Genuine Stress Urinary Incontinence in Women

New Laparoscopic Paravaginal Reconstruction

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OBJECTIVE: To assess a new laparoscopic technique of paravaginal repair, adapted from a classic laparotomy procedure, for genuine stress urinary incontinence.

STUDY DESIGN: From January 1992 to July 1997, 28 patients in a consecutive, prospective clinical case study were subjected to laparoscopic paravaginal repair. No concomitant surgery was performed. A clinical diagnosis of genuine stress urinary incontinence was documented by cystometry following a positive cough stress test. When indicated, a multichannel urodynamics study was performed.

RESULTS: In 16 patients (57%) of 28, the right pelvic side was affected, and in 43% fascia damage was identified and repaired bilaterally. The average operative time was 2 hours, 45 minutes; average blood loss was 1.2 g hemoglobin. No intraoperative, immediate postoperative, delayed postoperative or anesthesia-associated complications were observed. Patients were discharged from the surgical units in an average of 5 hours, 15 minutes. There was no postoperative hospital readmission.

CONCLUSION: Laparoscopic paravaginal repair is simple and safe and has a 93% cure rate. It is an attractive alternative to laparotomy. (J Reprod Med 1998;43: 477–482)

Keywords: urinary incontinence, stress; laparoscopic surgery; bladder diseases.

> **This procedure appears to be a very promising alternative to laparotomy, with all the advantages of a minimally invasive approach.**

Introduction

The purpose of the operative series reported on below was to evaluate a laparoscopic surgical technique of paravaginal repair as a mode of treatment for genuine stress urinary incontinence (G-SUI) due to lateral-superior separation of the pubocervical fascia from the lateral pelvic wall.

Why is laparoscopy being substituted for laparotomy in the treatment of G-SUI? This question is a complex one and must be broken down: Is paravaginal defect repair reliable enough to correct G-SUI in selected cases? Will minimal access and laparoscopic technique improve precision of execution of the operation and its outcome? Will the patient benefit from the laparoscopic approach versus laparotomy?

In 1976, Richardson et al[1] reported on four pelvic

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supporting tissue defects that might cause urethro-cystocele (lateral or paravaginal, transverse, mid-line and pubourethral ligament defects) and G-SUI. The most common of these defects is paravaginal (lateral) defect of the lateral-superior endopelvic fascia at its attachment to the tendinous arch. This

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report presents our experience with and clinical outcome of laparoscopic paravaginal repair.

Materials and Methods

A consecutive, prospective clinical case study was conducted from January 1992 to July 1997. Patients were observe for a minimum of 24 months from the time of reconstructive surgery. In all instances, the surgery performed was laparoscopic posterior pubourethral ligament shortening and lateral-superior paravaginal fascia reattachment to the tendinous arch and obturator muscle fascia in the midpelvis for G-SUI. A total of 28 women under-went this procedure at the Institute of Video En-doscopy and Laser Surgery of Washington DC, the Premier Surgical Center or Howard University Hospital.

Among subjects, the average age was 47 (range, 38–62); average gravidity, 4 (range 1–5); and aver-age parity, 2 (range, 1–4). Seven postmenopausal patients were on hormonal replacement therapy. Eighteen patients had had hysterectomy. Six had had antiincontinence operations and concomitant vaginal hysterectomy, and one of these subjects had had multiple operations: Kelly's plication following vaginal hysterectomy with anterior colporrhaphy and needle procedure.

Preoperatively, subjects' medical, neurologic, urologic, gynecologic, obstetric and surgical histo-ries were documented, particularly noting opera-tions that could possibly affect lower urinary tract function. Also obtained were symptom analysis and history of use of commonly dispensed drugs, such as diazepam, α-methyldopa, prazosin, phe-nothiazines, antihistamines and anticholinergic medication. A voiding diary (urolog) for 72 hours

was recorded by each patient before and in the sec-ond postoperative week.

