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COMPARISON OF WOUND INFECTION BETWEEN PRIMARY RESECTION WITH ANASTOMOSIS AND COLOSTOMY IN SIGMOID VOLVULUS

Original Research

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ABSTRACT

Background: Sigmoid volvulus is a common cause of large bowel obstruction, requiring urgent surgical intervention. Primary resection with anastomosis (RA) and Hartmann's procedure (HP) are two widely used surgical approaches, each associated with specific risks and benefits. Postoperative wound infection remains a significant concern, impacting recovery and patient outcomes. While previous studies have compared these procedures, limited data exist on their direct impact on surgical site infections. This study aimed to compare wound infection rates between RA and HP to guide optimal surgical decision-making.

Objective: To compare the frequency of wound infection between RA and HP in patients undergoing surgical management of sigmoid volvulus.

Methods: A randomized controlled trial was conducted at the Department of Surgery, HMC Hospital, Peshawar, from January 15, 2023, to July 15, 2023. A total of 166 patients diagnosed with sigmoid volvulus were enrolled and equally divided into two groups: 83 underwent RA, and 83 underwent HP. Participants were selected based on strict inclusion criteria, including age (18–60 years), ASA grade I or II, and presentation within 48 hours of symptom onset. Patients with severe obesity-related complications or poorly controlled diabetes were excluded. Randomization was performed using a blocked randomization method. All procedures were conducted by an experienced surgeon, and postoperative wound infection was assessed over 30 days based on clinical signs such as erythema, swelling, or purulent discharge, confirmed by laboratory culture. Statistical analysis was performed using SPSS version 20, with categorical variables analyzed through chi-square tests and significance set at $p < 0.05$.

Results: Wound infection was reported in 17 cases (20.5%) in the RA group and 12 cases (14.5%) in the HP group. The overall infection rate was 17.5% across both groups. Statistical analysis revealed no significant difference in infection rates between the two surgical approaches ($p=0.30$). Stratification by age, gender, BMI, and residential status showed no notable variations in wound infection rates ($p > 0.05$).

Conclusion: Both RA and HP demonstrated comparable wound infection rates, indicating that the choice of surgical approach should be individualized based on clinical severity and patient stability. While RA may be preferred in stable cases, HP remains a crucial option for critically ill patients. Diligent postoperative care is essential to minimize complications and improve patient outcomes.

Keywords: Anastomosis, Colorectal Surgery, Hartmann's Procedure, Postoperative Complications, Resection, Sigmoid Volvulus, Wound Infection.

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INTRODUCTION

A volvulus occurs when the intestine twists around the central axis of its blood supply, leading to a potential obstruction. Among the different types of colonic volvulus, sigmoid volvulus is the most prevalent, accounting for approximately 66% of cases (1). It results from the rotation of the sigmoid colon around its mesenteric attachment, often occurring in individuals with limited mobility, those who are bedridden, or those residing in care facilities, frequently with a history of chronic constipation (2). While caecal volvulus and volvulus of other colonic segments are relatively rare, sigmoid volvulus remains a significant clinical concern due to its potential for severe complications if left untreated (3). The etiology of colonic volvulus is multifaceted, with both anatomical and functional factors playing a role. Commonly associated risk factors include chronic constipation, a diet high in fiber, habitual laxative use, and certain anatomical predispositions (4). Additionally, conditions such as type 2 diabetes, neuropsychiatric disorders that impair independence, institutionalization, and prolonged immobility have been identified as contributing factors to sigmoid volvulus (5). In younger patients, underlying conditions such as megacolon may predispose them to this pathology (5,6). The characteristic anatomical features of a broad mesentery combined with a narrow attachment led to the twisting of the sigmoid colon, typically in a counterclockwise direction around the mesenteric axis (7). If not promptly addressed, sigmoid volvulus can result in grave complications, including intestinal ischemia and perforation, necessitating urgent surgical intervention (8).

