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THE EFFECT OF MEDIOLATERAL EPISIOTOMY KNOT PLACEMENT ON POSTPARTUM OUTCOMES IN MOTHERS: A RANDOMIZED CONTROLLED TRIAL

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Abstract

Background:

Episiotomy remains a widely performed obstetric intervention, particularly in assisted vaginal deliveries. While mediolateral episiotomy reduces the risk of severe perineal trauma, short-term maternal discomfort persists. Technical factors such as the position of the final suture knot have not been systematically studied despite their potential impact on pain and wound healing.

Objectives:

To evaluate whether right-sided knot placement during mediolateral episiotomy repair improves maternal comfort and wound outcomes compared to left-sided knot placement.

Methods:

This prospective, randomized controlled trial included 100 postpartum women undergoing mediolateral episiotomy. Participants were randomized into two groups: Group A (knot placed on the left side) and Group B (knot placed on the right side). Primary outcome was maternal pain assessed using the Visual Analog Scale (VAS) on postpartum days 1, 3, and 7. Secondary outcomes included pain during sitting/walking, local wound complications, and REEDA scores. Statistical analysis was performed using Student's t-test and Chi-square test, with $p< 0.05$ considered significant.

Results:

Baseline characteristics were comparable between the two groups. Group B reported significantly lower VAS scores across all time points (Day 1: 4.2 ± 1.2 vs. 5.8 ± 1.4, $p< 0.001$; Day 3: 2.9 ± 1.0 vs. 4.3 ± 1.1, $p< 0.001$; Day 7: 1.3 ± 0.8 vs. 2.1 ± 0.9, $p = 0.002$). Functional pain was also reduced in Group B (pain on sitting: 54% vs. 84%, $p = 0.001$; walking: 50% vs. 78%, $p = 0.003$). Local complications such as swelling (8% vs. 24%, $p = 0.026$) and redness (6% vs. 20%, $p = 0.039$) were significantly lower in Group B. REEDA scores on Day 7 were lower in Group B (0.7 ± 0.5 vs. 1.7 ± 0.8, $p< 0.001$), indicating better wound healing.

Conclusion: Right-sided knot placement during mediolateral episiotomy repair significantly improves maternal comfort and promotes superior wound healing compared to left-sided placement. This simple, cost-free modification may enhance postpartum outcomes and warrants consideration in routine obstetric practice.

Keywords: Episiotomy, Knot Placement, Maternal Pain, Perineal Healing, Randomized Controlled Trial, Postpartum Outcomes

INTRODUCTION

Episiotomy, defined as a surgical incision of the perineum to enlarge the vaginal orifice during the second stage of labor, remains one of the most commonly performed obstetric procedures globally despite shifts in practice patterns (1,2). Although contemporary guidelines advocate for restrictive use, episiotomy remains clinically indicated in specific situations such as instrumental vaginal deliveries, signs of fetal distress, or inadequate perineal elasticity (3–5).

Among the various techniques, the mediolateral episiotomy is the preferred approach in many regions, particularly across South Asia and Europe, owing to its lower likelihood of extension into the anal sphincter complex compared to the midline method (2,6,7). Substantial evidence from large observational cohorts and meta-analyses has demonstrated that mediolateral episiotomy significantly reduces the risk of deep perineal tears and obstetric anal sphincter injuries (OASIS), thereby reinforcing its utility in preventing severe perineal trauma (2,6,7).

Nonetheless, episiotomy—irrespective of type—is not without complications. Short-term maternal morbidities such as perineal pain, swelling, wound induration, and delays in healing are commonly reported. These issues can impact postpartum mobility, early maternal-neonatal bonding, and overall recovery (3–5). While mediolateral episiotomy is generally considered safe and not associated with a higher incidence of hematoma, infection, or wound dehiscence compared to other techniques, efforts have continued to refine surgical practice to minimize discomfort and enhance healing (3).

Recent strategies to mitigate episiotomy-related complications have focused on optimizing suture technique, choosing appropriate suture materials, and standardizing postpartum care protocols (4,5). However, certain procedural nuances—such as the position of the final suture knot—have received limited attention in clinical research. In standard practice, the final knot may be positioned medially (commonly on the left side by right-handed surgeons) or laterally, based primarily on operator preference. Anecdotal evidence and minor observational studies have raised the possibility that medial knot placement may align with pressure points encountered during sitting or ambulation, thereby exacerbating discomfort. In contrast, lateral placement may reduce mechanical irritation and potentially enhance maternal comfort.