In all patients, preoperative pelvic examination revealed anterior-lateral vaginal anatomic defects, which were graded in a manner similar to that pub-lished by Baden and Walker.[2] Physical examination included but was not limited to postvoiding resid-ual measurements, catheterized urine analysis and culture sensitivity; those who had documented uri-nary tract infections were treated according to a sensitivity diagram.

The following were utilized in determining a pre-operative clinical diagnosis of G-SUI in all patients in the study:

1. Urodynamic tests
   a. Cotton-tipped swab test,
   b. provocative stress test (positive cough stress test),
   c. absence of detrusor activity determined by cystometrogram.
2. Multi-channel urodynamic study: based upon initial results of the cystogram and provocative stress test, seven patients had indications for multichannel urodynamic testing. Six of these patients had had antiincontinence procedures, and one was more than 60 years old.

Patients who demonstrated other types of uri-nary incontinence than genuine stress urinary in-continence, including mixed detrusor instability with genuine stress urinary incontinence, or who had a direct contraindication to laparoscopic surgery were excluded from this evaluation.

Concomitant pelvic relaxation, such as cystocele (other forms of cystocele apart from paravaginal de-fect), rectocele, enterocele, and uterine or vaginal vault prolapse, was adequately subjected to surgi-cal treatment.

Operative time was determined from Veress nee-dle insertion to skin incision approximation upon completion of the laparoscopic operation.

Blood loss was measured by subtracting the pre-operative hemoglobin level from the level mea-sured 2 hours after intravenous fluid discontinua-tion postoperatively.

Criteria for early patient discharge from the hos-pital were previously established and reported.[3]

Postoperatively, clinical, urodynamic and ultra-sonography data were recorded, compared with preoperative data and supportive studies, and ana-lyzed. At three months postoperatively and then on a yearly basis, patients were interviewed for lower urinary functional results of the laparoscopic

paravaginal repair. Urodynamic studies were conducted corresponding to those administered preoperatively, and each subject's pelvic anatomy was graded. Preoperatively, the location and size of the defects were estimated and documented.

This laparoscopic technique of paravaginal repair was assessed for safety, unilateral or bilateral performance of operation, blood loss based upon preoperative and postoperative hemoglobin level, intraoperative and postoperative complications, and length of operation and hospital stay.

The anterior cul-de-sac peritoneum and umbilical prevesical fascia laterally from the urachus were incised with 5-mm monopolar laparoscopic scissors bilaterally. In the classic approach the space of Retzius is entered with no peritoneal cavity invasion; however, laparoscopic approach is best from the anterior cul-de-sac. The space of Retzius was entered by stripping off the transversalis fascia from the superior ramus of the pubis bilaterally with 5-mm laparoscopic scissors and/or hydrodissection until the obturator foramen with neurovascular bundle was visible. By removing the loose areolar tissue covering the obturator internus muscle, the pubourethral ligament was observed. The lateral-superior vaginal fascia defect and its extent in the midpelvis were evaluated (Figure 1). The urethrovesical junction was recognized by a small movement of the Foley catheter tube and shape of its inflated balloon.

