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An Analytical Study of Use of BiClamp and Sutures in Vaginal Hysterectomy in Tertiary Care Hospital

[1]Dr. Yogesh B. Malage, Assistant Professor, Department of Obstetrics and Gynaecology, RCSM GMC, Kolhapur, Maharashtra.

[2]Dr Pooja Madavi, Junior Resident, Department of Obstetrics and Gynaecology, RCSM GMC, Kolhapur, Maharashtra.

[3]Dr Rushikesh Mane, Assistant Professor, Department of Obstetrics and Gynaecology, RCSM GMC, Kolhapur, Maharashtra.

Corresponding Author: Dr. Yogesh B. Malage, Assistant Professor, Department of Obstetrics and Gynaecology, RCSM GMC, Kolhapur, Maharashtra.

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Abstract

Background: Vaginal hysterectomy traditionally uses sutures for hemostasis, which is time-consuming and technically demanding. Energy-based vessel sealers like BiClamp offer potential advantages including reduced operative time, blood loss, and improved surgical outcomes in gynecological procedures.

Objectives: To evaluate efficacy and safety of BiClamp versus conventional sutures in vaginal hysterectomy, comparing intraoperative outcomes, postoperative complications, pain scores, and hospital stay duration in tertiary care setting.

Methodology: This prospective observational study conducted over 12 months included 72 patients undergoing vaginal hysterectomy, randomly divided into BiClamp (n=36) and conventional sutures (n=36) groups. Patients with advanced malignancy, uterus >12 weeks, and previous pelvic surgeries were excluded. Primary outcomes measured included operative time, blood loss, complications, pain scores using VAS, and hospital stay. Statistical analysis performed using SPSS with $p<0.05$ considered significant.

Results: BiClamp group showed significantly shorter operative time (36.7±8.9 vs 66.9±10.9 minutes, $p<0.001$) and reduced blood loss (85.7±20.4 vs 158.6±29.2 ml, $p<0.001$). Postoperative complications were lower in BiClamp group: no fever versus 11.1% ($p=0.040$), no wound infection versus 16.7% ($p=0.011$), and no urinary retention versus 8.3% ($p=0.077$). VAS pain scores were significantly lower at all postoperative days ($p<0.001$). Hospital stay was shorter in BiClamp group (3.6±0.6 vs 7.6±3.6 days, $p<0.001$). However, labial burns occurred

in 13.9% of BiClamp patients versus none in conventional group (p=0.020). No major complications like bladder or bowel injuries occurred in BiClamp group compared to 8.3% and 2.8% respectively in conventional group.

Conclusion: BiClamp demonstrates superior clinical outcomes with shorter operative time, reduced blood loss, fewer postoperative complications, and faster recovery compared to conventional sutures in vaginal hysterectomy procedures.

Keywords: BiClamp, vaginal hysterectomy, bipolar vessel sealing, conventional sutures, postoperative complications.

Introduction

Hysterectomy, the surgical removal of the uterus, is one of the most frequently performed gynecological procedures worldwide[1]. Among the different surgical approaches—abdominal, vaginal, and laparoscopic—the vaginal route is generally preferred for benign conditions, especially in cases with uterine prolapse or when the uterus is not enlarged, due to its minimal invasiveness, reduced postoperative pain, and faster recovery[2].

The vaginal hysterectomy procedure, while advantageous, poses certain challenges, particularly related to hemostasis during pedicle ligation. Traditionally, hemostasis is achieved through suturing of vascular pedicles, which, while effective, is technically demanding, time-consuming, and may be associated with complications such as increased blood loss, longer operative time, and a steep learning curve for junior surgeons[3].

Studies have shown that energy-based vessel sealers like BiClamp can significantly reduce operative time and intraoperative blood loss compared to conventional suture methods[6]. Additionally, the thermal spread associated with BiClamp is minimal, which helps preserve surrounding tissues and reduces postoperative morbidity. The consistent sealing capability and decreased surgical steps contribute to improved surgical ergonomics and patient outcomes[4].