Despite the plausible biomechanical implications, no randomized controlled trial has, to date, systematically evaluated whether the side of knot placement in mediolateral episiotomy repair influences maternal pain or wound outcomes. Identifying the impact of this small but potentially meaningful modification could offer a simple, low-cost intervention to improve postpartum comfort and optimize perineal healing in women undergoing vaginal delivery.
Therefore, the present study was conducted to evaluate whether right-sided knot placement, as compared to left-sided placement, is associated with reduced maternal discomfort and improved wound healing following mediolateral episiotomy.

The specific objectives were:

- To compare patient-reported pain scores and functional discomfort between the two groups.
- To assess local wound complications and healing status using standardized clinical scales.

Materials and Methods

Study Design

This was a prospective, randomized controlled trial designed to evaluate the effect of episiotomy knot placement—medial (left side) versus lateral (right side)—on postpartum outcomes, specifically maternal comfort and wound-related complications.

Study Setting

The study was conducted at the Department of Obstetrics and Gynaecology, [Insert Institution Name], a tertiary care obstetric center, over a period of six months from [Insert Start Month and Year] to [Insert End Month and Year].

Study Population

Postpartum women aged 18 to 40 years undergoing mediolateral episiotomy during vaginal delivery were considered eligible. Participants were recruited after obtaining written informed consent.

Exclusion Criteria included:

- History of previous perineal surgery
- Third- or fourth-degree perineal tears
- Diagnosed diabetes mellitus or immunocompromised states
- Refusal to provide consent

Sample Size

A total of 100 participants were enrolled and randomized equally into two groups (n = 50 per group), based on a priori sample size estimation to detect a clinically significant difference in Visual Analog Scale (VAS) scores with 80% power and 5% level of significance.

