Article

Laparoscopic colposuspension for total vaginal prolapse[1]

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Abstract

Objective: To present and evaluate a new technique of modified translaparoscopic colpopexy for total vaginal prolapse following hysterectomy as an alternative surgical mode of therapy to abdominal sacral suspension or transvaginal sacrospinous ligament vaginal vault suspension. A modest modification (Group II) of this author's initial surgical technique (Group I) and postoperative observations from 1989 to 1996 are presented. *Methods:* Twenty-seven patients with iatrogenic total vaginal prolapse subsequent to hysterectomy enrolled in this clinical study, which was conducted from September 1989 through February 1996. Posteriorly, vaginal apex was suspended to the deep layer of the uterosacral ligaments. The latero-posteriors vaginal cuff was suspended to the cardinal ligaments. Anteriorly, the vaginal vault was approximated to the pubocervical fascia. These procedures were performed in both groups retroperitoneally. Additionally, and only in Group II, retrpubically, at the mid-pelvic level, the pubocervical fascia and lateral superior vaginal sulci were suspended to the tendinous arch and to the fascia covering the muscles of the pelvic sidewall. This additional part of the operation constituted a modification of the initial translaparoscopic colpopexy (Group I). *Results:* In Group I, fifteen patients had good outcome of the operation. However, patient number 16 had a recurrent total vaginal vault prolapse within 6 months following the initial laparoscopic colpopexy. Preceding an initial laparoscopic colpopexy, sacrospinous ligament suspension was performed as one of multiple corrective surgeries. This patient was subjected to the modified laparoscopic colpopexy and has been observed for over three years. The vaginal vault remains well suspended in this particular case as well as in all remaining patients in Group II. There were neither intraoperative, immediate, nor delayed postoperative complications in all 27 patients, in both groups. *Conclusions:* (1) When Group I results are compared with Group II results, the new, modified translaparoscopic retroperitoneal-retropubic colpopexy appeared to be a superior technique and very promising, and offers: (a) vaginal cuff suspension by using natural neighbouring genital pelvic structures, (b) reconstruction of pelvic gross/functional anatomy, placement of the vagina adequately in midline position, and alignment of the vagina parallel to the rectum, and re-constitution of proper relationship between the newly suspended vagina and pelvic viscera. (2) It is a safe operation, simple to learn, and easy to execute; however,

retroperitoneal-retropubic-mid-pelvis surgical experience as well as advanced operative laparoscopic skill is needed to meet technical demands of the operation.

1. Introduction

The purpose of this study was to evaluate a new translaparoscopic surgical concept of colpopexy for complete vaginal prolapse. Retroperitoneal rectovaginal septum and pouch of Douglas reconstruction with retroperitoneal vaginal apex suspension to the uterosacral-cardinal ligament complex-pubocervical fascia, and retropubic mid-pelvis attachment of the lateral superior vaginal sulci to the tendinous arch and the obturator internus and pubococcygeus muscles fascia (procedure 2).

Today, abdominal sacral colpopexy and transvaginal sacrospinous ligament vaginal vault suspension are widely executed operations. Both those techniques utilize extra-genital pelvic structures for colpopexy in contrast to the new, modified laparoscopic colpopexy where genital pelvic structures are used.

2. Materials and methods

Every operation was performed in ambulatory surgical set-up by this author. A total number of 27 patients were divided into two groups. The 16 women in Group I, whose age was from 41 to 74 years (mean, 58); there were 13 Caucasian and three Black patients; parity from 1 to 7 (mean, 3). All patients from Group I underwent a translaparoscopic retroperitoneal rectovaginal septum and pouch of Douglas reconstruction with vaginal vault suspension to the uterosacral-cardinal ligament complex-paravesical fascia for a complete vaginal vault prolapse (procedure 1).

Eleven patients in Group II, age from 42 to 76 (mean, 57); there were nine Caucasian and two Black; parity from 1 to 4 (mean, 2). All patients from Group II were subjected to the same mode of translaparoscopic surgical treatment as in Group I (procedure 1) and additionally, procedure 2 was executed.

Patients were enrolled in this study in September 1989 to August 1995 and postoperative observation was conducted through February 1996 with the diagnosis of complete vaginal prolapse following hysterectomy. Pre-postoperatively the degree of prolapse/descent of the vaginal vault was evaluated at rest, supine, and standing, and during a Valsalva maneuver. In both groups, postoperative evaluations were at 6 months and on a yearly basis thereafter and included pelvic anatomy status; vaginal apex position was determined using the ischial spine and hymen ring as reference points. Restoration of vaginal function was established during conferences with patients at each postoperative follow-up visit. As a matter of direct observation during pelvic examination, anatomy reconstruction results were mapped and weighted against preoperative abnormal findings.

