

LAPAROSCOPIC ROUND LIGAMENT SUSPENSION FOR VAULT PROLAPSE: EARLY EXPERIENCE AND RESULTS

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Abstract

Introduction & Objective: Pelvic organ prolapse is a common complication after hysterectomy with an 11.6% requiring surgery.³ Laparoscopic Sacrocolpopexy has been a standard treatment option for the vault prolapse. The highest incidence peaks of vault prolapse surgeries are among women over 70 years.^{4,5} who also have major comorbidities due to the old age and post-hysterectomy morbidities which may limit surgical options in these women. Usage of Round ligaments as an alternative native tissue repair has been described during hysterectomy for pelvic organ prolapse to prevent vault prolapse in the future.⁶ In our study, we employed this round ligament Colposuspension as a surgical management for high-risk patients presenting with post hysterectomy vault prolapse. **Methods:** This study is a prospective observational study to estimate the outcomes of this novel laparoscopic round ligament colposuspension as a surgical management option for post hysterectomy vault prolapse. We included vault prolapse patients following hysterectomy with age > 60 years, classified as high risk by anesthesiologist and are willing for minimally invasive surgery and excluded patients with prior failed prolapse repair. The patients were followed up at 7 days, 15 days and at 1, 3, 6, and 12 months postoperatively. Various parameters recorded include patients age, comorbidities, grade of prolapse, urinary symptoms, ASA physical risk grade, pre- and postoperative serum hemoglobin, packed cell volume, intraoperative duration (from port entry to closure), intraoperative and perioperative complications like bleeding requiring transfusion, prolonged intubation, need for intensive care, hospital stay, persistent pelvic pain/discomfort beyond postoperative day 7, time to return to normal activity, wound complications, recurrence of prolapse and onset of denovo urinary symptoms. Descriptive statistics were used to estimate the outcomes of this native tissue repair using round ligaments. **Results:** We enrolled three subjects with a mean age of 73.6 years and an Eastern Cooperative Oncology Group (ECOG) score of 2. All subjects presented with grade 4 vault prolapse and underwent laparoscopic native tissue repair using round ligaments. The mean intraoperative duration was 38.6 minutes with a minimal blood loss of 30 ml. No intraoperative drains were required, and the perioperative drop in hemoglobin was negligible at 0.1 mg/dl. At follow-up, none of the subjects experienced recurrent prolapse or developed new urinary symptoms. Additionally, no perioperative complications were observed. **Conclusion:** Laparoscopic colposuspension using round ligaments represents a minimally invasive, effective option for treating vault prolapse in women. It is especially feasible and recommended in elderly women with severe grades of vaginal prolapse. The ease of the procedure coupled with the short duration of surgery and quick recovery times make this an attractive alternative option in patients with multiple comorbidities.

Keywords: Native tissue repair, Round ligament, Vault prolapse, Hysterectomy, Pelvic organ prolapse, Laparoscopic colposuspension.

INTRODUCTION

The burden of Pelvic organ prolapse has been on the rising trend, in women both with intact uterus as well as hysterectomized. The major share of the factors causing this rise might be attributable to the increasing obesity and unhealthy lifestyles without adequate physical activity. This trend, which was previously observed in developed nations, has spread to the developing nations as well. Hysterectomy is the commonest gynecologic operation performed not only for malignant disease but also for many benign conditions such as fibroids, endometrial hyperplasia, adenomyosis, uterine prolapse, dysfunctional uterine bleeding, and cervical intraepithelial neoplasia. The prevalence of hysterectomy in India is 11.4%.¹ This rise in hysterectomy rates might be partly due to the increasing awareness and access to healthcare but there has been a question of probable rise in unnecessary hysterectomies in middle- and low-income countries.² Pelvic organ prolapse is a common complication after hysterectomy with an 11.6% requiring surgery.³ Laparoscopic Colposuspension has been a standard treatment option for the vault prolapse.

The highest incidence peaks of vault prolapse surgeries are among women over 70 years.^{4,5} Majority of this population have major comorbidities due to the old age and post-hysterectomy morbidities which may limit surgical options in these women. Usage of Round ligaments as an alternative native tissue repair has been described during hysterectomy for pelvic organ prolapse to prevent vault prolapse in the future.⁶ In our study, we employed this round ligament Colposuspension as a surgical management for high-risk patients presenting with post hysterectomy vault prolapse.

