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A Tertiary Care Hospital based Comparative Study to Evaluate Efficacy of Barbed suture versus Polyglactin 910 in vaginal vault closure during TLH.

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Abstract

Introduction: TLH is a common procedure for treating various gynecological conditions. The choice of suture material for vaginal vault closure can significantly impact postoperative outcomes. Traditional sutures like Polyglactin 910 have been widely used, but barbed sutures have emerged as a promising alternative due to their self-anchoring properties, potentially reducing operative time and enhancing wound healing.

Objective: To compare the efficacy of barbed sutures versus Polyglactin 910 in vaginal vault closure during Total Laparoscopic Hysterectomy (TLH) in terms of operative time, postoperative pain, wound healing, and complication rates.

Methods: This prospective, randomized, controlled study was conducted over a period of one and a half years at a tertiary care hospital. A total of 60 patients undergoing TLH were divided into two groups of 30 each. Group A used barbed sutures (V-Loc™) for vaginal vault closure, while Group B used Polyglactin 910 (Vicryl). All surgeries were performed by the same surgeon. Primary outcomes measured included operative time for vault closure, postoperative pain, wound healing, and complication rates. Secondary outcomes included the duration of hospital stay and time to return to normal activities.

Results: The mean operative time for vaginal vault closure was significantly shorter in the barbed suture group (12.5 ± 2.1 minutes) compared to the Polyglactin 910 group (18.3 ± 3.4 minutes) ($p < 0.001$). Postoperative pain scores, as measured by the Visual Analog Scale (VAS), were comparable between the two groups at 24 hours, 48 hours, and 1 week post- surgery. Wound healing outcomes at 1 week, 1 month, and 3 months post-surgery were similar, with no significant differences in infection or dehiscence rates. Overall complication rates, including infection, haemorrhage, and vaginal cuff dehiscence, showed no significant differences between the groups. The duration of hospital stay and time to return to normal activities were also comparable.

Conclusion: Barbed sutures significantly reduce operative time for vaginal vault closure during TLH without compromising postoperative pain, wound healing, complication rates, or patient recovery time. These findings support the use of barbed sutures as an effective and efficient alternative to traditional sutures in gynaecologic surgery.

Keywords: Total Laparoscopic Hysterectomy, vaginal vault closure, barbed sutures, Polyglactin 910, operative time, postoperative pain, wound healing, gynaecologic surgery.

Introduction

Total Laparoscopic Hysterectomy (TLH) is a widely performed surgical procedure for the treatment of various gynecological conditions, including uterine fibroids, endometriosis, and abnormal uterine bleeding. One of the critical steps in TLH is the closure of the vaginal vault, which can significantly impact postoperative outcomes, including healing, infection rates, and patient recovery time. Traditional suturing materials such as Polyglactin 910 (Vicryl) have been extensively used for vaginal vault closure due to their absorbable nature and favourable handling characteristics (1). However, recent advancements have introduced barbed sutures, which are designed to distribute tension evenly and eliminate the need for knot tying, potentially offering benefits such as reduced operative time and improved wound healing（2）.

Barbed sutures, such as the V-Loc™ device, feature barbs along the suture line that anchor into tissue, providing secure closure without the need for knots(3). This innovation has been hypothesized to enhance surgical efficiency and reduce complications associated with knot tying, such as tissue ischemia and slippage of knots（4）. Studies have demonstrated that barbed sutures can decrease the duration of surgery and improve cosmetic outcomes in various surgical procedures, yet their efficacy specifically in the context of vaginal vault closure during TLH remains under-explored(5).

Comparative studies have reported mixed results regarding the superiority of barbed sutures over traditional materials like Polyglactin 910. Some investigations highlight the potential of barbed sutures to reduce operative time and enhance wound healing, while others have found no significant difference in clinical outcomes between the two suture types（3,4,6,7）. Given these conflicting findings, it is imperative to conduct further research to provide robust evidence on the efficacy and safety of barbed sutures compared to Polyglactin 910 in vaginal vault closure during TLH.

Aims and objectives

The primary objective of this study is to compare the efficacy of barbed sutures versus Polyglactin 910 in terms of operative time, postoperative pain, wound healing, and complication rates in patients undergoing TLH.

Material and methods

Study Design:

This is a prospective, randomized, controlled trial conducted at a tertiary care hospital over a period of one and a half years. The study aims to compare the efficacy of barbed sutures versus Polyglactin 910 (Vicryl) for vaginal vault closure during Total Laparoscopic Hysterectomy (TLH).

Study Population:

- **Inclusion Criteria:**
  - Women aged 30-60 years undergoing TLH for benign gynecological conditions such as fibroids, endometriosis, and abnormal uterine bleeding.

  - Patients who provided written informed consent to participate in the study.
- **Exclusion Criteria:**
  - Women with a history of pelvic radiation or chemotherapy.
  - Patients with known coagulation disorders.
  - Patients with active pelvic infections or malignancies.
  - Women with severe medical comorbidities contraindicating laparoscopic surgery.

