

ORIGINAL RESEARCH

Comparative Analysis of Hemostatic Efficacy: Local Application of Lancehead Snake Venom Thrombin versus Hemostatic Forceps in Colon Polypectomy

Dalei Chen, MM; Jingwei Kou, MM; Jianguang Zhang, MM

ABSTRACT

Background • Colon polypectomy often involves managing bleeding, and the choice of hemostatic methods is critical for patient outcomes. This study addresses the hemostatic effects of lancehead snake venom thrombin compared to hemostatic forceps in the context of colon polypectomy.

Objective • To compare and assess the effectiveness and safety of local application of lancehead snake venom thrombin and hemostatic forceps in achieving hemostasis during colon polypectomy.

Design • A randomized controlled trial was conducted to investigate and compare the hemostatic outcomes of two different approaches in colon polypectomy.

Setting • The study was conducted at the Affiliated Hospital of Hebei University Hospital from January 2022 to June 2022.

Participants • A total of 80 patients with colon polyps who met the inclusion criteria were randomly assigned to either the lancehead snake venom thrombin group or the hemostatic forceps group.

Interventions • In the hemostatic forceps group, hemostatic forceps were employed to seal the wound post-polyp resection. In the lancehead snake venom thrombin group, aluminium potassium sulfate gel, in conjunction

with locally sprayed lancehead snake venom thrombin, was applied to the wound.

Primary Outcome Measures • The study assessed (1) intraoperative immediate bleeding and hemostasis; (2) intraoperative hemostasis time; (3) postoperative delayed post-polypectomy bleeding (DPPB); and (4) adverse reactions as primary outcome measures.

Results • No significant differences were observed in the incidence rate of intraoperative immediate bleeding and the success rate of intraoperative hemostasis between the two groups. The lancehead snake venom thrombin group exhibited a shorter intraoperative hemostasis time and a lower incidence rate of adverse reactions compared to the hemostatic forceps group. No significant difference was found in the incidence rate of postoperative DPPB between the two groups.

Conclusion • Local application of lancehead snake venom thrombin proves to be more effective and safer than hemostatic forceps in promptly managing bleeding during colon polypectomy. (*Altern Ther Health Med.* [E-pub ahead of print.])

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INTRODUCTION

Colorectal cancer has emerged as the third most prevalent cancer and the second leading cause of death worldwide.¹ Typically evolving from polyps, colorectal cancer includes adenomatous or serrated polyps categorized by their distinct growth patterns.² Failure to promptly remove colon polyps poses a significant risk, with up to a 20% chance of

progressing to colon cancer.³ Therefore, the timely removal of colon polyps plays an important role in mitigating the risk of colon cancer for patients.⁴

Presently, endoscopic polypectomy stands as the primary treatment for colon polyps.⁵ While offering the advantage of a relatively shorter operation time, it is associated with a higher incidence of complications.⁶ Predominant among these complications are post-polypectomy bleeding (PPB) and colon perforation.⁷ PPB is further categorized into immediate post-polypectomy bleeding (IPPB) and delayed post-polypectomy bleeding (DPPB).⁸ The reported incidence of IPPB ranges from 2.1% to 9%, whereas that of DPPB is 0.7-2.5%.⁹

In instances of IPPB, endoscopists commonly employ hemostatic forceps for closure, effectively addressing IPPB.¹⁰ Timely intervention for IPPB proves instrumental in averting the development of DPPB.¹¹ However, the use of hemostatic

forceps is linked to an extended operation time¹² and does not substantially decrease the risk of DPPB.¹³

Lancehead snake venom thrombin is a purified thrombin-like enzyme derived from snake venom and is extensively utilized for preventing and treating surgical bleeding.¹⁴ It demonstrates outstanding hemostatic efficacy, particularly in orthopedic surgeries.¹⁵ Studies indicate that the localized application of hemostatic agents during polypectomy proves effective in achieving hemostasis.¹⁶

Therefore, this study aims to carefully compare the hemostatic effects achieved through the local application of lancehead snake venom thrombin with those attained using hemostatic forceps in the context of colon polypectomy. This study provides insights into optimizing hemostatic procedures during colon polypectomy, potentially enhancing patient outcomes and safety in this common medical intervention.