METHODS

This study is a prospective observational study to estimate the outcomes of this novel laparoscopic round ligament colposuspension as a surgical management option for post hysterectomy vault prolapse. A written informed consent was obtained from all the study participants. Ethics committee approval was obtained from the ethics committee of XXXXXXXX institute with approval number- XXXXXXXX/EC/01/2023-24. We included vault prolapse patients following hysterectomy with age > 60 years, classified as high risk by anesthesiologist and are willing for minimally invasive surgery. The risk stratification was based on The American Society of Anesthesiologists (ASA) physical status

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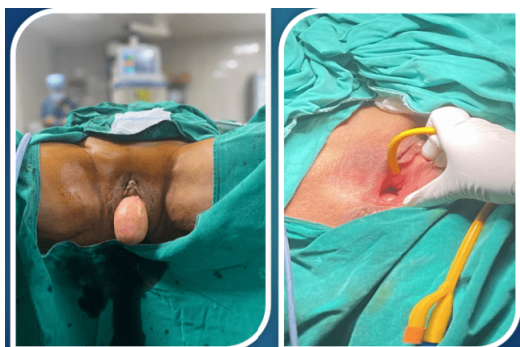
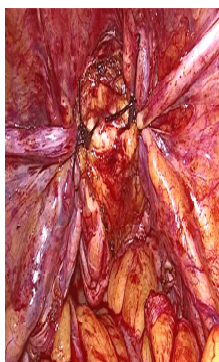
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classification system with high risk defined as ASA grade ≥ 3 .⁷ We excluded patients younger than 60 yrs and those with prior failed prolapse repair.

Technique: The technique involves standard pneumoperitoneum creation, and laparoscopic port insertion in a patient placed in supine trendelenberg position with low lithotomy under general anesthesia. One 10 mm camera port and two 5mm working ports are used. We start with adhesiolysis if any adhesions are encountered secondary to previous hysterectomy. The vaginal vault identification laparoscopically is facilitated with the help of surgical gauze mop pushed vaginally using sponge holding forceps. Peritoneum over the vesicovaginal pouch is incised and subsequently, the vault is separated posteriorly from the rectum and then all around. Round ligaments are identified on both the sides and assessed for laxity. A nonabsorbable suture (prolene or silk 2-0) is used to suture the vault with the taut round ligament. Similar fixation of vault to the contralateral round ligament is performed. The peritoneum is sutured over the vault and fixation sutures to prevent bowel related complications. The pneumoperitoneum is actively evacuated before port closure in layers. A foleys catheter is retained in postoperative period for 1 day.

The patients were followed up at at 7 days, 15 days and at 1, 3, 6, and 12 months postoperatively. Various parameters recorded include patients age, comorbidities, grade of prolapse, urinary symptoms, ASA physical risk grade, pre- and postoperative serum hemoglobin, packed cell volume, intraoperative duration (from port entry to closure), intraoperative and perioperative complications like bleeding requiring transfusion, perolnged intubation, need for intensive care, hospital stay, persistent pelvic pain/discomfort beyond postoperative day 7, time to return to normal activity, wound complications, recurrence of prolapse and onset of denovo urinary symptoms.

Descriptive statistics were used to estimate the outcomes of this native tissue repair using round ligaments.



RESULTS

We enrolled three subjects with a mean age of 73.6 years and an Eastern Cooperative Oncology Group (ECOG) score of 2. All subjects presented with grade 4 vault prolapse and underwent laparoscopic native tissue repair using round ligaments. Patient characteristics are summarised in table 1. The mean intraoperative duration was 38.6 minutes with a minimal blood loss of 30 ml. No intraoperative drains were required, and the perioperative drop in hemoglobin was negligible at 0.1 mg/dl. Notably, one subject's stress urinary incontinence was resolved postoperatively. Postoperative recovery was swift, with oral analgesics managing pain for 3 days and patients resuming normal activities within the same timeframe. The average hospital stay was 2 days, with patients being discharged on postoperative day 1 following Foley catheter removal. At follow-up, none of the subjects experienced recurrent prolapse or developed new urinary symptoms. Additionally, no perioperative complications were observed. A detailed summary of perioperative events is presented in Table 2.