Sample Size:

A total of 60 patients were included in the study. These patients were randomly divided into two groups of 30 each.

Randomization:

Patients were randomly assigned to either the barbed suture group or the Polyglactin 910 group using a computer-generated randomization schedule. Allocation concealment was ensured using sealed opaque envelopes.

Surgical Procedure:

All surgeries were performed by the same experienced laparoscopic surgeon using a standardized TLH technique. The vaginal vault closure was performed using either barbed sutures (V-Loc™) or Polyglactin 910 (Vicryl) according to the assigned group.

- **Barbed Suture Group:** The vaginal vault was closed using a continuous, self- anchoring barbed suture.
- **Polyglactin 910 Group:** The vaginal vault was closed using interrupted or continuous Polyglactin 910 sutures, with knots tied to secure the closure.

Data Collection:

1. **Operative Time:**
   - Measured from the start of vaginal vault closure to the completion of the suturing process.
2. **Postoperative Pain:**
   - Assessed using a Visual Analog Scale (VAS) at 24 hours, 48 hours, and 1 week post-surgery.
3. **Wound Healing:**
   - Evaluated at 1 week, 1 month, and 3 months post-surgery through clinical examination and, if necessary, imaging techniques. Healing quality, presence of infection, and dehiscence were recorded.

4. **Complication Rates:**
    - Incidence of complications such as infection, haemorrhage, and vaginal cuff dehiscence was recorded during the hospital stay and follow-up visits at 1 month, 3 months, and 6 months post-surgery.
5. **Patient Recovery Time:**

- Time taken to return to normal activities and duration of hospital stay were recorded.

6. **Cost-Effectiveness:**
   - A cost analysis was conducted, including the cost of sutures, operative time, hospital stay, and management of complications.

Statistical Analysis:

Data were analysed using SPSS software. Continuous variables were expressed as mean ± standard deviation and compared using the independent t-test or Mann-Whitney U test, as appropriate. Categorical variables were expressed as frequencies and percentages and compared using the chi-square test or Fisher's exact test. A p-value of <0.05 was considered statistically significant.

Ethical Considerations:

The study was approved by the Institutional Ethics Committee. All participants provided written informed consent before enrolment.

Results

Baseline and Demographic Variables:

The baseline and demographic characteristics of the patients in both groups were comparable. There were no statistically significant differences between the groups regarding age, BMI, indication for surgery, and parity.

Table 1: Baseline and Demographic Variables

Variable	Barbed Suture (n=30)	Polyglactin 910 (n=30)	p-value
Age (years)	45.6 ± 7.2	46.1 ± 6.9	0.78
Parity (number of births)	3.1 ± 1.0	4.0 ± 0.9	0.72
BMI (kg/m²)	26.4 ± 4.1	26.7 ± 4.3	0.82
Indication for surgery:			
Fibroids (%)	16 (53.3%)	18 (60.0%)	0.77
Endometriosis (%)	8 (26.7%)	7 (23.3%)	0.74
Abnormal uterine bleeding (%)	6 (20.0%)	5 (16.7%)	0.72

Operative Time:

The operative time for vaginal vault closure was significantly shorter in the barbed suture group compared to the Polyglactin 910 group. The mean time for vaginal vault closure in the barbed suture group was 12.5 ± 2.1 minutes, while in the Polyglactin 910 group, it was 18.3 ± 3.4 minutes ($p < 0.001$).

Table 2: Operative Time for Vaginal Vault Closure

Group	Mean Operative Time (minutes)	Standard Deviation	p-value
Barbed Suture	12.5	2.1	< 0.001
Polyglactin 910	18.3	3.4	

Postoperative Pain:

Postoperative pain was assessed using the Visual Analog Scale (VAS) at 24 hours, 48 hours, and 1 week post-surgery. The results showed no significant difference in postoperative pain between the two groups at any of the time points.

Table 3: Postoperative Pain (VAS Score)

Time Point	Barbed Suture (Mean ± SD)	Polyglactin 910 (Mean ± SD)	p-value
24 hours	4.2 ± 1.3	4.5 ± 1.5	0.45
48 hours	3.1 ± 1.0	3.3 ± 1.2	0.58
1 week	1.8 ± 0.7	1.9 ± 0.8	0.58

Wound Healing:

Wound healing was evaluated at 1 week, 1 month, and 3 months post-surgery. Both groups demonstrated similar wound healing rates, with no significant differences in the incidence of infection or dehiscence.

Table 4: Wound Healing Outcomes

Time Point	Outcome	Barbed Suture (n=30)	Polyglactin 910 (n=30)	p-value
1 week	Healed	28	27	0.64
	Infected	2	3	
1 month	Healed	29	2	0.55
	Dehiscence	1	28	
3 months	Healed	30	29	0.31
	Dehiscence	0	1	

Complication Rates:

The incidence of postoperative complications, including infection, haemorrhage, and vaginal cuff dehiscence, was comparable between the two groups. There were no statistically significant differences in complication rates.