DATA AND METHODS

Study Design

A total of 80 patients with colon polyps who visited the Affiliated Hospital of Hebei University Hospital from January 2022 to June 2022 were selected as the study subjects. The study employed a randomized and even distribution method, dividing patients into the lancehead snake venom thrombin group and the hemostatic forceps group through computer-generated random numbers. Ethical approval for this study was obtained from the Ethics Committee of the Affiliated Hospital of Hebei University Hospital, and all patients provided informed consent before surgery.

Inclusion and Exclusion Criteria

Inclusion Criteria were as follows: (1) Patients with various sizes of pedunculated polyps and adenomas; (2) Those with non-pedunculated polyps and adenomas with a diameter <2 cm; (3) Patients with multiple adenomas and polyps exhibiting scattered distribution and a small number. Exclusion criteria were as follows: (1) Patients with contraindications for endoscopy; (2) Those with familial adenomatous polyposis; (3) Patients with obvious malignant transformation observed through endoscopy and suitable for surgical treatment; (4) Individuals with uncorrected coagulation disorders, platelet count <100×10⁹/L; (5) Patients with significant liver or kidney dysfunction.

Polypectomy Procedure

Patients in both groups underwent polypectomy via a colonoscope (CV-150 Electronic Colonoscope, Olympus, Japan).

Hemostatic Procedures in the Lancehead Snake Venom Thrombin Group

In the lancehead snake venom thrombin group, the wound was irrigated with 1U of lancehead snake venom thrombin (H20041419, Penglai Nuo Kang Pharmaceutical Co., Ltd., Shandong, China) diluted in 10 mL of 0.9% saline after polyp removal. Additional snake venom thrombin was

applied if bleeding persisted after 3 minutes.¹⁷ After hemostasis, the site was observed for 3 minutes, and then the colonoscope was withdrawn.

Hemostatic Procedures in the Hemostatic Forceps Group

In the hemostatic forceps group, 1-3 Hemoclips (HX-610-135L, Olympus, Japan) were applied to the wound for hemostasis immediately after polyp removal. Similar to the other group, the site was observed for 3 minutes post-hemostasis, and then the colonoscope was withdrawn.

Observation Indicators

Intraoperative Immediate Bleeding and Hemostasis.

The study assessed the incidence rate of intraoperative immediate bleeding, defined as active bleeding or oozing occurring within 3 minutes after polyp removal. Additionally, the success rate of intraoperative hemostasis, characterized by bleeding cessation within 3 minutes, underwent statistical analysis for both patient groups.

Intraoperative Hemostasis Time.

The study conducted a statistical analysis of the intraoperative hemostasis time, defined as the duration from lesion removal to the cessation of active bleeding in the residual lesion, for both patient groups.

Postoperative Delayed Post-Polypectomy Bleeding (DPPB) Condition. The study conducted a statistical analysis of the number of patients who developed DPPB, identified by a positive result in the fecal occult blood test within 30 days after surgery, in both groups.

Adverse Reactions. The study conducted a statistical analysis of adverse reactions occurring post-surgery.

Statistical Analysis

Data analysis was conducted using SPSS 23.0 (IBM, Armonk, NY, USA) for statistical analysis and GraphPad Prism 9.0 for graphical representation. Continuous data were expressed as mean ± standard deviation ($\bar{x} \pm s$), and the *t* test was employed for between-group comparisons. Categorical data were presented as [n (%)] and analyzed using the chi-squared test (χ^2). A significance level of *P* < .05 was applied for statistical significance.