Table 1. patient characteristics

	Patient 01	Patient 02	Patient 03
Age	72	68	81
Hysterectomy	+	+	+
Ecog score	2	2	2
Grade of prolapse	IV	IV	IV
Comorbidities	DM-II, HTN	HTN	IHD,HTN
Vaginal deliveries	2	3	1
Voiding symptoms	Present	Absent	Absent
Storage symptoms	Absent	Present	Present
Stress incontinence	Absent	Present	Absent

Table 2. perioperative parameters

Parameters	Value
Peri-operative blood transfusion	0
Bowel injury	0
Duration of surgery	38.6 min (45-59)
Duration of hospital stay	2 days
Return to normal activity	3 days
SSI	0
Port-site hernia	0

DISCUSSION

Vault prolapse following hysterectomy frequently affects geriatric women with multiple comorbid conditions, reduced functional capacity and reduced immune capacities. Such frail women are at high risk of delay wound healing, perioperative complications and classified as high risk for anesthesia. Therefore, selecting an optimal surgical procedure is crucial and should be made keeping in mind the unique properties of this patient population. Minimally invasive surgeries with minimal dissection and surgical manipulation with considerable success rate yields best choice in this population. Laparoscopic colposuspension using round ligaments is a surgical technique for treating vault prolapse. This approach represents a minimally invasive method aimed at providing adequate support to the urethra, which helps prevent stress urinary incontinence and also to vaginal vault, which helps prevent recurrent POP. Native Tissue Repair (NTR) has regained importance following the FDA's warning against mesh usage due to increased perioperative complications like mesh exposure, fistulae and bladder/rectal injuries. NTR by a transvaginal stump fixation is performed after total

hysterectomy to prevent future vault prolapse by Shull method where the vaginal stump is fixed to the uterosacral ligament.⁸ However, a risk of ureteral injury remains as the ureter is in close proximity to the uterosacral ligament remains and effective repair may not be achievable in patients with severe POP because the vaginal canal is long with overextended or weakened uterosacral ligaments.

Round Ligament as a Suspension Structure

To overcome these challenges, we attempted this novel method of native tissue repair using round ligaments. The vaginal stump was fixed to the uterine round ligament, which is anatomically higher & histologically stronger & has no vital organs in the adjacent areas. The round ligaments, normally involved in supporting the uterus, have been adapted in certain colposuspension techniques to provide additional support. The use of round ligaments for this purpose was developed to avoid some of the complications associated with other methods that rely on the sacral promontory or other structures that may be more prone to causing tension and chronic pelvic pain, tissue damage and other mesh related complications. By suturing the round ligaments to the vault, the surgeon creates a sling-like effect, providing adequate support to the urethra as well as vault, without putting excessive tension on nearby structures. This also has the benefit of reducing the risk of injury to the bladder or rectum, which can occur with other POP repairs. There has been previous attempts of using round ligaments in POP. Prophylactic fixation of vaginal stump to round ligaments during hysterectomy has been described by Kakinuma *et al.*⁶ Unilateral fixation of uterus to round ligament for uterine prolapse has been described with 75.4% success rate in 55 women.⁹ In 1983 Lampe introduced a novel technique in which the vaginal vault is fixed to the bilateral round, infundibulopelvic, and uterosacral ligaments to treat prolapse of the vaginal vault after resection of 2 to 4 cm opened vagina.¹⁰ Modified Lampe technique has been described using the Lampe technique during hysterectomy.¹¹ Advantages of Using Round Ligaments: One of the primary advantages of using round ligaments in colposuspension is the reduced intraoperative duration, reduced intraoperative complications and reduced risk of injury to other structures, such as the bladder, urethra, or rectum. The learning curve is also minimal as the procedure is simple without involving huge dissections and strategic positioning of round ligaments without vital structures like major vessels/organs/nerves nearby. By utilizing these ligaments, surgeons can achieve a supportive suspension with lower tension, which can result in fewer post-operative complications like pain, infection, or voiding difficulties. Furthermore, the round ligaments are more easily accessible during laparoscopic surgery and are less likely to weaken or fail over time. This makes the procedure particularly beneficial for older women or those with a higher risk profile. Additionally, the procedure is technically straightforward, and its success is largely unaffected by the surgeon's skill level. This is attributed to the anatomical location of the uterine round ligament, which is relatively isolated from critical structures, minimizing the risk of complications.