The fascia adjacent to the urethra and bladder was identified. Two fingers of the surgeon's left hand were inserted into the vaginal pool to palpate the urethra and keep it from being incorporated into sutures as well as to elevate the lateral superior vaginal wall until it reached the level of its natural attachment alongside the tendinous arch of the levator muscle. The fascia defect and its extent were determined in relation to the pelvic sidewall (the obturator internus and pubococcygeus muscles) (Figure 1). The bladder was isolated from the pelvic sidewall until the iliopectineal line was exposed. The posterior pubourethral ligament was resuspended with no. 0 polydioxanone single suture, which was placed through the obturator internus muscle fascia and the tendinous arch of the levator ani muscle. An extra suture was applied close to the urethrovesical junction and obturator internus muscle fascia through the tendinous arch of the levator ani muscle. Suturing was continued in the perivesical area, incorporating the paravaginal fascia without penetrating the vaginal mucosa (Figure 2) until the fascia defect was repaired close to the adjacent region of the ischial spine. Each suture was tied first extracorporeally and then secured additionally with the intracorporeal, two-turn, flat square knot. The procedure was performed bilaterally, if necessary (Figure 3). Most surgeons recommend a nonabsorbable suture; however, in order to avoid the possible late complication of an erosion encompassing a suture, delayed absorbable PDS suture was selected. When edges before surgical approximation are scarified, a scar is supporting force and not a suturing material. Based upon these principles, a no. 0 PDS laparoscopic suture was selected for this reconstructive operation.
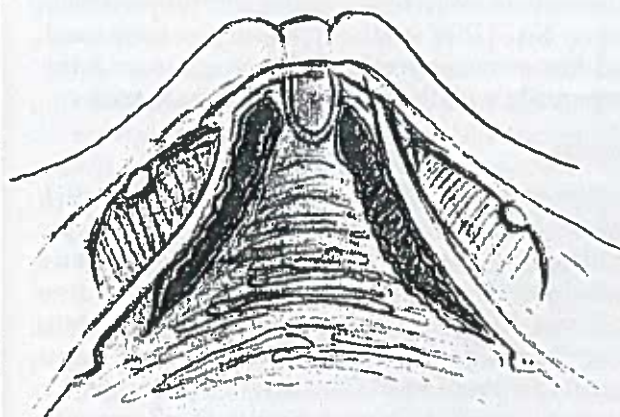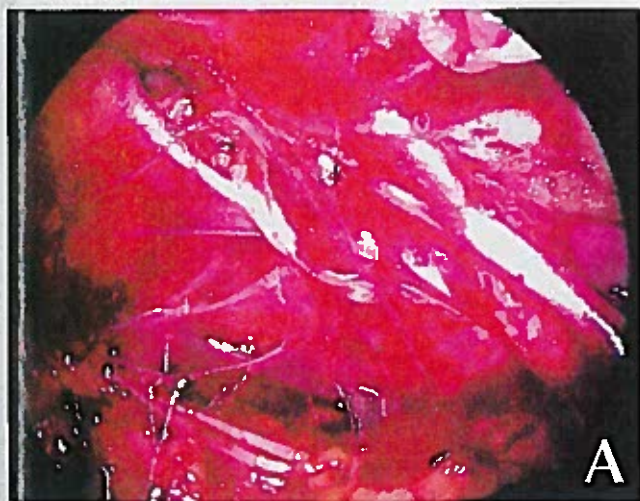

Figure 1   Laparoscopic view of the right paravaginal defect near the bottom. (A) Bilateral paravaginal defect. (B) Schematic.
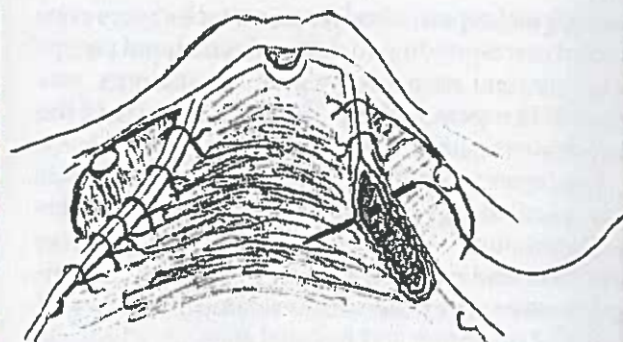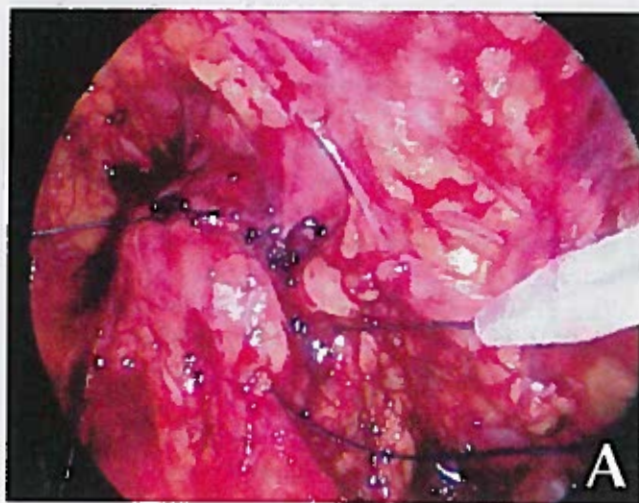
Figure 2   Process of reconstructing the lateral paravaginal fascia defect. Two of the surgeon's fingers of the nondominant hand transvaginally elevating the lateral-superior sulcus of the vagina. The suture line is depicted between the lateral-superior vaginal sulci and the obturator internus fascia-tendinous arch. (A) Process of reconstructing the paravaginal defect. (B) Schematic.