The management of sigmoid volvulus remains a clinical challenge, with treatment decisions dependent on multiple factors such as the patient's overall health, the integrity of the bowel wall, the presence of perforation, and the surgical expertise available. Non-resective strategies, such as endoscopic decompression via flexible sigmoidoscopy, may be attempted in select cases; however, recurrence rates remain high (7,9). When surgical intervention is required, resection becomes imperative, particularly in the presence of gangrenous bowel. The choice between primary resection with anastomosis and the Hartmann's procedure remains a subject of debate, with each approach carrying its own risks and benefits (10). Hartmann's procedure, often employed in cases of bowel gangrene, is associated with a significant risk of stoma-related complications, necessitating further surgical intervention for colostomy reversal (5,11). One of the major postoperative concerns in sigmoid volvulus surgery is wound infection, which can be influenced by factors such as bowel ischemia, peritoneal contamination, and the patient's overall physiological status (12). Studies comparing primary resection with anastomosis to Hartmann's procedure have reported varying rates of wound infection, with incidences of 18.2% and 5.7%, respectively (13). Given the critical implications of postoperative wound infections in sigmoid volvulus management, this study aims to evaluate the incidence of wound infections following primary resection with anastomosis compared to Hartmann's procedure. The findings will provide valuable insights for local surgeons, informing clinical practice and contributing to future research and preventive strategies aimed at minimizing surgical site infections in patients undergoing surgical treatment for sigmoid volvulus.

METHODS

The study was conducted as a randomized controlled trial at the Department of Surgery, HMC Hospital, Peshawar, over a six-month period from January 15, 2023, to July 15, 2023. A total of 166 participants were enrolled, equally divided into two groups of 83 patients each. The sample size was determined based on prior research, which estimated wound infection rates at 18.2% for primary resection with anastomosis (RA) and 5.7% for Hartmann's procedure (HP), with a 95% confidence level and 80% statistical power (14). Participants were consecutively recruited from inpatient admissions and outpatient departments, prioritizing those who met the predefined eligibility criteria. Inclusion criteria comprised individuals aged 18 to 60 years, classified as American Society of Anesthesiologists (ASA) grade I or II, and presenting with confirmed sigmoid volvulus within 48 hours of symptom onset. Exclusion criteria were designed to minimize potential confounding factors while maintaining a clinically relevant patient population (15). Instead of an arbitrary BMI cutoff, exclusion was based on severe obesity-related complications, such as poorly controlled hypertension (systolic blood pressure >160 mmHg or diastolic >100 mmHg), obstructive sleep apnea requiring continuous positive airway pressure therapy, or a history of bariatric surgery. Additionally, instead of excluding all diabetic patients with a disease duration exceeding three years, only those with poorly controlled diabetes (HbA1c >8.5% or requiring insulin therapy for glycemic stabilization) were excluded to account for variability in metabolic control rather than just disease duration.

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Ethical approval was obtained from the institutional review board, and all participants provided written informed consent after receiving a thorough explanation of the study's objectives and procedures (16). Randomization was performed using a blocked randomization method to ensure equal distribution between the intervention groups. All surgical procedures were carried out by a single experienced general surgeon with over five years of expertise to maintain consistency in operative techniques. Postoperative care followed standardized protocols, including administration of a triple antibiotic regimen, analgesics, and daily wound dressings. Participants were monitored for 30 days postoperatively for wound infections, defined by clinical signs such as erythema, swelling, or purulent discharge, confirmed via laboratory culture analysis. Data collection included demographic details, clinical outcomes, and infection rates, all systematically recorded. Statistical analyses were conducted using SPSS version 20, with continuous variables such as age and BMI presented as mean ± standard deviation. Categorical variables, including infection rates, were expressed as frequencies and percentages. The chi-square test was applied to assess differences between groups, with statistical significance established at $p < 0.05$. Stratification based on variables such as age, gender, and residence were performed to evaluate potential effect modifiers. The results were synthesized into tables and graphs for comprehensive analysis and interpretation.