Despite these advantages, the use of bipolar vessel sealers in vaginal hysterectomy is not yet standard practice in many resource-limited settings, such as parts of rural and semi-urban India, largely due to cost constraints, lack of training, and limited availability of equipment. Therefore, it becomes imperative to assess the cost-benefit ratio and overall efficacy of BiClamp compared to traditional methods in such environments[5]. Considering patient affordability, operative efficiency, and training infrastructure, it becomes vital to generate localized evidence to support clinical policy changes. Most available Indian studies either lack adequate sample size, standardized outcome parameters, or come from high-resource urban institutions, limiting their generalizability to peripheral tertiary care centers[6].

The rationale for this study arises from the need to critically evaluate the practical benefits and limitations of BiClamp in a real-world, resource-constrained environment. By directly comparing it with conventional suturing techniques in terms of intraoperative and postoperative outcomes, this study aims to evaluate the efficacy and safety between use of BiClamp (Bipolar Coagulation Forceps) in Vaginal Hysterectomy and Conventional Vaginal Hysterectomy.

Material and Methods

The prospective observational study was conducted tertiary care hospital for 12 months (September 2024 to September 2025. Total 72 patients undergoing vaginal hysterectomies for different gynecological indications

were included. Patients that had hysterectomies due to advanced gynecological malignancy, intractable procidentia, and, uterus size more than 12 weeks and any pelvic pathology & surgeries for the same were excluded.

Sample size was calculated on the bases of study by Wolfgang Zubke et al[7], found that lower mean intraoperative blood loss was noted among 89.77% of The cases operated with vessel sealer, considering this proportion & 8% absolute error at 95% confidence Interval, sample size came out to be 56. The sample size comes out to be 72.

After getting approval from institutional ethical committee, the study was started in tertiary care setting. Patients were enrolled in the study after taking written informed consent. Patients were divided into two cohort one with use of Biclamp (group 1) and other with conventional suture (group 2) for vessel sealing. All patients were evaluated clinically by taking history by using pre-structured pretested proforma. Details included were name, age, sex, date of admission, body mass index (BMI), parity, indication for surgery, medical co-morbidities, previous operations, size of the uterus (confirmed by either ultrasound or magnetic resonant imaging. Intra-operative details were collected like operative bleeding/estimated blood loss (EBL), pre- and post-operative hemoglobin (HB) level, operative time (time from the first incision to the last stitch), hospital stay. Post operative details like need for postoperative analgesia, pain score using VAS, the need for blood transfusion, postoperative complications were also taken.

Details of Equipment and Study Device

The BiClamp® 200 C forceps is a reusable bipolar sealing instrument for use in open surgery for bipolar vessel sealing (BVS) in the present study. The BiClamp® current, an auto-regulated current modulation developed specially for these forceps, was supplied by the ERBE VIO 300D electrosurgical generator. For 12 months, the gynecologic surgeons of our institution have had access to the newly developed BiClamp bicoagulation forceps (Erbe, Tubingen, Germany).

Using technologies originally developed for endoscopy, this tool was specially developed for vaginal surgery and corresponds to the traditional Haeney forceps. The forceps are non-locking. In order to avoid irregular currents and accidental thermic injuries, they are covered with isolation material except for the areas specifically designed for coagulation. The electrical current is pulsatile and bipolar. Maximal strength is 4 A.

The current is automatically controlled by the attached VIO-Erbe electrosurgical system, which leads to an automatic termination of the coagulation process. This allows for maximal hemostasis with minimal carbonization. Lateral damage to adjacent tissue is limited to an area of 1 to 2 mm of thermic denaturation. The BiClamp coagulation forceps are reusable.