Finally, the anterior cul-de-sac peritoneum was closed with no. 0-4 PDS single intracorporeal suture. No drainage was necessary in the space of Retzius.

Postoperatively, Foley catheter was discontinued, and patients urinated spontaneously in the recovery room.

A very few reusable instruments were needed to accomplish this operation: two 5-mm laparoscopic tissue graspers, electrocautery monopolar curve scissors, and suture scissors, laparoscopic needle holder and hydrodissection set. The procedure was executed with hydrodissection and laparoscopic scissors to develop tissue planes and suturing technique. No. 0 PDS laparoscopic sutures were used, tied first extracorporeally and then enhanced intracorporeally with the two-turn, flat square knot.

Results

A total of 28 patients were diagnosed with G-SUI, and all of them underwent the new laparoscopic technique of posterior pubourethral ligament and lateral-superior paravaginal fascia reconstruction with reattachment to the tendinous arch and obturator muscle fascia. All the subjects were documented to have G-SUI. The demographic data for the study population were similar in reference to age, gravidity and parity. All postmenopausal patients were on hormonal therapy.

In all patients, an anterior-lateral segment anatomic defect was noted during pelvic examina-

tion, and a cotton-tipped swab test determined excessive mobility of the urethrovesical junction. Preoperatively, a positive provocative stress test with a negative antecedent cystogram (no detrusor function abnormality identified) was observed in 21 patients, and the other 7 required multichannel urodynamic study. In these 7 subjects, urine loss with cough during multichannel urodynamic study with no detrusor activity was observed. In 16 patients (57%) of 28, only the right side was affected; in 43%, fascia damage was identified and repaired bilaterally, and no solely left side paravaginal damage was noted.

Average operative time was 2 hours, 45 minutes

Figure 3   Laparoscopic paravaginal repair completed bilaterally.

(range, 1 hour, 55 minutes to 5 hours, 15 minutes). The longer operative time, when compared to laparotomy operative time, is compensated for by early hospital discharge and a shorter recovery/recuperating time. Therefore, it may appear to be a cost-effective laparoscopic procedure; however, this study was not designed to address this issue.

Average blood loss was 1.2 g hemoglobin (range, 0.8–1.8). None of the patients required blood or blood product transfusion.

There was no anesthesia-associated, intraoperative, immediate postoperative or delayed postoperative complications.

Patients were discharged from surgical units in an average time of 5 hours, 15 minutes (range, 3 hours, 45 minutes to 8 hours, 15 minutes), and no hospital readmission was necessary.

One hundred percent of subjects returned for the three-month and one-year postoperative urinary function interview, physical examination and urodynamic study. Twenty-eight patients reported for the two-year postoperative follow-up visit. The other two patients (7%) had two-year follow-up visits with their referring physicians, neither of these patients reported G-SUI symptomatology, and no urodynamic study was done. The remaining 26 patients continued the follow-up protocol with us.

At the three-month postoperative visits, 2 (7%) of 28 patients reported loss of urine with physical exercise. Both patients had urine loss with coughing during multichannel urodynamic study. Preoperatively, these subjects were diagnosed with G-SUI documented by multichannel cystometry.