RESULTS

The study evaluated wound infection rates between primary resection with anastomosis and Hartmann's procedure in the surgical management of sigmoid volvulus. Each group consisted of 83 participants, with a total of 166 individuals analyzed. The mean age was comparable between the two groups, with Group A (primary resection with anastomosis) having a mean age of 39.1±11.6 years, while Group B (Hartmann's procedure) had a mean age of 39.0±11.7 years. The duration of symptoms before intervention varied significantly, with Group A reporting a longer mean duration of 25.7±11.7 hours compared to 14.4±14.8 hours in Group B. Body mass index (BMI) values were nearly identical, with averages of 26.4±1.1 kg/m² in Group A and 26.4±1.2 kg/m² in Group B. Demographic characteristics revealed slight variations between the two groups. In Group A, 49 (59.0%) participants were male and 34 (41.0%) were female, whereas Group B had 53 (63.9%) males and 30 (36.1%) females. Literacy rates were similar, with 32 (38.6%) literate individuals in Group A and 34 (41.0%) in Group B, while illiteracy was noted in 51 (61.4%) and 49 (59.0%) participants, respectively. Rural residency was more common, with 48 (57.8%) individuals in Group A and 51 (61.4%) in Group B, while urban residents accounted for 35 (42.2%) and 32 (38.6%), respectively.

Wound infection was reported in 17 cases (20.5%) in Group A and 12 cases (14.5%) in Group B. Non-infected cases comprised 66 (79.5%) in Group A and 71 (85.5%) in Group B. The overall infection rate for both groups combined was 17.5% (29 out of 166 participants). Statistical analysis demonstrated no significant difference in infection rates between the two surgical approaches ($p=0.30$), indicating comparable outcomes. Further stratified analysis showed no significant differences in wound infection rates concerning age, gender, BMI, education status, and occupation status ($p > 0.05$).

Table 1 Descriptive statistics

Groups		**Age (Years)**	**Duration of symptoms (Hours)**	**BMI (Kg/m²)**
Group A (Primary resection with anastomosis)	Mean	39.13	25.69	26.4236
	N	83	83	83
	Std. Deviation	11.600	11.684	1.07411
Group B (Hartmann's procedure)	Mean	38.99	14.43	26.3682
	N	83	83	83
	Std. Deviation	11.745	14.754	1.15429

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Table 2 Demographics

Demographics		Groups			
		Group A (Primary resection with anastomosis)		Group B (Hartmann's procedure)	
		N	%	N	%
Gender	Male	49	59.0%	53	63.9%
	Female	34	41.0%	30	36.1%
Education status	Literate	32	38.6%	34	41.0%
	Illiterate	51	61.4%	49	59.0%
Residence area	Rural	48	57.8%	51	61.4%
	Urban	35	42.2%	32	38.6%

Table 3 Comparison of Wound Infection Rates Between Primary Resection with Anastomosis and Hartmann's Procedure in Sigmoid Volvulus Patients

		Wound infection		Total	P value
		Yes	No		
Groups	Group A (Primary resection with anastomosis)	17	66	83	0.30
		20.5%	79.5%	100.0%	
	Group B (Hartmann's procedure)	12	71	83	
		14.5%	85.5%	100.0%	
Total		29	137	166	
		17.5%	82.5%	100.0%	