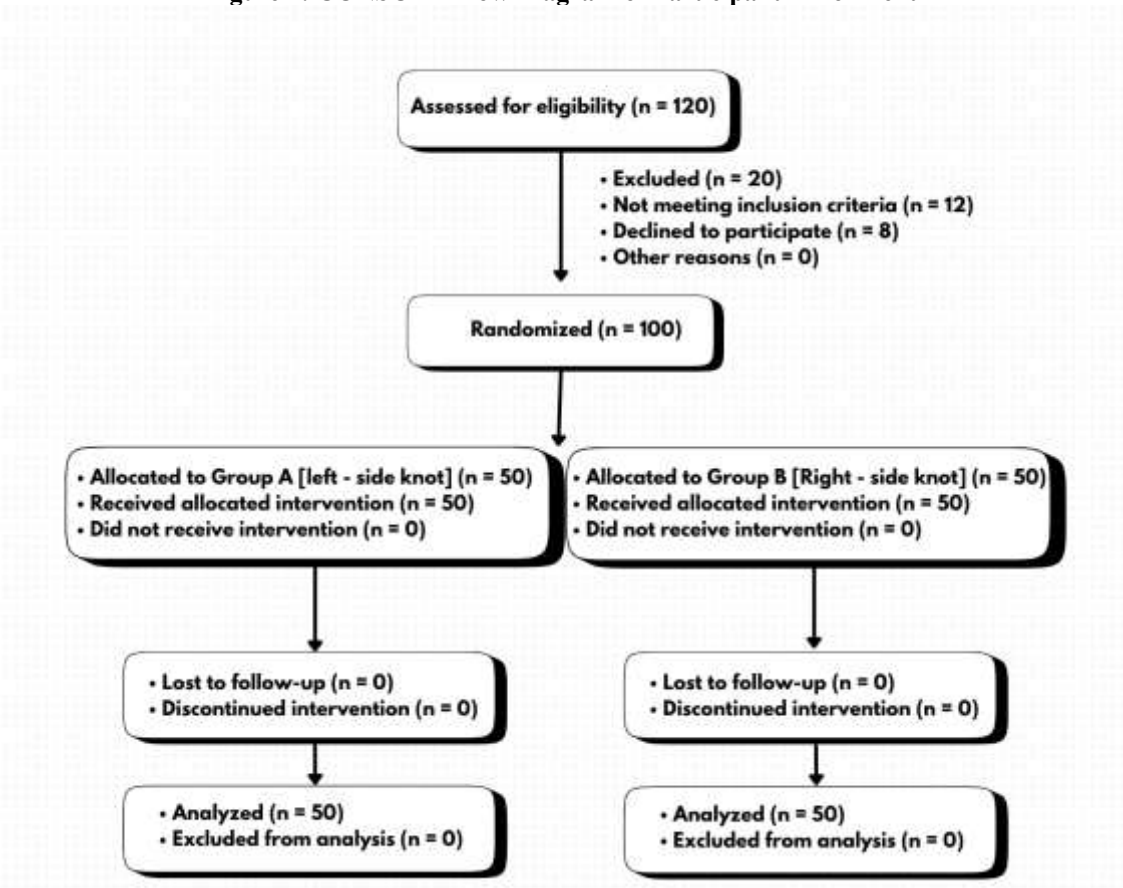
Randomization and Intervention

Participants were randomly allocated to one of two groups using a computer-generated block randomization method:

- **Group A:** Episiotomy suture knot placed on the **left side** of the wound
- **Group B:** Episiotomy suture knot placed on the **right side** of the wound

All episiotomies were performed using a standardized mediolateral technique by experienced obstetricians. A uniform absorbable suture material (Vicryl 2-0) was used in all cases. Only the final knot placement differed between the groups.

Figure 1: CONSORT Flow Diagram of Participant Enrollment



Outcome Measures

Primary Outcome:

- Maternal discomfort, as measured by the Visual Analog Scale (VAS) on postpartum days 1, 3, and 7.

Secondary Outcomes:

- Pain during sitting and walking
- Swelling or induration at the suture site
- Wound healing status assessed using the REEDA scale (Redness, Edema, Ecchymosis, Discharge, Approximation)

- Requirement for additional analgesia

Data Collection

All assessments were performed by investigators blinded to group allocation. Pain scores were recorded using a 10-point VAS. Clinical evaluation for secondary outcomes was carried out on postpartum days 1, 3, and 7 through direct examination and patient-reported symptoms using a structured questionnaire.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version [Insert Version]. Continuous variables such as VAS scores were expressed as mean ± standard deviation and compared using Student's *t*-test. Categorical variables such as presence of swelling or need for additional analgesia were analyzed using the Chi-square test or Fisher's exact test, as appropriate. A p-value < 0.05 was considered statistically significant.

RESULTS

A total of 100 participants were randomized equally into two groups: Group A (episiotomy knot on the left side) and Group B (episiotomy knot on the right side). Baseline demographic and obstetric variables were comparable between the groups with no statistically significant differences (Table 1). The mean age was 27.4 ± 3.6 years in Group A and 26.9 ± 4.1 years in Group B (p = 0.512). Most participants were primiparous (68% in Group A vs 66% in Group B, p = 0.823). The average gestational age at delivery and mean birth weight were also similar across groups.

Table 1: Baseline Characteristics of Participants

Characteristic	Group A (Left Knot)	Group B (Right Knot)	p-value
Mean Age (years)	27.4 ± 3.6	26.9 ± 4.1	0.512
Primiparous (%)	68%	66%	0.823
Mean Gestational Age (wks)	38.7 ± 1.2	38.5 ± 1.5	0.426
Mean Birth Weight (g)	2950 ± 320	3010 ± 290	0.393
Duration of Labor (hours)	6.8 ± 2.1	6.5 ± 1.9	0.592