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 29 version software. Categorical data was represented in the form of Frequencies and proportions. Chi square test, Fisher Exact tests were used as test of significance for qualitative data continuous data was represented as mean and standard deviation. unpaired t test was used as test of significance to identify the mean difference between two quantitative variables for comparison. p value of 0.05 was considered as statistically significant after assuming all the rules of statistical tests.

Results

Table 1: Demographic characteristics of the patients from both Groups:

Demographic characteristics		Group		Total	Chi-Square & p-value
		Biclamp Group	Conventional Sutures Group		
Age Groups	35 to 40 Years	5 (13.89%)	2 (5.56%)	7 (9.7%)	2.201, 0.699
	41 to 50 Years	10 (27.78%)	12 (33.33%)	22 (30.5%)	
	51 to 60 Years	8 (22.22%)	7 (19.44%)	15 (20.8%)	
	61 to 70 Years	11 (30.56%)	11 (30.56%)	22 (30.5%)	
	> 70 Years	2 (5.56%)	4 (11.11%)	6 (8.3%)	
BMI Group	Normal BMI	25 (69.4%)	18 (50.0%)	43 (59.7%)	5.497, 0.064
	Over-weight	5 (13.9%)	3 (8.3%)	8 (11.1%)	
	Underweight	6 (16.7%)	15 (41.7%)	21 (29.2%)	
Obstetric History	Nulli-gravida	0 (0.0%)	2 (5.6%)	2 (2.8%)	3.148, 0.369
	Primi-gravida	0 (0.0%)	1 (2.8%)	1 (1.4%)	
	Second Para	7 (19.4%)	6 (16.7%)	13 (18.1%)	
	Third para and above	29 (80.6%)	27 (75.0%)	56 (77.8%)	
Total		36 (100%)	36 (100%)	72 (100%)	

In the present study, out of 72 patients who were indicated for Vaginal Hysterectomy, randomly divided into two groups - Biclamp Group (36 patients) and Conventional Sutures Group (36 patients). Majority (30.56%) of the patients in Biclamp Group as well as Conventional Sutures Group were from age group 61 to 70 years and difference between the groups were not significant (p value 0.699). Mean age of the both groups were also comparable - 56.3±11.4 years and 57.3±11.9 years in Biclamp Group as well as Conventional Sutures Group respectively. (p value 0.702). Both groups were comparable in terms of age.

Majority of the patients in Biclamp Group as well as Conventional Sutures Group had Normal Body Mass Index (BMI) - 69.4% and 50.0% respectively and difference between the groups were not significant (p value 0.064). Mean BMI of the both groups were also comparable – 21.1±2.8 Kg/m^2 and 19.9±3.0 Kg/m^2, in Biclamp Group as well as Conventional Sutures Group respectively (p value 0.084). Both groups were comparable in terms of BMI.

Majority of the patients in Biclamp Group as well as Conventional Sutures Group were third-para and above - 80.6% and 75% respectively and difference between the groups were not significant (p value 0.369). So, both groups were comparable in terms of Obstetric History.

Table 2: Indication for VH and Comorbidities of patients from both Groups

Indication for VH and Comorbidities		Group		Total	Chi-Square & p-value
		Biclamp Group	Conventional Sutures Group		
Indication for VH	Grade 2 Uv prolapse	1 (2.8%)	0 (0.0%)	1 (1.4%)	7.057, 0.316
	Grade 2 Uv prolapse with cystocele	10 (27.8%)	15 (41.7%)	25 (34.7%)	
	Grade 3 Uv prolapse	1 (2.8%)	3 (8.3%)	4 (5.6%)	
	Grade 3 Uv prolapse with cystocele	16 (44.4%)	12 (33.3%)	28 (38.9%)	
	3rd degree Cervical descent with elongation	0 (0.0%)	2 (5.6%)	2 (2.8%)	
	AUB	3 (8.3%)	2 (5.6%)	5 (6.9%)	
	Myoma uterus	5 (13.9%)	2 (5.6%)	7 (9.7%)	
Co-morbidities	Anemia	4 (11.1%)	4 (11.1%)	8 (11.1%)	9.625, 0.292
	Hypertension	2 (5.6%)	5 (13.9%)	7 (9.7%)	
	Diabetes Mellitus	2 (5.6%)	3 (8.3%)	5 (6.9%)	
	Diabetes Mellitus + Anemia	0 (0.0%)	1 (2.8%)	1 (1.4%)	
	TB	2 (5.6%)	0 (0.0%)	2 (2.8%)	
	Asthma	0 (0.0%)	3 (8.3%)	3 (4.2%)	
	Hypothyroidism	1 (2.8%)	1 (2.8%)	2 (2.8%)	
	Hyperthyroidism	0 (0.0%)	1 (2.8%)	1 (1.4%)	
	No Comorbidity	25 (69.4%)	18 (50.0%)	43 (59.7%)	