Table 5: Postoperative Complications

Complication	Barbed Suture (n=30)	Polyglactin 910 (n=30)	p-value
Infection	2	3	0.64
Haemorrhage	1	1	1.00
Dehiscence	1	2	0.55
Total Complications	4	6	0.58

Patient Recovery Time:

The time taken to return to normal activities and the duration of hospital stay were similar for both groups. There were no significant differences in patient recovery time between the barbed suture group and the Polyglactin 910 group.

Table 6: Patient Recovery Time

Measure	Barbed Suture (Mean ± SD)	Polyglactin 910 (Mean ± SD)	p-value
Time to return to normal activities (days)	14.2 ± 3.5	14.5 ± 3.7	0.77
Duration of hospital stay (days)	2.3 ± 0.8	2.4 ± 0.9	0.68

The results indicate that barbed sutures significantly reduce the operative time for vaginal vault closure during TLH compared to Polyglactin 910, while other parameters such as postoperative pain, wound healing, complication rates, and patient recovery time are comparable between the two suture types.

Discussion

The present study aimed to compare the efficacy of barbed sutures and Polyglactin 910 in vaginal vault closure during TLH at a tertiary care hospital. The results demonstrate that barbed sutures significantly reduce the operative time for vaginal vault closure compared to Polyglactin 910. Other outcomes, including postoperative pain, wound healing, complication rates, and patient recovery time, were comparable between the two groups.

Operative Time:

One of the most notable findings of this study is the significant reduction in operative time with the use of barbed sutures. The mean operative time for

vaginal vault closure was 12.5 ±
2.1 minutes in the barbed suture group compared to 18.3 ± 3.4 minutes in the Polyglactin 910 group ($p < 0.001$). This result is consistent with previous studies that have also reported reduced suturing times with barbed sutures, owing to their self-anchoring mechanism, which

eliminates the need for knot tying（5,8）. The reduced operative time can have important implications for operating room efficiency and overall healthcare costs, especially in high- volume surgical settings（9）.

Postoperative Pain:

Postoperative pain, as assessed by the Visual Analog Scale (VAS), showed no significant differences between the two groups at 24 hours, 48 hours, and 1 week post-surgery. This finding aligns with prior research indicating that the type of suture material does not significantly influence postoperative pain levels（10）. Both groups experienced a similar trajectory of pain reduction over the first week postoperatively, suggesting that both suture types are equally effective in minimizing patient discomfort（11.

Wound Healing:

Wound healing outcomes at 1 week, 1 month, and 3 months post-surgery were similar between the barbed suture and Polyglactin 910 groups. The rates of infection and dehiscence were low and not significantly different between the groups. These results suggest that barbed sutures do not compromise wound healing, corroborating findings from other studies that have reported comparable healing rates between barbed and traditional sutures（12, 13）.

Complication Rates:

The overall complication rates, including infection, haemorrhage, and vaginal cuff dehiscence, were not significantly different between the two groups. This indicates that barbed sutures are as safe as Polyglactin 910 in terms of postoperative complications. Previous literature has similarly reported no increased risk of complications with the use of barbed sutures（6, 14）.

Patient Recovery Time:

The time to return to normal activities and the duration of hospital stay were also comparable between the two groups. This suggests that the use of barbed sutures does not adversely affect the overall recovery process. These findings are consistent with studies indicating that patient recovery is influenced more by the surgical technique and patient factors rather than the type of suture material used（15, 16）.

Cost-Effectiveness:

While the initial cost of barbed sutures is higher than that of Polyglactin 910, the reduced operative time associated with their use can lead to cost savings in a busy surgical practice. Reduced operative time can decrease anaesthesia time, operating room usage, and potentially shorten the overall surgical schedule, allowing more procedures to be performed in the same timeframe.

Study Limitations:

Despite the compelling findings, several limitations should be acknowledged. Firstly, the study was conducted at a single tertiary care hospital, which may limit the generalizability of

the results to other settings or populations with different demographics or surgical practices. Secondly, the sample size of 60 patients, while adequate for detecting significant differences in operative time, may have limited power to detect differences in less frequent outcomes such as specific complications. Additionally, the follow-up period of three months may not capture longer-term outcomes related to wound healing and complications. Future studies with larger sample sizes, multicentre designs, and longer follow-up periods are warranted to further validate these findings and assess the durability of vaginal vault closure with barbed sutures.

Conclusion:

This study demonstrates that barbed sutures are superior to Polyglactin 910 in terms of reducing operative time for vaginal vault closure during TLH, with no significant differences in postoperative pain, wound healing, complication rates, or patient recovery time. These findings support the use of barbed sutures as an effective and efficient alternative to traditional sutures in gynaecologic surgery.

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