difficulty controlling loose stools, resulting in lower CFI and PASS scores. Unilateral pudendal neuropathy results in poor physiologic and functional outcomes.

**CONCLUSION**

Double incontinence is not uncommon.\textsuperscript{4} Suspicion of multisystem disease must be high in patients with pelvic organ prolapse, necessitating careful GI and GU evaluation.

The laparoscopic Burch colposuspension, when performed with the same technique as laparotomy Burch, is a successful technique for treating genuine stress incontinence. The laparoscopic approach has the advantages of minimally invasive surgery, mainly, decreased pain, short hospital stays, and a rapid return to a normal lifestyle.

The evaluation of fecal incontinence requires a minimum of anal sonography and PNTML for adequate patient counseling and selection of appropriate treatment. Obstetrical sphincter tears have a high cure rate if no pudendal neuropathy is present. The most common sphincteroplasty complication is repair breakdown during the healing phase. If unilateral neuropathy is present, the patient should be informed of a higher failure rate. The possibility of postoperative biofeedback or anal muscle stimulation therapy should be discussed. Possibly, sphincter repair should not be the first line of treatment with unilateral neuropathy.\textsuperscript{21,32}

**References:**

1. Harrison G, Memel DS. Urinary incontinence in women: its prevalence and its management in a health promotion clinic.\textit{Br J Gen Pract.} 1994;44:149-152.
2. Brown J, Seeley DG, Fong J, Black DM, Ensrud KE, Grady D. Urinary incontinence in older women: who is at risk? \textit{Obstet Gynecol.} 1996;87:715-721.
3. Haadem K, Ohrlander S, Lingman G. Long-term ailments due to anal sphincter rupture caused by delivery - a hidden problem.\textit{Eur J Obstet Gynecol Reprod Biol.} 1988;27:27-32.
4. Leroi AM, Weber J, Menard JF, Touchais JY, Denis P. Prevalence of anal incontinence in 409 patients investigated for stress urinary incontinence.\textit{Neurourol Urodynam.} 1999;18:579-590.
5. Thomas T, Egan M, Walgrove A, Meade TW. The prevalence of faecal and double incontinence.\textit{Comm Med.} 1984;6:216-220.
6. Sultan A, Kamn MA, Hudson CN, Thomas JM, Bartram CI. Anal-sphincter disruption during vaginal delivery.\textit{N Engl J Med.} 1993;329:1905-19011.
7. Nakanishi N, Tatara K, Naramura H, Fujiwara H, Takashima Y, Fukuda H. Urinary and fecal incontinence in a community-
residing older population in Japan. *J Am Geriatr Soc.* 1997;45(2):215-219.

8. Jackson SL, Weber AM, Hull TL, Mitchinson AR, Walters MD. Fecal incontinence in women with urinary incontinence and pelvic organ prolapse. *Obstet Gynecol.* 1997;89(3):423-427.

9. Peet S, Castleden CM, McGrother CW. Prevalence of urinary and faecal incontinence in hospitals and residential and nursing homes for older people. *BMJ.* 1995;311:1063-1064.

10. Thorpe A, Roberts JP, Williams NS, Blandy JP, Badenoch DF. Pelvic floor physiology in women with faecal incontinence and urinary symptoms. *Br J Surg.* 1995;82:173-176.

11. Ross J. Multichannel urodynamic evaluation of laparoscopic Burch colposuspension for genuine stress incontinence. *Obstet Gynecol.* 1998;91(1):55-59.

12. Wexner S, Marchetti F, Jagelman DG. The role of sphincteroplasty for fecal incontinence reevaluated: a prospective physiologic and functional review. *Dis Colon Rectum.* 1991;34:22-30.

13. Uebersax J, Wyman JF, Shumaker SA, McClish DJ, Fantl JA. Short forms to assess life quality and symptom distress for urinary incontinence in women: the incontinence impact questionnaire and the urogenital distress inventory. *Neurourol Urodyn.* 1995;14:131-139.