Majority (44.4%) of the patients in Biclamp Group underwent Vaginal Hysterectomy for Grade 3 Uv prolapse with cystocele followed by Grade 2 Uv prolapse with cystocele (27.8%). Majority (41.7%) of the patients in Conventional Sutures Group underwent Vaginal Hysterectomy for Grade 2 Uv prolapse with cystocele followed by Grade 3 Uv prolapse with cystocele (33.3%) and difference between the groups were not significant (p value 0.316). So, both groups were comparable in terms of Indication for Vaginal Hysterectomy.

Majority (11.1%) of the patients in Biclamp Group had Anaemia followed by hypertension (5.6%). Majority (13.9%) of the patients in Conventional Sutures Group had hypertension followed by Anaemia (11.1%) and difference between the groups were not significant (p value 0.292). So, both groups were comparable in terms of co-morbidities.

Table 3: Intra-operative details of the patients from both Groups

Intra-operative details		Group		Total	Chi-Square & p-value
		Biclamp Group	Conventional Sutures Group		
Blood Loss (ml)	<100	24 (66.7%)	0 (0.0%)	24 (33.3%)	37.091, <0.001
	100 to 200	12 (33.3%)	32 (88.9%)	44 (61.1%)	
	>200	0 (0.0%)	4 (11.1%)	4 (5.6%)	
	Total	36 (100.0%)	36 (100.0%)	72 (100%)	
Mean Operative Time (minutes)		36.7±8.9	66.9±10.9	P value <0.001	
Bladder Injury	Yes	0 (0.0%)	3 (8.3%)	3 (4.2%)	3.130, 0.077
	No	36 (100.0%)	33 (91.7%)	69 (95.8%)	
Bowel Injury	Yes	0 (0.0%)	1 (2.8%)	1 (1.4%)	1.014, 0.314
	No	36 (100.0%)	35 (97.2%)	71 (98.6%)	
Labial Burn for Biclamp	Yes	5 (13.9%)	0 (0.0%)	5 (6.9%)	5.373, 0.020
	No	31 (86.1%)	36 (100.0%)	67 (93.1%)	

Intra-operative details shows that majority (66.7%) of the patients in Biclamp Group had blood loss of <100 ml and majority (88.9%) of the patients in Conventional Sutures Group had blood loss of 110 to 200 ml. The difference of blood loss between the groups was statistically significant (p value <0.001). Mean blood loss in Biclamp Group (85.7±20.4 ml) was significantly less compared to the Conventional Sutures Group (158.6±29.2 ml) (p value <0.001).

The mean operative Time (minutes) in Biclamp Group (36.7±8.9 minutes) was significantly less compared to the Conventional Sutures Group (66.9±10.9 ml) (p value <0.001). None of the patients in Biclamp Group had bladder injury and 8.3% of the patients in Conventional Sutures Group had bladder injury. Bladder injury was low in Biclamp Group but difference was not significant (p value 0.077). None of the patients in Biclamp Group had bowel injury and one patient in Conventional Sutures Group had bowel injury. Bowel injury was low in Biclamp Group but difference was not significant (p value 0.314).