A good initial outcome of translaparoscopic colpopexy on 15 consecutive patents [1–3] and ability to identify cause of failure of the surgical treatment in case number 16 from Group I encouraged us to modify the original operation.

3. Modification of the original laparoscopic colpopexy (procedure 2)

In 1992, a modification of the original operation [1–3], was introduced which incorporated procedure 2.

In Group II, the retropubic space was entered between the urachus and medial umbilical folds on the right and left sides of the urachus. The space of Retzius was opened by separating transversalis fascia from the superior ramus of the pubis bilaterally with 5-mm laparoscopic scissors and/or hydrodissection probe. The dissection was continued under laparoscopic magnification until the obturator foramen with neurovascular bundle was noticed laterally on the posterior

surface of the superior ramus of the pubis (Fig. 1). By removing the loose areolar tissue overlying the obturator internus muscle, the pubourethral ligament was appreciated as well as the mid-pelvis fascia defect and its extent (Fig. 1). The urethrovesical junction was recognized by small movement of the Foley catheter intravesically. The fascia adjacent to the urethra and bladder was identified. Two fingers of the left hand were inserted into vaginal pool to elevate the right anterior vaginal wall until it reached the level of its normal attachment alongside the tendinous arch. The fascia defect and its extent were determined in relation to the pelvic sidewall. The bladder was isolated from pelvic sidewall until the iliopectineal line was exposed.

A No. 0-PDS (Polydioxanone) Endoknot single suture was placed through the obturator internus muscle fascia and the tendinous arch (Fig. 2). Suturing was continued via the paravaginal fascia without penetrating the vaginal mucosa and the suture was tied by the initial extracorporeal sliding square knot technique enhanced with the intracorporeal two-turn flat square knot (Fig. 3). The procedure was performed bilaterally. Finally, the peritoneum between the urachus and medial umbilical folds and ligaments on the right and left

Fig. 2. Process of suspending the lateral superior vaginal (Vg) sulci to the obturator internus muscle fascia and the tendinous arch (TA). The pubocervical fascia defect (Fd) and the suture (S) route are visualized.

sides of the urachus was closed with a No. 0-4 PDS single intracorporeal suture and tied into a two-tun flat square knot. No drainage was established in the space of Retzius.

Very few instruments were needed to accomplish this operation: two 5-mm laparoscopic graspers, monopolar curve scissors, a needle holder, and a hydrodissection set.

4. Results

Sixteen patients (59%) out of 27 were subjected to total abdominal hysterectomy and eleven patients (41%) out of 27 underwent total vaginal hysterectomy during initial surgery.

All but three patients were discharged from the surgical unit on the day of surgery. Three out of 27 patients were observed in the hospital for 24 h due to having required over 4 h of surgery (two from Group I and one patient from Group II). The shorter operating time in Group II was due to increased surgeon experience. There were no intraoperative or immediate postoperative complications. Two patients (7%) developed low urinary tract infection within 7 days after surgery. Estimated blood loss was minimal and none of the patients required blood or blood product
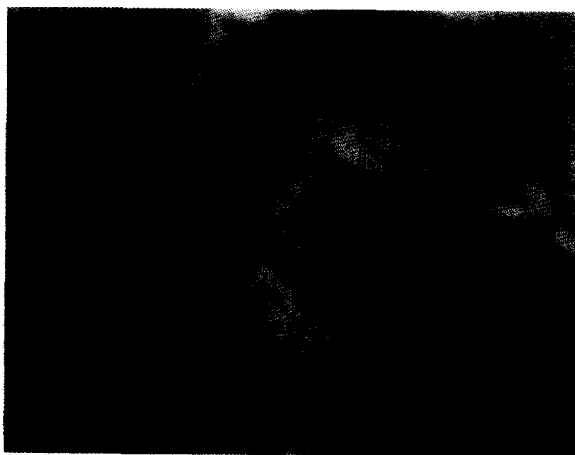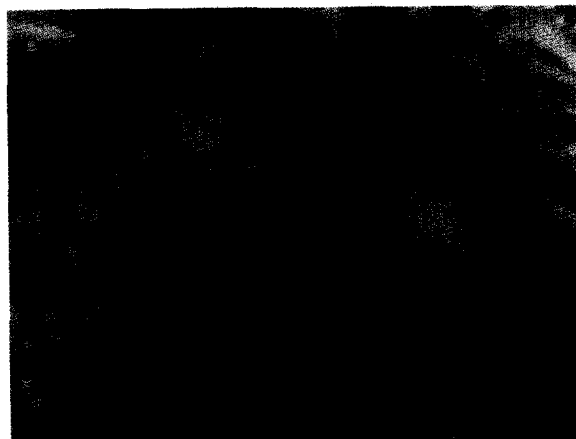