RESULTS

Comparison of General Patient Data

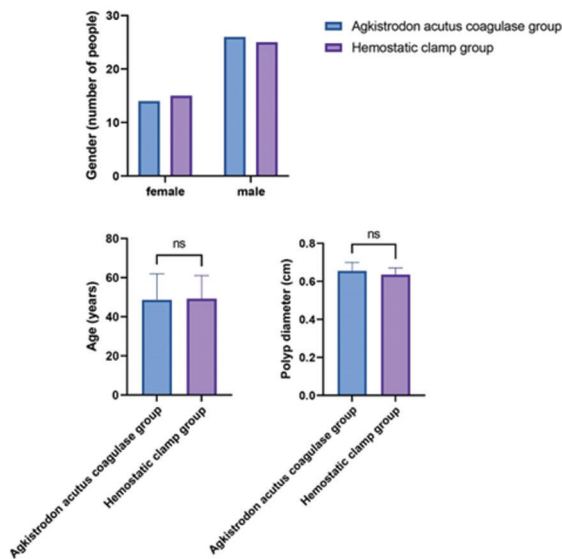
Upon comparison, no statistically significant differences were observed between the two patient groups in terms of age, gender, and polyp diameter (*P* > .05). Refer to Table 1 and Figure 1 for details.

Table 1. Comparison of General Patient Information

Category	Gender		Age (years)	Polyp Diameter (cm)
	Male	Female		
Lancehead Snake Venom Thrombin Group (n=40)	26	14	48.63±13.35	0.65±0.04
Hemostatic Forceps Group (n=40)	25	15	49.20±11.80	0.64±0.04
t/χ ²	0.0541		0.2023	1.1180
P value	.8161		.8402	.2670

Notes: Data are presented as ($\bar{x} \pm s$).

Figure 1. Comparison of Patient Characteristics between Snake Venom Thrombin and Hemostatic Forceps (Clamp) Groups



Note: Statistical analysis reveals no significant differences in gender distribution, age, or polyp diameter among patients in the Snake Venom Thrombin group and the Hemostatic Forceps (Clamp) group.

Table 2. Comparison of Intraoperative Immediate Bleeding and Hemostasis in Patients

Category	Immediate Bleeding (%)	Hemostasis Success Rate (%)
Lancehead Snake Venom Thrombin Group (n=40)	11 (27.5)	100
Hemostatic Forceps Group (n=40)	9 (22.5)	100
χ^2	0.2667	1
P value	.6056	1

Notes: Data are presented as [n (%)].

Comparison of Intraoperative Immediate Bleeding and Hemostasis

The comparison results revealed no statistically significant differences in the incidence rate of intraoperative immediate bleeding and the success rate of intraoperative hemostasis between the two groups ($P > .05$). Refer to Table 2 and Figure 2 for detailed findings.

Intraoperative Hemostasis Time

The intraoperative hemostasis time was significantly shorter in the lancehead snake venom thrombin group compared to the hemostatic forceps group ($P < .05$). Refer to Table 3 and Figure 3 for detailed results.

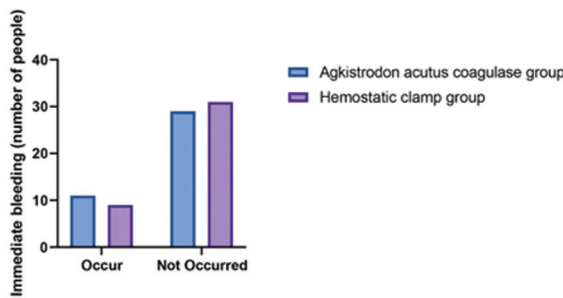
Comparison of Postoperative Delayed Post-Polypectomy Bleeding (DPPB)

No statistically significant difference was observed in the incidence rate of postoperative DPPB between the two groups ($P > .05$). Refer to Table 4 and Figure 4 for detailed findings.

Adverse Reactions in Patients

The incidence rate of adverse reactions was significantly lower in the lancehead snake venom thrombin group

Figure 2. Comparison of Intraoperative Bleeding Patients between Snake Venom Thrombin and Hemostatic Forceps (Clamp) Groups



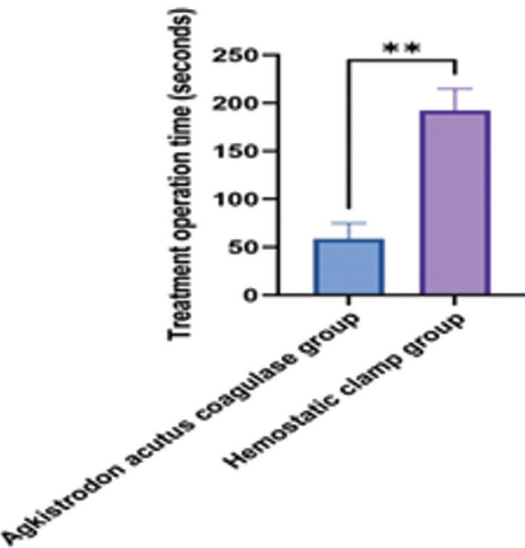
Note: The snake venom thrombin group exhibits a higher number of intraoperative bleeding patients compared to the hemostatic forceps group, although this difference lacks statistical significance.