Postoperatively, there was no additional case of recurrent G-SUI within the study period reported by a patient or demonstrated by urodynamic study. The period of total postoperative observation was 4.5 years for 7 women, 3.5 years for 9 women, 2.5 years for 10 women, 1.5 years for 5 women and 1 year for 2 women.

Discussion

A review of the literature through Medline in reference to G-SUI due to paravaginal fascial defect reveals that laparotomy paravaginal fascia defect repair was reported to be successful in 95.3% of cases by Richardson et al[4] and in 97.3% by Shull et al.[5] While these studies were flawed for lack of objective testing for diagnosis and cure of stress urinary incontinence, the two groups presented very successful clinical outcomes of paravaginal repair. Therefore, this technique was selected as a basis for

developing laparoscopic surgical treatment of G-SUI associated with a lateral paravaginal defect.

Through a video endoscopic system with a three-chip camera, laparoscopic magnification ability, computerized digital image contrast enhancement and edge correction in real time, intimate exposure of retropubic midpelvic defects is possible.[6] The laparoscopic capability, combined with urogynecologic retropubic surgical experience and endoscopic dexterity with intracorporeal suturing and tying techniques, makes execution of this operation very precise, with minimal blood loss, and compensates for deficiencies in palpating and for the long operating time.

This operation is less traumatic emotionally[7] and physically for the patient and carries great acceptance and satisfaction for the following reasons: surgery is performed on an outpatient basis, abdominal incisions are small and cosmetically acceptable, recovery and recuperation times are short, postoperative care takes place at home, and postoperative pain is substantially reduced, promoting early, comfortable ambulating, which lowers the risk of atelectesis and thromboembolic complications. Additionally, reduced contact with body fluids, decreased risk of the needle stick, lower incidence of wound infection, limited tissue crushing and decreased abdominal wall trauma are favorable for the patient and surgical team.

Operative time is the main disadvantage of this operation; it is generously outweighed by the favorable parameters of minimal access surgery. There is no opportunity for the surgeon's direct palpation of tissue during any laparoscopic operation, but this aspect is well compensated for by the close view and magnification provided by laparoscopy.

This new laparoscopic technique of posterior pubourethral ligament and lateral paravaginal fascia reconstruction for G-SUI, as an alternative approach to traditional laparotomy, appears to be valuable and may play a major role in future surgical treatment of this medical entity. However, there are barriers to this technique's gaining instantaneous popularity: it is time consuming to learn and best attempted by a urogynecologic surgeon who possesses a good understanding of gross and functional female pelvic anatomy, laparoscopic surgical and suturing techniques, and extracorporeal and intracorporeal tying technique.

In view of the 20–40% prevalence rate of urinary incontinence in women[8-10] and an even higher rate among the elderly,[11,12] this medical entity carries

not only medical and social concerns but also immense economic consequences, estimated at $10 billion per year.[13]

Diagnosis of G-SUI by symptoms is difficult since only 51% of patients have specific symptoms.[14] Additionally, only 50% of women leaking urine associated with activity increasing intraabdominal pressure (sneezing, coughing, lifting, etc.) will be diagnosed with G-SUI.[15] Addressing urodynamic testing for G-SUI, Swift et al[14] documented, in a very well designed study, that urine loss with coughing during multichannel urodynamics was the best approach for documenting G-SUI; however, there is enough proof that a positive provocative stress test following cystometrography sufficiently supports a clinical diagnosis of G-SUI.[16-18]

Results of this study group coincide with findings that the positive provocative stress test with antecedent cystometrogram is sensitive and specific enough to comfortably make a diagnosis of G-SUI. Since neither of the patients in this series who presented with postoperative G-SUI came from the group in which diagnosis of G-SUI was supported by a positive provocative stress test following cystometrography, one is led to postulate that this observation may have predictive value for the surgical outcome of paravaginal repair.