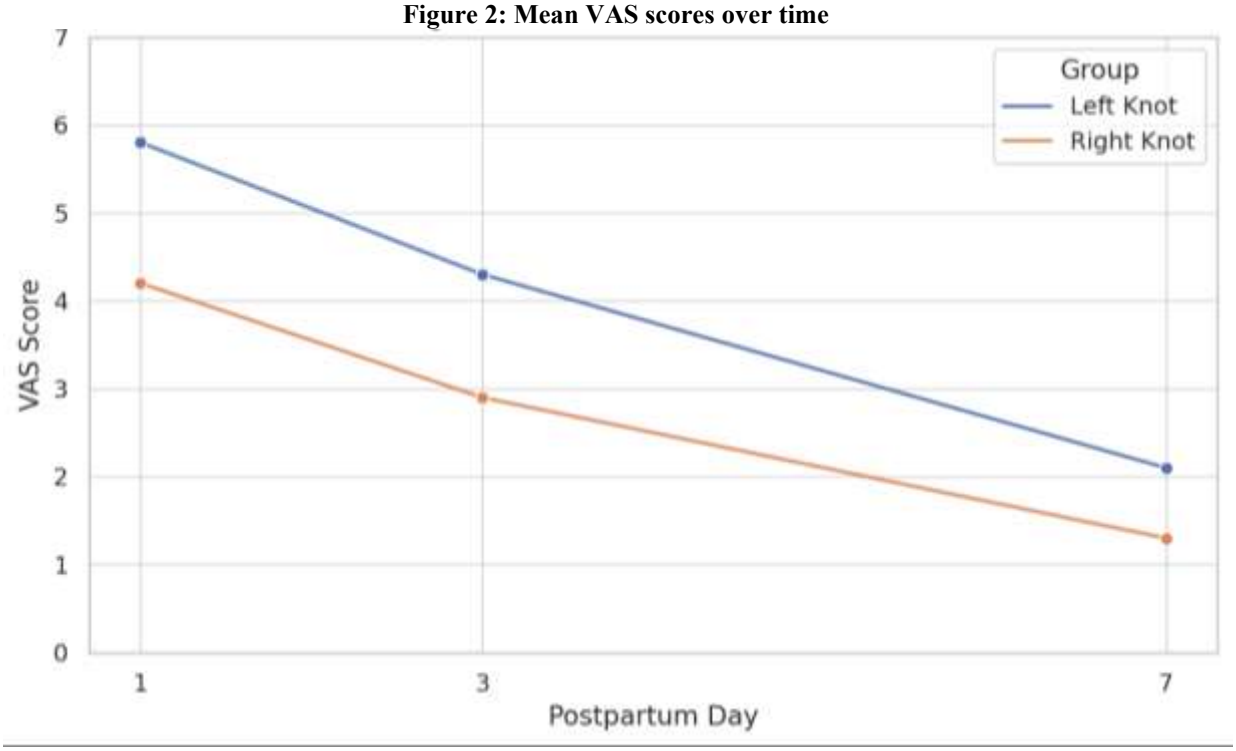
Pain and Discomfort Scores (VAS)

Visual Analog Scale (VAS) scores were significantly lower in Group B (right knot placement) across all postpartum days assessed. On day 1, mean VAS score in Group A was 5.8 ± 1.4 compared to 4.2 ± 1.2 in Group B (p < 0.001). This trend continued on day 3 (4.3 ± 1.1 vs 2.9 ± 1.0; p < 0.001) and day 7 (2.1 ± 0.9 vs 1.3 ± 0.8; p = 0.002), suggesting better comfort levels in participants with right-side knot placement **(Table 2; Figure 2).**

Table 2: VAS Scores for Pain/Discomfort

Postpartum Day	Group A (Left Knot)	Group B (Right Knot)	p-value
Day 1	5.8 ± 1.4	4.2 ± 1.2	<0.001
Day 3	4.3 ± 1.1	2.9 ± 1.0	<0.001
Day 7	2.1 ± 0.9	1.3 ± 0.8	0.002