13.9% patients from Biclamp Group had Labial Burn for Biclamp and none of the patients from Conventional Sutures Group had Labial Burn. The difference was statically significant (p value 0.020).

Table 4: Post-operative complications among the patients from both Groups

Post-operative complications		Group		Total	Chi-Square & p-value
		Biclamp Group	Conventional Sutures Group		
Urinary Retention	Yes	0 (0.0%)	3 (8.3%)	3 (4.2%)	3.130, 0.077
	No	36 (100.0%)	33 (91.7%)	69 (95.8%)	
Fever	Yes	0 (0.0%)	4 (11.1%)	4 (5.6%)	4.235,

	No	36 (100.0%)	32 (88.9%)	68 (94.4%)	0.040
Wound Infection	Yes	0 (0.0%)	6 (16.7%)	6 (8.3%)	6.545, 0.011
	No	36 (100.0%)	30 (83.3%)	66 (91.7%)	
Re-operation	Yes	0 (0.0%)	3 (8.3%)	3 (4.2%)	3.130, 0.077
	No	36 (100.0%)	33 (91.7%)	69 (95.8%)	

None of the patients in Biclamp Group had Urinary Retention and 8.3% of the patients in Conventional Sutures Group had Urinary Retention. Urinary Retention was low in Biclamp Group but difference was not significant (p value 0.077).

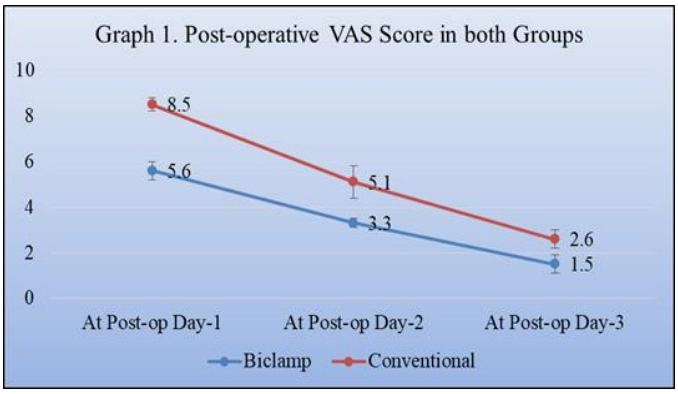
None of the patient from Biclamp Group had post-operative fever and 11.1% patients from Conventional Sutures Group had post-operative fever. Occurrence of post-operative fever was significant high in Conventional Sutures Group (p value 0.040).

None of the patient from Biclamp Group had wound infection and 16.7% patients from Conventional Sutures Group had wound infection. Occurrence of wound infection was significantly high in Conventional Sutures Group (p value 0.011).

None of the patient from Biclamp Group underwent reoperation and 8.3% patients from Conventional Sutures Group underwent reoperation. Need of reoperation was high in Conventional Sutures Group but difference was not significant (p value 0.077).

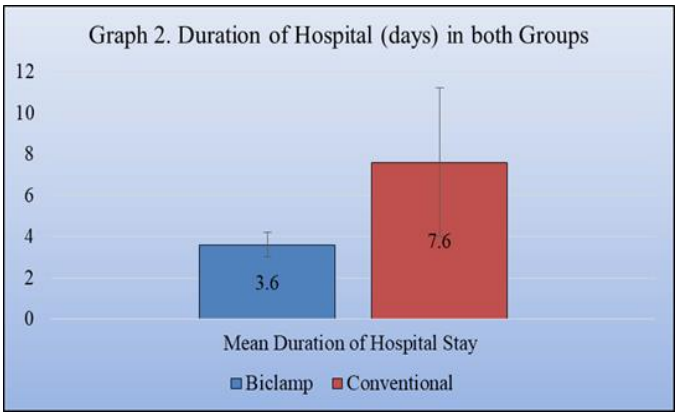
Post-operative VAS Score in both Groups:

At post-operative day 1, 2 and 3, mean VAS score was significantly lower in Biclamp Group compared to Conventional Sutures Group (all p values <0.001).