Table 3. Intraoperative Hemostatic Procedure Time in Patients

Category	Treatment Procedure Time (s)
Lancehead Snake Venom Thrombin Group (n=40)	58.58±16.23
Hemostatic Forceps Group (n=40)	192.18±22.46
t	30.4926
P value	<.05

Notes: Data are presented as ($\bar{x} \pm s$).

Figure 3. Comparison of Intraoperative Hemostasis Time between Snake Venom Thrombin and Hemostatic Forceps (Clamp) Groups



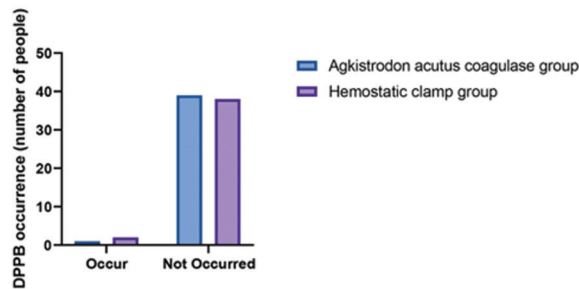
Note: Patients in the snake venom thrombin group demonstrate a shorter intraoperative hemostasis time compared to the hemostatic clip group.

Table 4. Comparison of Postoperative DPPB in Patients

Category	DPPB (%)
Lancehead Snake Venom Thrombin Group (n=40)	1 (2.5)
Hemostatic Forceps Group (n=40)	2 (5)
χ^2	0
P value	1

Notes: Data are presented as [n (%)].

Figure 4. Comparison of Delayed Post-Polypectomy Bleeding (DPPB) Incidence between Bothrops Atrax Thrombin and Hemostatic Forceps (Clamp) Groups



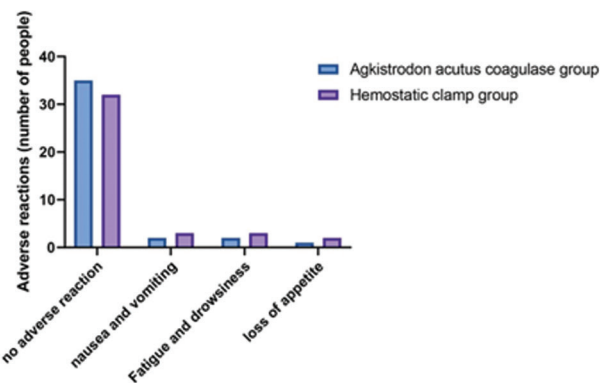
Note: In both the Bothrops atrax thrombin and hemostatic clip groups, the majority of patients did not experience Delayed Post-Polypectomy Bleeding (DPPB). However, the number of patients with DPPB was higher in the hemostatic clip group than the Bothrops atrax thrombin group, with no statistically significant difference observed between the two groups.

Table 5. Adverse Reactions in Patients

Category	Nausea And Vomiting (%)	Loss Of Appetite (%)	Fatigue And Sleepiness (%)	Adverse Reactions (%)
Lancehead Snake Venom Thrombin Group (n=40)	2 (5.0)	1 (2.5)	2 (5.0)	5 (12.5)
Hemostatic Forceps Group (n=40)	3 (7.5)	2 (5.0)	3 (7.5)	8 (20.0)
χ^2	0.8266			
P value	.3633			

Notes: Data are presented as [n (%)].

Figure 5. Comparison of Postoperative Adverse Reactions between Snake Venom Thrombin and Hemostatic Forceps (Clamp) Groups



Note: The snake venom thrombin group exhibits a higher number of postoperative adverse reactions compared to the hemostatic clip group, although this difference is not statistically significant.

compared to the hemostatic forceps group ($P < .05$). Refer to Table 5 and Figure 5 for detailed results.