In 1991, Vancaillie and Schuesser[19] reported the first successful laparoscopic adaptation of the Burch operation.[20] Our clinical experience and that of others[4,5] indicate that lateral paravaginal repair for genuine stress incontinence is a very reliable method with an unremarkable long-term complication rate; therefore, executing this operation via laparoscopy should be more beneficial than the Burch operation, after which 13% of patients develop enterocele or rectocele.[21] The clinical results of this series are comparable with those achieved during classic abdominal surgery for paravaginal repair[4,5]; therefore, this procedure appears to be a very promising alternative to laparotomy, with all the advantages of a minimally invasive approach.

References

1. Richardson AC, Lyon JB, Williams NL: A new look at pelvic relaxation. Am J Obstet Gynecol 1976;126:568–573

2. Baden WF, Walker TA: Physical diagnosis in the evaluation of vaginal relaxation. Clin Obstet Gynecol 1972;15:1055–1062

3. Ostrzenski A: Laparoscopic total abdominal hysterectomy by suturing technique, with no transvaginal surgical approach: A review of 276 cases. Int J Gynecol Obstet 1996;55:247–257

4. Richardson AC, Edmonds PB, Williams NL: Treatment of stress urinary incontinence due to paravaginal fascia defect. Obstet Gynecol 1981;57:357–362

5. Shull BL, Baden WF: A six-year experience with paravaginal defect repair for stress urinary incontinence. Am J Obstet Gynecol 1989;160:1432–1439

6. Ostrzenski A: Advanced video endoscopic gynecological surgery as a live imaging. In Women's Health Today: Perspective on Current Research and Clinical Practice. Edited by DR Popkin, Peddle, New York, Parthenon, 1994, pp 251–255

7. Ostrzenski A: Psychological advantages of advanced endoscopy v/s laparotomy in gynecological surgery. In Prenatal and Perinatal Psycho-medicine. Edited by R Klimek. Cracow, DWN DReAM, 1992, pp 95–102

8. Yarnell JWG, Voyle GJ, Richards CJ, et al: The prevalence and severity of urinary incontinence in women. J Epidemiol Commun Health 1981;35:71–74

9. Urinary incontinence in adults: Consensus conference. JAMA 1989;261:2685

10. Urinary incontinence in adults: NIH consensus statement. Bethesda, NIH, 1988

11. Ouslander JG, Kane RL, Abrass IB: Urinary incontinence in elderly nursing home patients. JAMA 1982;248:1194–1198

12. Castleden CM, Duffin HM, Asher MJ: Clinical and urodynamic studies in 100 elderly incontinent patients. Br Med J 1981;282:1103–1105

13. Caputo RM, Benson JT, McClellan E: Intravaginal maximal electrical stimulation in the treatment of urinary incontinence. J Reprod Med 1993;38:667–671

14. Swift SE, Ostergard DR: Evaluation of current urodynamic testing: Methods in the diagnosis of genuine stress incontinence. Obstet Gynecol 1995;86:85–91

15. Jensen JK, Nielsen FR, Ostergard DR: The role of the patient history in the diagnosis of urinary incontinence. Obstet Gynecol 1994;83:904–910

16. Wall LL, Wiskind AK, Taylor PA: Simple bladder filling with a cough stress test compared with subtracted cystometry for the diagnosis of urinary incontinence. Am J Obstet Gynecol 1994;171:1472–1477

17. Scotti RJ, Myers DL: A comparison of the cough stress test and single-channel cystometry with multichannel urodynamics evaluation in genuine stress incontinence. Obstet Gynecol 1993;81:430–433

18. Scotti RJ, Ostergard DR: Predictive value of urethroscopy in genuine stress incontinence and vesical instability. Int Urodynam J 1993;4:255–258

19. Vancaillie TG, Schuessler W: Laparoscopic bladder neck suspension. J Laparosc Endosc Surg 1991;1:169–173

20. Burch JC: Urethrovaginal fixation to Cooper's ligament for correction of stress incontinence, cystocele and prolapse. Am J Obstet Gynecol 1961;281:81–90

21. Enzelsberger H, Helmer H, Schatten C: Comparison of Burch and Lyodura sling procedures for repair of unsuccessful incontinence surgery. Obstet Gynecol 1996;88:251–256