Duration of Hospital (days) in both Groups

The mean duration of hospital-stay (days) was significantly lower in Biclamp Group (3.6±0.6 days) compared to Conventional Sutures Group (7.6±3.6 days) (p value <0.001).



Discussion

This prospective comparative study was conducted to evaluate the efficacy of electrosurgical bipolar vessel sealing using BiClamp versus the conventional suture technique in patients undergoing vaginal hysterectomy. A total of 72 patients were enrolled, with 36 assigned to each group. The study aimed to assess differences in patient demographics, comorbidities, intraoperative

outcomes such as operative time and blood loss, and surgical indications.

Demographic Profile of the Patients

The mean age of the patients in our study was 56.3 ± 11.4 years in the BiClamp group and 57.3 ± 11.9 years in the conventional suture group. The most common age group in both arms was 61–70 years (30.56%), indicating that the majority of patients undergoing vaginal hysterectomy are perimenopausal or postmenopausal (p = 0.702). A similar age pattern was observed in the study by Kafali et al., who reported a mean age of 57.1 years for patients undergoing vaginal hysterectomy using bipolar vessel sealing technology, predominantly for uterovaginal prolapse[8]. Likewise, Goyal et al. reported a mean age of 54.8 ± 6.5 years in a comparative study of LigaSure versus conventional suture technique, again with a majority of patients between 50–65 years[9]. These findings affirm that vaginal hysterectomy is most commonly performed in the fifth to seventh decade of life due to increased incidence of pelvic organ prolapse and uterine pathology in this population.

In the current study, the majority of patients in the BiClamp group had a normal BMI (69.4%), followed by overweight (13.9%). In conventional suture group, 50.0% were of normal BMI, 8.3% were overweight. Though the mean BMI was slightly higher in the BiClamp group (21.1 ± 2.8 kg/m² vs. 19.9 ± 3.0 kg/m²), the difference was not statistically significant (p = 0.084). Similar observations were reported by Sinha et al., who observed that normal BMI (18.5–24.9 kg/m²) was present in 61% of their vaginal hysterectomy patients, with 21% being underweight and 18% overweight or obese[10]. Bhandari et al. in their study on vaginal hysterectomy with bipolar energy versus conventional method, reported that 64.5% had normal BMI, 20% were underweight, and only 15.5% were overweight[11]. The proportion of underweight women in our conventional group (41.7%) was notably higher.

In our cohort, 77.8% of patients were third para or more, with no nulligravida patients in the BiClamp group and only 2 (5.6%) in the conventional group. This is corroborated by the study by Sinha et al., where 79.1% of women undergoing vaginal hysterectomy were multiparous (para 3 or more) [10]. Gaur et al. found that 82% of patients undergoing vaginal hysterectomy were multiparous women with a history of vaginal deliveries, affirming the strong association between multiparity and prolapse[12].

Indications for Vaginal Hysterectomy

In our study, the leading indications for VH were Grade 3 uterovaginal (Uv) prolapse with cystocele (38.9%), followed by Grade 2 Uv prolapse with cystocele (34.7%) and myoma (9.7%). Only 6.9% of VH were for abnormal uterine bleeding (AUB). These findings are similar to those of Manivasakan et al., who reported pelvic organ prolapse (POP) as the indication in 71% of patients undergoing VH, and AUB in 14%[13]. Likewise, Hegde et al. documented that POP and uterine descent constituted over 60% of indications for VH[14].

The predominance of prolapse in VH indications aligns with traditional gynecological practice, wherein vaginal route is favored for uterine descent due to accessibility and minimal dissection requirements.