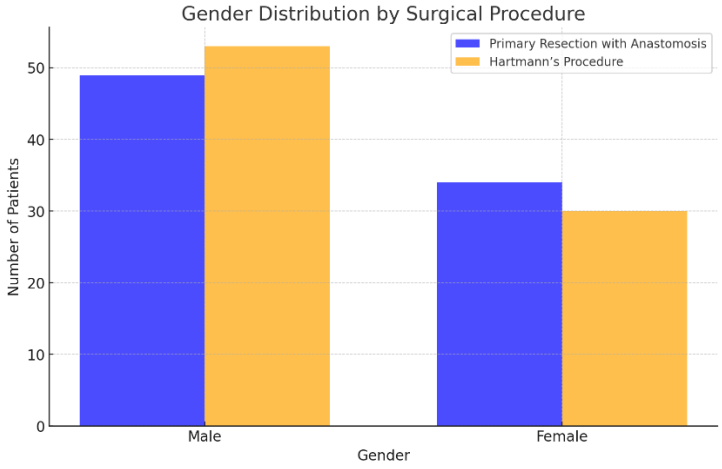

Figure 2 Gender Distribution by Surgical Procedure

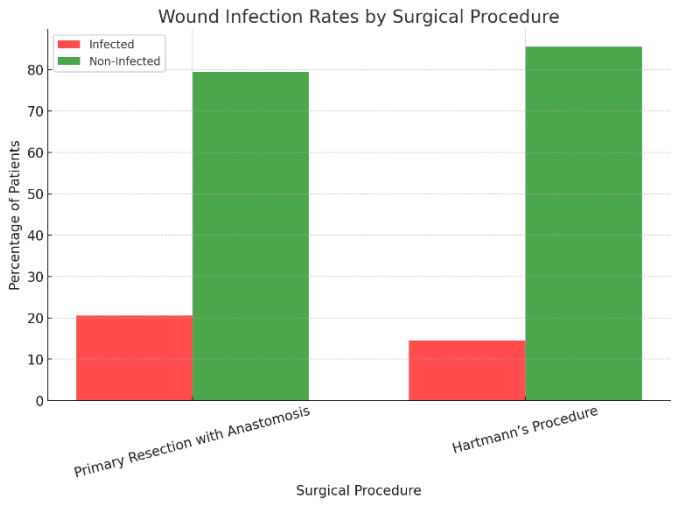

Figure 1 Wound Infection Rates by Surgical Procedures

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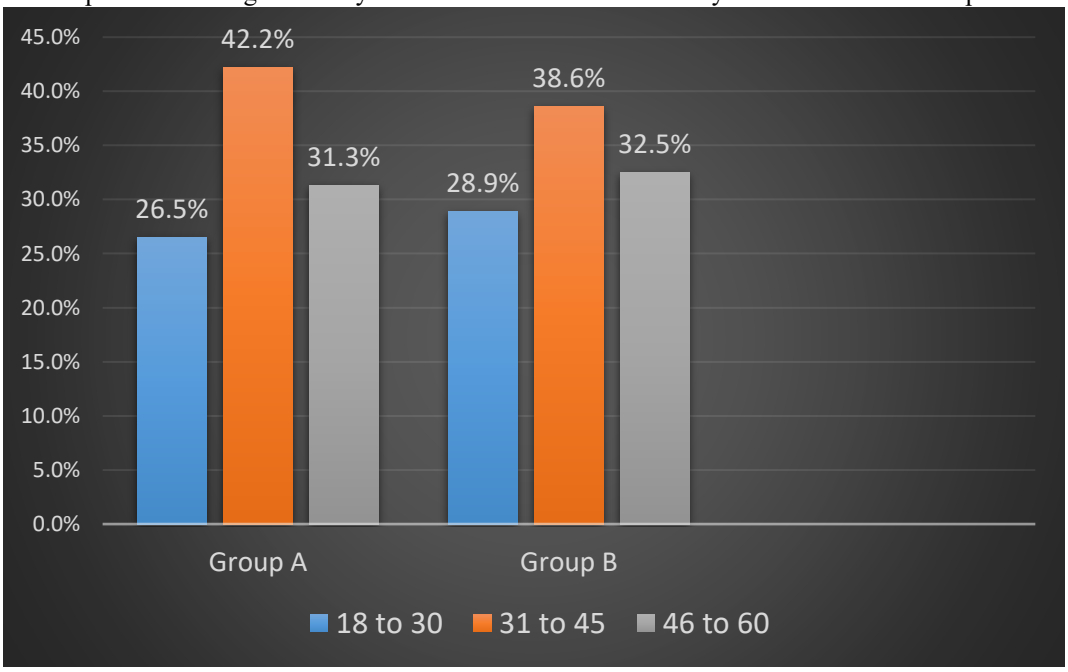
DISCUSSION

The findings of this study provide valuable insights into the comparative wound infection rates between primary resection with anastomosis and Hartmann's procedure in the management of sigmoid volvulus. Both groups consisted of 83 participants with similar baseline characteristics, allowing for a balanced comparison. The mean age was nearly identical between the two groups, with Group A at 39.1±11.6 years and Group B at 39.0±11.7 years. The demographic distribution revealed a predominance of male patients, aligning with existing literature that has documented a higher prevalence of sigmoid volvulus in men. This gender disparity has been attributed to anatomical and lifestyle differences that predispose males to volvulus formation (17).