Fig. 1. Translaparoscopic view of the Retzius space is depicted: the pubourethral ligament (PUL), the neurovascular bundle entering the obturator foramen (FO), lateral superior vaginal sulci (LVgSS) separated from the tendinoud arch are depicted.

Fig. 3. Four initial 0-PDS suture were tied and the lateral superior vaginal sulci were suspended to the obturator internus muscle fascia and the tendinous arch. The neurovascular bundle entering the obturator foramen (FO).

transfusion. All 27 patients are alive and only one patient has missed a clinical follow-up after 3 months participation; however, an interview was done with this patient on a regular basis in writing.

In Group I, one patient (6.25%) experienced complete vaginal vault prolapse through the hymen ring with the anterior vaginal wall as a primary defect at the introitus of the vagina, within 6 months postoperatively. Eleven (68.75%) out of 16 patients displayed no significant laxity of the vaginal apex nor walls. Three patients (18.75%) demonstrated vaginal vault descent less than the halfway point between the ischial spine and the hymen ring. One patient (6.25%) presented with the vaginal cuff below the halfway point between the ischial spine and the hymen ring. In Group I, a total number of four patients (25%) displayed vaginal cuff descent, which was observed at or after 36 months following surgery. Two out of 16 patients (12.50%) were observed in the hospital for 24 h due to over 4 h of surgical time. One postmenopausal patient (6.25%), age 71, has had a good result of the vaginal suspension and support; however, the vaginal introitus and lower part of the vagina revealed stenosis. In Group I, surgical time ranged from 3 h and 7 min to 6 h and 5 min with an average time of 3 h and 42 min.

In Group II, among 11 women, there was no observed vaginal apex prolapse within 42 months. Ten out of 11 patients (90.91%) displayed no laxity of the vaginal apex nor walls. One patient (9.09%) demonstrated vaginal vault descent less than the halfway point between the ischial spine and the hymen ring. The patient from Group II presented with vaginal cuff descent at 36 months following surgery; this time of appearance of the vaginal cuff descent corresponds with time when this abnormality was displayed in Group I. One out of 11 patients (9.09%) was observed in the hospital for 24 h due to over 4 h of surgical time. In Group II surgical time ranged from 2 h and 50 min to 5 h and 10 min with an average time of 3 h and 20 min. After performing the retropubic-mid-pelvis attachments of the lateral superior vaginal sulci to pelvic side wall (obturator internus and pubococcygeus muscles) and to the tendinous arch of the levator ani muscle (white line), the cystocele did not require repair.

5. Discussion

The prevalence of post hysterectomy vaginal vault prolapse is unknown; however, it is expected at a range of 900–1200 cases per year in the United States [4]. A durable colpopexy with restoration of adequate vaginal topography and gross/functional anatomy has proved an overwhelming surgical task for several generations of pelvic surgeons. Since 1892 several different surgical approaches have been offered: sacrotuberous fixation [5]; approximation of the uterosacral ligaments to the vaginal apex and then inserting them to the anterior sacrum [6]; the sacrospinous ligament used as suspension points for the vaginal vault [7–10]; abdominal sacral colpopexy [11–13]; Cooper's ligament adapted for vaginal vault suspension [14]; fascia lata utilized for colpopexy [15,16]; and a laparoscopic retroperitoneal rectovaginal septum and pouch of Douglas reconstruction and retroperitoneal suspension of the vaginal vault to the uterosacral-cardinal ligament complex-pubocervical fascia [1,2].

The new video laparoscopic technology and its magnification ability, digital computerized contrast enhancement, and edge correction allow close, direct inspection and identification of retropubic-mid-pelvis-reroperitoneal landmark structures such as stumps of the cardinal and uterosacral ligaments and their relationship to neighbouring pelvic structures, or the lateral superior vaginal sulci, or tendinous arch. Such ability provides an intimate laparoscopic view of the retroperitoneal pelvis and permits an endoscopic surgeon to execute the vaginal apex suspension with great precision.