Figure 2: Mean VAS scores over time



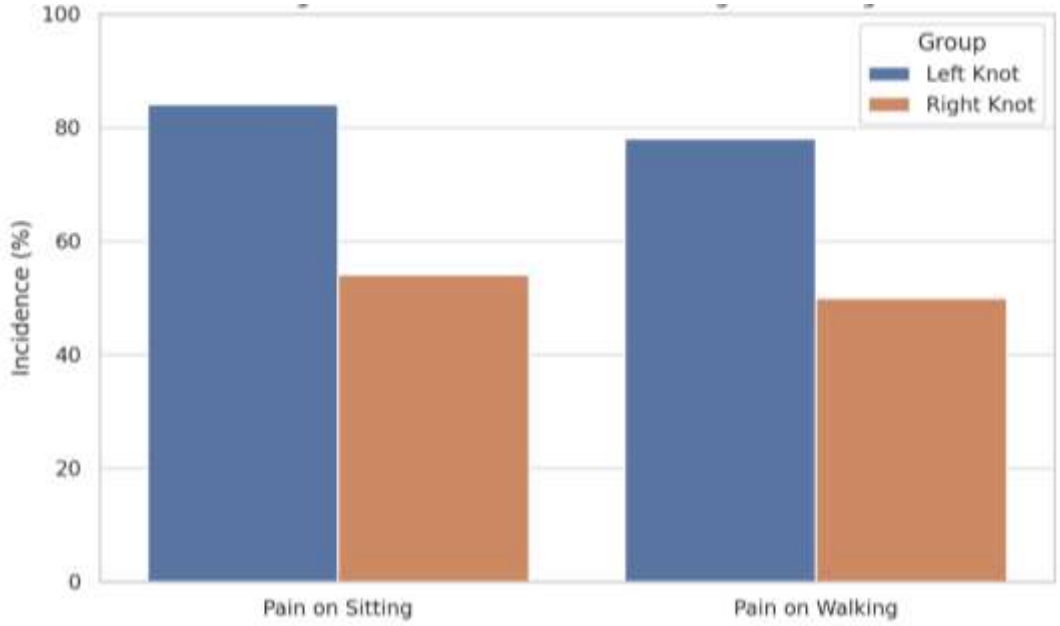
Pain During Functional Activities

A significantly greater proportion of women in Group A reported pain during sitting and walking compared to Group B. Pain on sitting was reported by 84% in Group A versus 54% in Group B (p = 0.001), and pain on walking by 78% in Group A versus 50% in Group B (p = 0.003) **(Table 3; Figure 3).** These findings reinforce the comfort advantage associated with right-side knot placement.

Table 3: Pain While Sitting/Walking

Symptom	Group A (n=50)	Group B (n=50)	p-value
Pain on Sitting	42 (84%)	27 (54%)	0.001
Pain on Walking	39 (78%)	25 (50%)	0.003

Figure 3: Incidence of pain while sitting and walking



Group A demonstrated a higher frequency of local wound complications. Swelling or induration was observed in 24% of women in Group A compared to 8% in Group B ($p = 0.026$). Redness was also significantly more prevalent in Group A (20% vs 6%, $p = 0.039$). Wound dehiscence was rare and did not differ significantly between groups (4% vs 2%, $p = 0.556$) **(Table 4).**

Table 4: Local Complications

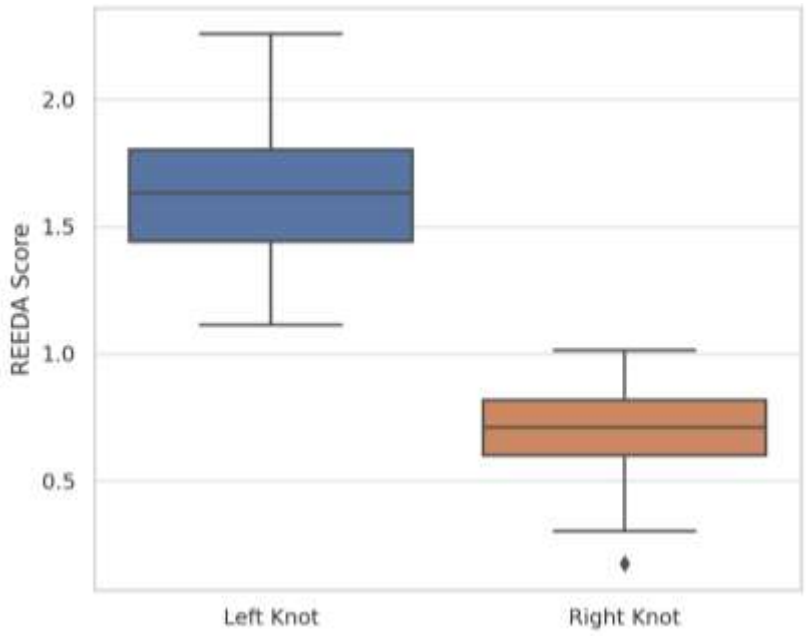
Complication	Group A (n=50)	Group B (n=50)	p-value
Swelling/Induration	12 (24%)	4 (8%)	0.026
Redness	10 (20%)	3 (6%)	0.039
Wound Dehiscence	2 (4%)	1 (2%)	0.556

Total REEDA scores on day 7 were significantly lower in Group B, indicating superior wound healing. The mean total REEDA score was 1.7 ± 0.8 in Group A versus 0.7 ± 0.5 in Group B ($p < 0.001$). Individual REEDA domains, including redness, edema, and wound approximation, also favored Group B **(Table 5; Figure 4).** The distribution of REEDA scores, as shown in the boxplot, demonstrated tighter clustering and lower median values in Group B.