In this study, no surgical complications were observed in the cases analyzed. Another advantage of this NTR, is having minimal intra-operative complication risks, such as organ injuries during retroperitoneal tunnel creation for mesh insertion & vascular injuries during fixation of the mesh to the

anterior longitudinal ligament of the sacral promontory in laparoscopic sacrocolpopexy (LSC). When it is desirable to avoid LSC for reasons such as severe adhesions, it is possible to immediately switch over to this method. Potential Complications and Considerations: Long-term data on the durability of round ligament support for colposuspension are still evolving and late recurrences are to be evaluated in larger studies. It's also important to note that not all women are suitable candidates for this surgery. Factors such as the degree of pelvic organ prolapse, the severity of incontinence, and the presence of other pelvic floor dysfunctions can influence the choice of treatment. Therefore, careful patient selection and preoperative evaluation are critical. Limitations: This single-center study has a small sample size. Future randomized comparative studies with laparoscopic sacrocolpopexy (LSC) and longer follow-up will refine the benefits and value of this NTR using round ligaments.

Conclusion

Laparoscopic colposuspension using round ligaments represents a minimally invasive, effective option for treating vault prolapse in women. It is especially feasible and recommended in elderly women with severe grades of vaginal prolapse. The ease of the procedure coupled with the short duration of surgery and quick recovery times make this an attractive alternative option in patients with multiple comorbidities. By utilizing the round ligaments, this technique provides a sling-like support to the vault with fewer risks of complications, less tension on surrounding structures, and faster recovery times compared to traditional methods. However, long-term outcomes and patient selection remain important considerations for ensuring the procedure's success.

REFERENCES

- Desai S, Singh RJ, Govil D, Nambiar D, Shukla A, Sinha HH, Ved R, Bhatla N, Mishra GD. Hysterectomy and women's health in India: evidence from a nationally representative, cross-sectional survey of older women. *Womens Midlife Health*. 2023 Jan 6;9(1):1. doi: 10.1186/s40695-022-00084-9. PMID: 36609516; PMCID: PMC9825041.
- Meher, T. & Sahoo, H. Changing trends in the preference of health care facility and reasons for hysterectomy in India. *Health Care Women Int*. 41(7), 802–816 (2020).
- Kuittinen T, Tulokas S, Rahkola-Soisalo P, et al. Pelvic organ prolapse after hysterectomy: A10-year national follow-up study. *Acta Obstet Gynecol Scand*. 2023; 102:556-566. doi:10.1111/aogs.14542
- Kurkijärvi K, Aaltonen R, Gissler M, Mäkinen J. Pelvic organ pro-lapse surgery in Finland from 1987 to 2009: a national registerbased study. *Eur J Obstet Gynecol Reprod Biol*. 2017; 214:71-77.
- Wu JM, Vaughan CP, Goode PS, et al. Prevalence and trends of symptomatic pelvic floor disorders in U.S. women. *Obstet Gynecol*. 2014; 123:141-148.
- Kakinuma T, Kaneko A, Kakinuma K, Imai K, Takeshima N, Ohwada M. New native tissue repair for pelvic organ prolapse: Medium-term outcomes of laparoscopic vaginal stump-round ligament fixation. *World J Clin Cases*. 2023 May 26;11(15):3457-3463. doi: 10.12998/wjcc.v11.i15.3457. PMID: 37383910; PMCID: PMC10294204.

7. Doyle DJ, Hendrix JM, Garmon EH. American Society of Anesthesiologists Classification. In: StatPearls. Treasure Island (FL): Stat Pearls Publishing; 2024 Jan.
8. Shull BL, Bachofen C, Coates KW, Kuehl TJ. A transvaginal approach to repair of apical and other associated sites of pelvic organ prolapse with uterosacral ligaments. *Am J Obstet Gynecol*. 2000 Dec;183(6):1365-73; discussion 1373-4. doi: 10.1067/mob.2000.110910. PMID: 11120498.
9. Hsieh CH. A new laparoscopic technique for uterine prolapse: one-sided uterine fixation through the round ligament. *Int Urogynecol J*. 2011 Feb;22(2):213-9. doi: 10.1007/s00192-010-1269-z. Epub 2010 Sep 25. PMID: 20871979.
10. Lampe L. New operative procedure for vaginal vault prolapse. *Magy Neorv L*. 1983;46:197-202.
11. Kim DH, Han SS, Lee IH. Long-term results of laparoscopic colposuspension with bilateral round-infundibulopelvic ligaments after hysterectomy for uterovaginal prolapse. *J Minim Invasive Gynecol*. 2009 Nov-Dec;16(6):687-91. doi: 10.1016/j.jmig.2009.06.016. Epub 2009 Sep 5. PMID: 19734108.