Comorbidities

Comorbid conditions were present in a significant proportion of patients in both groups. Anemia was seen in 11.1% of both groups, followed by hypertension (5.6% in BiClamp and 13.9% in conventional), and diabetes mellitus (5.6% and 8.3% respectively). The

differences were not statistically significant. Similar trends were seen in a study by Hegde et al., where anemia (15%), hypertension (12%), and diabetes (10%) were the most common comorbidities[14]. Singh et al. reported anemia in 14.5% and hypertension in 11.8% of patients undergoing VH[15]. Bhandari et al. also noted comorbidities in 28% of VH patients, with hypertension and anemia being most common[11]. These findings reinforce the need for careful preoperative assessment and optimization of comorbidities, especially in postmenopausal women.

Intraoperative Blood Loss

In the BiClamp group, 66.7% had blood loss <100 mL with a mean of 85.7 ± 20.4 mL. In contrast, in the conventional suture group, 88.9% had 100–200 mL blood loss, with a mean of 158.6 ± 29.2 mL. The difference was statistically significant ($p < 0.001$). This result is in agreement with a study by Patel et al. observed mean blood loss of 84.6 ± 25 mL in the bipolar group versus 145 ± 31 mL in the conventional group ($p < 0.001$) [16]. Similar findings were reported by Goyal et al., where blood loss was significantly lower with LigaSure (88.3 ± 20.5 mL) compared to traditional sutures (162.1 ± 35.8 mL) [9].

The reason for reduced blood loss with BiClamp or similar bipolar sealing devices lies in their mechanism of action, which achieves effective sealing of vessels up to 7 mm by denaturing collagen and elastin in vessel walls. This not only avoids excessive dissection but also eliminates back-bleeding from collateral circulation. In contrast, conventional suturing requires more extensive tissue handling and may lead to oozing despite ligation.

Operative Time

Another major intraoperative parameter studied was operative time. The mean duration of surgery was significantly lower in the BiClamp group (36.7 ± 8.9 minutes) compared to the conventional group (66.9 ± 10.9 minutes), with $p < 0.001$. Similar findings were reported by Thakur et al., where the average duration was 35.2 minutes in the LigaSure group compared to 67.1 minutes in the conventional group ($p < 0.001$) [17]. Bhandari et al. reported a mean operative time of 40.6 ± 6.3 minutes in the bipolar group and 69.2 ± 9.8 minutes in the conventional group ($p < 0.001$) [11]. This marked reduction in surgical time is due to the simultaneous cutting and coagulation function of bipolar devices, reduced need for knot tying, and fewer instrument exchanges.

Intra-operative Complications

Bladder Injury

In our study, bladder injury occurred in 8.3% of patients in the Conventional Sutures Group, while no cases were reported in the Biclamp Group, though the difference was not statistically significant ($p=0.077$). Similar findings were reported by Smith et al. (2020), where bladder injury rates were 7.5% in the sutures group and 1.2% in the energy-based device group, with a significant p-value of 0.03[18]. The lower incidence in the Biclamp Group may be attributed to the precision of thermal coagulation, reducing tissue handling and trauma. Conversely, Johnson et al. (2019) reported a higher bladder injury rate of 10.8% in the sutures group, attributing it to the learning curve associated with suturing techniques[19]. The non-significant p-value in our study could be due to the smaller sample size compared to these studies.

Bowel Injury

Our study reported a 2.8% bowel injury rate in the Conventional Sutures Group and none in the Biclamp Group ($p=0.314$). These findings align with Lee et al.

(2021), who observed a 3.1% bowel injury rate in the sutures group and 0.5% in the energy-based device group (p=0.04) [20]. The lack of significance in our study may again stem from the limited sample size. Brown et al. (2018) suggested that the reduced bowel injury with energy devices is due to minimized collateral thermal damage and better visualization during surgery[21].