Table 5: REEDA Scores on Day 7

Domain	Group A	Group B	p-value
Redness	0.6 ± 0.5	0.3 ± 0.4	0.008
Edema	0.5 ± 0.4	0.2 ± 0.3	0.003
Ecchymosis	0.2 ± 0.4	0.1 ± 0.3	0.237
Discharge	0.1 ± 0.3	0.0 ± 0.0	0.153
Approximation	0.3 ± 0.3	0.1 ± 0.2	0.015
Total REEDA	**1.7 ± 0.8**	**0.7 ± 0.5**	**<0.001**

Figure 4: Total REEDA scores on Day 7



DISCUSSION

This randomized controlled trial assessed the influence of episiotomy knot placement—left versus right—on maternal pain, functional discomfort, and wound healing outcomes in the early postpartum period. Our findings indicate that right-sided knot placement significantly improved patient-reported comfort, reduced pain during activities such as sitting and walking, and enhanced wound healing compared to left-sided placement.

The two groups were well-matched at baseline with respect to age, parity, gestational age, duration of labor, and neonatal birth weight, reducing the risk of confounding. Pain scores measured by the Visual Analog Scale (VAS) were consistently lower in the right-knot group on postpartum days 1, 3, and 7. Notably, on day 1, participants with right-side knots reported a mean VAS score of 4.2 ± 1.2, significantly lower than the 5.8 ± 1.4 reported in the left-knot group ($p< 0.001$). This trend continued on subsequent days, suggesting a sustained benefit in terms of maternal comfort.

Functional pain was also significantly lower among participants in Group B. Pain while sitting and walking was reported in 84% and 78% of women in Group A, respectively, compared to only 54% and 50% in Group B ($p = 0.001$ and $p = 0.003$, respectively). These findings support the hypothesis that the medial placement of the suture knot may coincide with perineal pressure points during routine activities, thereby increasing discomfort, while lateral (right) knot positioning may reduce this burden.

In terms of wound-related complications, the right-knot group demonstrated a clear advantage. Swelling and redness were significantly more common in the left-knot group, with swelling observed in 24% versus 8% ($p = 0.026$) and redness in 20% versus 6% ($p = 0.039$), respectively. Although the incidence of wound dehiscence was low and not statistically different, the overall trend points toward reduced local tissue irritation with right-sided knot placement. Additionally, total REEDA scores on day 7 were significantly lower in the right-knot group (0.7 ± 0.5 vs. 1.7 ± 0.8, $p< 0.001$), indicating faster and more complete wound healing. Individual REEDA components—including redness, edema, and approximation—also favored the right-knot group.

These findings align with broader surgical principles regarding suture orientation and tension vectors, which have long been recognized as important factors in minimizing postoperative pain and optimizing healing outcomes (5,8,9). The continuous, non-locking suture technique employed in our study is supported in the literature for its association with improved healing and reduced pain, and placing the knot behind the hymenal ring has also been advocated to minimize discomfort (5,10). While most studies emphasize suture technique and material, our study is likely among the first to evaluate the impact of knot **position**—an overlooked yet modifiable component of perineal repair.

Our results are also supported indirectly by existing literature comparing episiotomy types. While our study included only mediolateral episiotomies, previous work has highlighted higher rates of deep perineal tears in midline compared to mediolateral approaches (14.8% vs. 7%) with no significant differences in other complications such as hematoma, blood loss, infection, or dyspareunia. Aytan et al. similarly reported severe perineal lacerations in 3% of midline versus 1% of mediolateral episiotomies (11), and Angioli et al. found rates of 6.6% and 4.1%, respectively (12). Additionally, factors such as midline episiotomy, primiparity, maternal height ≤145 cm, birth weight >3500 g, and forceps delivery have been identified as risk factors for perineal trauma, corroborating findings from previous studies (2,13).

CONCLUSION

This randomized controlled trial demonstrated that the placement of the final suture knot on the right side during mediolateral episiotomy repair significantly reduced postpartum pain, improved maternal comfort during functional activities, and enhanced wound healing outcomes compared to left-sided knot placement. The findings highlight that even minor technical modifications in routine obstetric procedures can yield meaningful clinical benefits. Right-sided knot placement, being simple, cost-neutral, and easily implementable, has the potential to improve postpartum recovery without altering the core surgical technique. Further multicenter studies with long-term follow-up are warranted to validate these results and assess their implications on overall maternal well-being.

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