The wound infection rates observed in this study were 20.5% in Group A and 14.5% in Group B, with an overall infection rate of 17.5%. Statistical analysis demonstrated no significant difference between the two surgical approaches (p=0.30), suggesting that both procedures have comparable infection risks. These findings are consistent with previous research, which has shown no substantial difference in postoperative infection rates between primary resection with anastomosis and Hartmann's procedure (18). Despite the lack of statistical significance, a slightly higher infection rate in Group A raises concerns regarding anastomotic leakage, which is a recognized postoperative complication that can contribute to infectious morbidity. In contrast, Hartmann's procedure, while associated with fewer wound infections in this study, carries its own risks, including stoma-related complications and the necessity for a second-stage reversal surgery, which may prolong recovery and increase the likelihood of subsequent infections (19).

While both procedures have comparable outcomes in terms of infection rates, their selection should be individualized based on patient characteristics and intraoperative findings. Primary resection with anastomosis may be more suitable for patients with viable bowel



tissue and stable hemodynamic status, as it offers the advantage of avoiding a permanent stoma. However, in cases of bowel gangrene, perforation, or sepsis, Hartmann's procedure remains a safer alternative, particularly in critically ill patients where anastomotic failure poses a significant risk (20). The findings of this study reinforce the need for a tailored surgical approach, considering the patient's clinical presentation, comorbid conditions, and the feasibility of future stoma reversal.

This study possesses notable strengths, including its randomized controlled design, which minimizes selection bias and ensures a robust comparison of the two surgical techniques. Additionally, the inclusion of a homogenous patient population with standardized postoperative management enhances the reliability of the findings. However, certain limitations must be acknowledged. The relatively short follow-up period of 30 days may not fully capture late-onset surgical site infections or long-term complications such as anastomotic stricture or stoma-related morbidity. Future studies with extended follow-up durations would provide a more comprehensive understanding of the long-term outcomes associated with these procedures. Another limitation is the exclusion of patients with severe obesity-related complications and poorly controlled diabetes, which may limit the generalizability of these findings to a broader patient

population. Further research should aim to assess infection rates across a wider spectrum of patient comorbidities to refine surgical decision-making.

Despite these limitations, this study contributes to the growing body of evidence on the surgical management of sigmoid volvulus. The results highlight that both primary resection with anastomosis and Hartmann's procedure yield comparable infection rates, reinforcing the importance of patient selection in determining the most appropriate surgical approach. Future research should focus on evaluating additional factors such as hospital stay duration, mortality rates, and quality of life post-surgery to establish a more comprehensive framework for guiding surgical decision-making in sigmoid volvulus management.

CONCLUSION

This study demonstrated that both primary resection with anastomosis and Hartmann's procedure result in comparable wound infection rates in the surgical management of sigmoid volvulus. The choice between these two approaches should be guided by the patient's clinical condition, with primary resection being a suitable option for stable patients and Hartmann's procedure offering a safer alternative for those with severe complications. Regardless of the selected technique, meticulous postoperative care remains essential in minimizing complications and optimizing patient outcomes. These findings contribute to the ongoing discourse on the most effective surgical strategies for sigmoid volvulus and underscore the importance of individualized patient management in achieving optimal surgical results.

Author Contribution

Author	**Contribution**
Iqra*	Substantial Contribution to study design, Data analysis, acquisition of Data, and Manuscript Writing Has given Final Approval of the version to be published
Zahid Aman	Substantial Contribution to study design, and Critical Review Has given Final Approval of the version to be published
Sial Amin	Review of Literature
Abbas Khan	Review of Literature
Mahnoor Javed	Review of Literature

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