DISCUSSION

Polypectomy, a widely employed and efficient surgical approach for precancerous polyps, plays a crucial role in significantly reducing the incidence and mortality of colorectal cancer.¹⁸ Despite its effectiveness, PPB is the most common complication of polypectomy, which has a considerable impact on patient treatment.¹⁹ PPB encompasses IPPB, occurring during surgery, and DPPB, occurring within 30 days after the procedure.²⁰

IPPB is typically addressed during the surgical procedure, whereas DPPB is more severe and may necessitate secondary interventions.²¹ Commonly accepted risk factors for DPPB include polyp size larger than 10 mm, specific colon polyp pathology (particularly in young individuals with Peutz-Jeghers syndrome), and the occurrence of IPPB.²²

Endoscopic clipping is an established technique for addressing IPPB during polypectomy.²³ This method achieves hemostasis mechanically by utilizing hemostatic forceps under an endoscope.²⁴ However, effective hemostasis often necessitates the use of multiple hemostatic forceps,²⁵ and the presence of multiple forceps is recognized as a risk factor for DPPB.²⁶ Furthermore, the preventive efficacy of hemostatic forceps against DPPB remains a subject of controversy.²⁷

Batroxobin is a thrombin-like serine protease extracted from the venom of Bothrops atrax and Bothrops moojeni snake species.²⁸ Existing research indicates that Bothrops atrax thrombin can effectively reduce prothrombin time and demonstrate favorable hemostatic and coagulation effects.²⁹ In this study, we conducted a comparison between the local application of lancehead snake venom thrombin and closure with hemostatic forceps during colon polypectomy.

The results revealed no statistically significant differences in the incidence rate of intraoperative immediate bleeding and the success rate of intraoperative hemostasis between the two groups. However, the intraoperative hemostasis time was notably shorter in the lancehead snake venom thrombin group compared to the hemostatic forceps group. This finding suggests that the local application of Bothrops atrax thrombin may be more effective than using hemostatic clips in promptly managing bleeding during colon polypectomy in patients.

In this study, two cases of DPPB occurred in the hemostatic forceps group, while only one case of DPPB was observed in the lancehead snake venom thrombin group. However, this difference was not statistically significant, potentially due to the limited sample size in this study. Concerning adverse reactions, the proportion of patients experiencing adverse effects was lower in the lancehead snake venom thrombin group compared to the hemostatic forceps group. This result suggests that the local application of lancehead snake venom thrombin is a safer option for patients in comparison to hemostatic forceps.

Study Limitations

A few limitations should be acknowledged in this study. Firstly, the sample size was limited, potentially affecting the statistical power to detect small differences. Additionally, the study focused on a specific population and setting, limiting the generalizability of the findings to broader contexts. Moreover, the nature of the study design may introduce biases, and the analysis could lead to incomplete or biased data collection. The short follow-up period may not capture long-term outcomes or complications. Despite these limitations, the study provides valuable insights into the hemostatic effectiveness and safety of lancehead snake venom thrombin in colon polypectomy.

CONCLUSION

In conclusion, the study findings suggest that the local application of lancehead snake venom thrombin demonstrates superior effectiveness and safety in promptly managing bleeding during colon polypectomy when compared to the use of hemostatic forceps. The observed shorter intraoperative hemostasis time in the lancehead snake venom thrombin group supports its efficiency in achieving hemostasis. However, despite the promising results, further research is warranted to thoroughly assess the preventive effect of lancehead snake venom thrombin on DPPB. This recommendation stems from the recognition of the study's limitations, such as the limited sample size and the need for a more extended follow-up period to capture potential long-term outcomes and complications. Nonetheless, the study contributes valuable insights to the field, highlighting the potential benefits of lancehead snake venom thrombin in enhancing the safety and efficacy of colon polypectomy procedures.

CONFLICT OF INTERESTS

The authors report no conflict of interest.

FUNDING

No funding was received.

AUTHORS' CONTRIBUTIONS

Dalei Chen and Jingwei Kou contributed equally to the work.

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None

AVAILABILITY OF DATA AND MATERIALS

The data supporting the findings of this study are available from the corresponding author upon request, subject to reasonable conditions.

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