14. Abrams P, Blaivas JG, Stanton SL, Andersen JT. The standardization of lower urinary tract function recommended by the International Continence Society. *Int Urogynecol J.* 1990;1:45-58.

15. Ross J. Techniques of laparoscopic repair of total eversion after hysterectomy. *J Amer Assoc Gynecol Laparosc.* 1997;4:173-183.

16. Ross J. Apical vault repair, the cornerstone of pelvic vault reconstruction. *J Urol.* 1976;116:751-753.

18. Ross J. 5-Year outcome of laparoscopic Burch for stress incontinence. *J Amer Assoc Gynecol Laparosc.* 1999;6(3):48 S.

19. Rosenzweig BA, Pushkin, S, Blumenfeld, D, Bhatia, NN. Prevalence of abnormal urodynamic test results in continent women with severe genitourinary prolapse. *Obstet Gynecol.* 1992;79:539-542.

20. Londono-Schimmer E, Garcia-Duperly R, Nicholls RJ, Ritchie JK, Hawley PR, Thomson JP. Overlapping anal sphincter repair following sphincter repair for faecal incontinence due to sphincter trauma: five year follow-up functional results. *Int J Colorect Dis.* 1994;9:110-113.

21. Oliveira L, Pfeifer J, Wexner SD. Physiological and clinical outcome of anterior sphincteroplasty. *Br J Surg.* 1996;83:502-505.

22. Sultan A, Kamm MA, Talbot IC, Nicholls RJ, Bratnam CI. Anal endosonography for identifying external sphincter defects confirmed histologically. *Br J Surg.* 1994;81:463-465.

23. Tjandra J, Milson JW, Stolfi VM, et al. Endoluminal ultrasound defines anatomy of the anal canal and pelvic floor. *Dis Colon Rectum.* 1992;35:465-470.

24. Romano G, Rotondano G, Esposito P, Pellecchia L, Novi A. External anal sphincter defects: correlation between pre-operative anal endosonography and intraoperative findings. *Br J Radiol.* 1996;69:6-9.

25. Felt-Bersma R, van Baren R, Koorevaar M, Strijers RL, Cuesta MA. Unsuspected sphincter defects shown by anal endosonography after anorectal surgery. *Dis Colon Rectum.* 1995;38:249-255.

26. Deen K, Kumar D, Williams JG, Olliff J, Keighley MR. Anal sphincter defects correlation between endoanal ultrasound and surgery. *Ann Surg.* 1993;218:201-205.

27. Parks A, Swash M, Urich H. Sphincter denervation in anorectal incontinence and rectal prolapse. *Gut.* 1977;18:656-665.

28. Tetzschner T, Sorensen M, Rasmussen OR, Lose G, Christiansen J. Pudendal nerve damage increases the risk of fecal incontinence in women with anal sphincter rupture after childbirth. *Acta Obstet Gynecol Scand.* 1995;74:434-440.

29. Wexner S, Marchetti F, Salanga VD, Corredor C, Jagelman DG. Neurophysiologic assessment of the anal sphincters. *Dis Colon Rectum.* 1991;34:606-612.

30. Laurberg S, Swash M, Henry MM. Delayed external sphincter repair for obstetric tear. *Br J Surg.* 1988;75:786-788.

31. Lubowski D, Jones PN, Swash M, Henry MM. Asymmetrical pudendal nerve damage in pelvic floor disorders. *Int J Colorect Dis.* 1988;3:158-160.

32. Sangwan Y, Coller JA, Barrett RC, et al. Unilateral pudendal neuropathy impact on outcome of anal sphincter repair. *Dis Colon Rectum.* 1996;39:686-689.

33. Engel A, Baal SJ, Bummekamp WH. Late results of anterior sphincter plication for traumatic fecal incontinence. *Eur J Surg.* 1994;160:633-636.

Acknowledgments: I wish to thank Stryker Endoscopy, Laborie Technology, and Teca for equipment aid and Ethicon EndoSurgery for a grant-in-aid used in completing this study.