Experience with initial laparoscopic retroperitoneal colpopexy in Group I demonstrated that in 31.25% the vaginal vault descent occurred with different degrees of progression. This technique was analyzed from video types and revealed that the deep layer of the uterosacral ligaments (in 1929 Okabayashi [17] introduced a functional classification of the uterosacral ligament into superficial and deep layers) was attached to the posterior aspect of the vagina retroperitoneally. As intraoperative observations indicated, insertion of the deep layer of the uterosacral ligaments posteriorly into the vaginal apex placed upper vagina parallel to the rectum, giving a natural vaginal alignment. A lateral–posterior aspect of the vagina was suspended to the cardinal ligament bilaterally. Anteriorly, the vagina was suspended to the vesicocervical fascia. An enterocele was repaired by high excision of pelvic hernia sac and closure with anterior pararectal fascia-posterior paravaginal fascia, and laterally the deep layer of the uterosacral ligaments obliterated the enterocele defect [3]. Therefore, the vaginal cuff was suspended to strong fibromuscular tissue from anterior, posterior and lateral aspects. All ligaments were adequately shortened. Consequently, the vaginal cuff itself was firmly suspended. This analysis confirmed that it must be an additional mechanism which plays a role in the occurrence of this iatrogenic medical entity.

In 1948, Goff [18] studied the surgical anatomy of the pubocervical fascia and demonstrated that anterior vaginal wall descent with cystourethrocele formation is not the result of a defect of the anterior vaginal wall, and contrary to medical views, that the anterior vaginal wall, with its tunica propria and muscular coat over a cystocele, is hypertrophic. Therefore, the coexisting etiology of cystocele associated with vaginal cuff descent/prolapse may be in the mid-pelvis of the endopelvic fascia.

The anatomical distribution of fibromuscular tissue of the cardinal ligament runs in two directions: laterally, tissue advances to the pelvic bone; ventrally, it extends to the pubocervical fascial tissue and passes under the symphysis to merge with the ureogenital diaphragm. Therefore, the following questions arose: (1) What is the condition of the mid-pelvis-retropubic tissue with special attention to the pubocervical fascia's condition and its relationship to the lateral superior vaginal sulci? (2) What role does cystocele play in vaginal cuff prolapse following hysterectomy? In 1912, White [19] and later Durfee [20], Macer [21], Richardson et al. [22] and Shull et al. [23] documented that fascial defects between the lateral pubocervical and lateral superior sulci on each side of the vagina fuse with the fascia of the muscles of the pelvic sidewall (obturator internus and pubococcygeus muscles) at the tendinous arch of the levator ani muscle. Those clinical findings [19–22] led to the conclusion that during translaparoscopic colpopexy, reconstructing retropubic lateral endopelvic fascia defect(s) will suspend mid-pelvis vaginal wall and repair cystocele.

Bearing in mind that vaginal prolapse following hysterectomy, executed either abdominally or transvaginally, is an iatrogenic medical entity, emphasis should be placed on prevention during initial surgery. Recently, results of a very encouraging 10-year clinical study (from 1982 to 1993) of a new simplified laparotomy prophylactic retroperitoneal culdeplasty and vaginal cuff suspension have been published by Ostrzenski [24]. In 1990, this technique was adapted and is routinely executed during laparoscopic total abdominal hysterectomy, in which no transvaginal surgery is executed [25,26]. It must be emphatically stressed that prophylactic retroperitoneal rectovaginal space and pouch of Douglas reconstruction and/or enterocele repair following hysterectomy is very important to address, since clinical data verify a possible life threatening small in-

testinal eventration through narcotized enterocele sac [27].

When the results of Group I are compared with Group II results, the new, modified translaparoscopic retroperitoneal-retropubic colpopexy appeared to be a superior technique and very promising, and offers: (1) vaginal cuff suspension by using natural neighbouring genital pelvic structures, (2) reconstruction of pelvic gross/functional anatomy and placement of the vagina adequately in midline position, and alignment of the vagina parallel to the rectum, and re-constitution of the proper relationship between the newly suspended vagina and pelvic viscera.

It is a safe operation, simple to learn, and easy to execute; however, retroperitoneal-retropubic-mid-pelvis surgical experience as well as advanced operative laparoscopic skill are needed to meet the technical demands of the operation.

Reviewing existing literature indicates that the new, modified laparoscopic colpopexy is the first presentation of this type of operation for the treatment of complete vaginal prolapse following hysterectomy. There is no such surgical approach being described by means of laparotomy, transvaginally, or translaparoscopically for this medical condition.

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