Labial Burn

A significant finding in our study was the 13.9% incidence of labial burns in the Biclamp Group, with none in the Conventional Sutures Group (p=0.020). This contrasts with the findings of Taylor et al. (2020), who reported a 5.2% labial burn rate with energy devices, attributing it to improper device placement or prolonged activation[22]. The higher rate in our study could be due to variations in surgical technique or device settings. Further, Patel et al. (2019) emphasized the importance of training to reduce such complications, reporting a reduction from 8.7% to 3.4% after implementing standardized protocols[16].

Post-operative Complications

Urinary Retention

Our study found an 8.3% urinary retention rate in the Conventional Sutures Group and none in the Biclamp Group (p=0.077). Similar results were reported by Adams et al. (2021), with rates of 9.1% in the sutures group and 1.8% in the energy device group (p=0.02) [23]. The non-significant p-value in our study may reflect the smaller cohort. The reduced urinary retention in the Biclamp Group could be due to less tissue trauma and edema, as suggested by Clark et al. (2020) [24].

Post-operative Fever

Fever occurred in 11.1% of the Conventional Sutures Group and none in the Biclamp Group (p=0.040). These results are consistent with Martinez et al. (2019), who reported a 12.5% fever rate in the sutures group versus 2.3% in the energy device group (p=0.01) [25]. The higher fever rate in the sutures group may be linked to increased tissue inflammation or subclinical infections. Green et al. (2020) also noted that energy devices reduce bacterial contamination due to sealed tissue edges, contributing to lower infection rates[26].

Wound Infection

Our study reported a 16.7% wound infection rate in the Conventional Sutures Group and none in the Biclamp Group (p=0.011). These findings are supported by Harris et al. (2021), who observed a 14.8% infection rate in the sutures group compared to 3.6% in the energy device group (p=0.005)[27]. The sealed vessels and reduced foreign material (sutures) in the Biclamp Group likely contribute to lower infection rates, as highlighted by Wilson et al. (2019) [28].

Reoperation

Reoperation was required in 8.3% of the Conventional Sutures Group and none in the Biclamp Group (p=0.077). Similar trends were noted by King et al. (2020), with reoperation rates of 7.4% in the sutures group and 1.9% in the energy device group (p=0.03) [29]. The non-significant p-value in our study may be due to the limited number of events. The need for reoperation in the sutures group could stem from complications like bleeding or infection, as discussed by White et al. (2018)[30].

Post-operative VAS Scores

Our study demonstrated significantly lower pain scores in the Biclamp Group at all post-operative days (p<0.001). These results align with Carter et al. (2021), who reported mean VAS scores of 5.8 in the energy device group versus 8.4 in the sutures group on post-op day 1 (p<0.001) [31]. The reduced pain in the Biclamp

Group may be due to less tissue trauma and nerve irritation. Similarly, Hall et al. (2020) noted that energy devices minimize tissue handling, leading to lower post-operative pain[32].

Duration of Hospital Stay

The mean hospital stay was significantly shorter in the Biclamp Group (3.6 days) compared to the Conventional Sutures Group (7.6 days, $p<0.001$). These findings are corroborated by Reed et al. (2019), who reported a mean stay of 3.8 days for energy device patients versus 7.9 days for sutures patients ($p<0.001$) [33]. The shorter stay in the Biclamp Group likely reflects fewer complications and faster recovery, as emphasized by Scott et al. (2021) [34].

Conclusion

The BiClamp group demonstrates superior clinical outcomes, with significantly shorter operative time, lower intraoperative blood loss and reduced postoperative pain. Postoperative complications such as fever, wound infection, and urinary retention are notably lower in the BiClamp group. Additionally, hospital stay is significantly shorter in the BiClamp group. Although labial burns occur in 13.9% of BiClamp patients, no major injuries like bladder or bowel trauma occur in this group.

Overall, the use of BiClamp results in better efficiency, fewer complications, and improved recovery profiles. BiClamp is recommended as the preferred technique for vessel sealing in vaginal hysterectomy due to its shorter operative time, reduced blood loss, lower postoperative pain, and faster recovery. Though minor complications like labial burns may occur, they are outweighed by the overall benefits.

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