

Retrospective Comparative Assessment of the Clinical Efficacy of Cold Snare Polypectomy using a Thin-Wire Snare and Thick-Wire Snare for Small Colorectal Polyps

Dheeraj Kumar¹, Sonal², Vishwamohan Dayal³

¹Senior Resident, Department of Gastroenterology, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

²Senior Resident, Department of Obstetrics and Gynaecology, AIIMS, Patna, Bihar, India

³Professor and HOD, Department of Gastroenterology, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

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Corresponding author: Dr. Sonal

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Abstract

Aim: The aim of the present study was to compare the clinical effectiveness of thin-wire mini-snare and thick-wire mini-snare during CSP for small colorectal polyps.

Methods: This was a retrospective comparative study conducted in the Department of Gastroenterology. Patients who underwent CSP for 5 to 9 mm polyps were enrolled. CSP was performed on 80 patients, resulting in the removal of 100 polyps.

Results: There were no significant differences between the thin-snare group and the thick-snare group in terms of various factors, including age, the indication for the procedure, the size of the polyp, the morphology of the polyps and the pathological findings. The en bloc rate and resected specimen retrieval rate were 100% in both groups. The CRR was 78% in the thin- snare group and 84% in the thick-snare group, with no statistically significant difference between the two groups. There were no significant differences in specimen size and the rates of specimens containing submucosal tissue between the two groups. The depth of submucosa in resected specimens was $500.8 \pm 403.8 \mu\text{m}$ in the thin-snare group and $409.3 \pm 196.5 \mu\text{m}$ in the thick-snare group, with no statistically significant difference between the two groups. In the univariate analysis of independent factors related to CRR, the pathologic diagnosis of the polyp was the only factor statistically significantly associated with the CRR. In contrast, no statistically significant associations were found for other factors, such as snare type, polyp size polyp morphology, polyp location. In the multiple logistic regression analysis, the pathologic diagnosis of the polyp was the only independent factor related to the CRR, and the CRR was significantly lower in SSLs than in adenomas.

Conclusion: In conclusion, when performing CSP for small polyps, the snare thickness does not seem to have a significant effect on the clinical outcomes, including CRR and the occurrence of complications. Among the factors associated with the CRR, the histologic finding of the polyp, such as SSL, was the only risk factor for incomplete resection.

Keywords: thin-wire and thick-wire mini-snare, Adenoma; Colonic polyps; Hemorrhage

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Introduction

Colorectal cancer (CRC) is a leading cause of cancer-related morbidity and mortality, and colonoscopy is effective at reducing the risk through the removal of adenomatous polyps. [1,2] Techniques for endoscopic polyp resection include cold or hot biopsy forceps and cold or hot snare, and significant variation exists in clinical practice. [3] Cold snare polypectomy is used to remove colonic polyps up to 10mm in size through transection of the polyp base along with a 1-2 mm cuff of normal mucosa to achieve complete resection. This technique avoids the use of electrocautery and its

potential for deep thermal injury associated delayed bleeding or perforation. [4] The effectiveness of colonoscopy in reducing CRC is dependent on accurate detection and complete resection of colorectal polyps. CRC diagnosed soon after colonoscopy ("interval" CRC) may be due to incompletely resected polyps in 19% of cases. [5] Traditional hot snare polypectomy (HSP) is useful for removing these lesions. However, HSP is associated with a small but significant risk of serious adverse events, including post-polypectomy bleeding (PPB) and perforation. [6] The American

Society for Gastrointestinal Endoscopy and the European Society of Gastrointestinal Endoscopy recommend cold snare polypectomy (CSP) for colorectal lesions <10 mm in diameter. [7,8] In a recent large-scale propensity score-matched study of polypectomy outcomes for colorectal lesions <10 mm, CSP had a significantly lower risk of PPB than HSP. [9] Endoscopic lesion resection is the second factor that determines polypectomy efficacy, as residual lesions can be associated with post-colonoscopy interval cancer. [10] The presence of residual or recurrent tissue following snare polypectomy is reportedly 3% to 14%. [11,12] A recent randomized controlled trial by the POLIPEC HOT-COLD study group showed no differences in complete resection rates (CRRs) between HSP and CSP, with reduced intensity and duration of post-colonoscopy abdominal pain. [13]

To improve the convenience and effectiveness of CSP, a specialized cold snare has been designed. This dedicated cold snare is thinner than the traditional snare, and its angled shield-like shape is distinctive from the oval shape of the conventional snare. [14] Several studies have demonstrated that the thin-wire snare has a superior CRR compared to the conventional thick-wire snare. [15] However, the conventional thick-wire snare is still in widespread use, and some studies suggest that there is no significant difference in CRR. [16]

The aim of the present study was to compare the clinical effectiveness of thin-wire mini-snare and thick-wire mini-snare during CSP for small colorectal polyps.

Materials and Methods

This was a retrospective comparative study conducted in the Department of Gastroenterology, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India from December 2021 to November 2022. Patients who underwent CSP for 5- to 9-mm polyps were enrolled. CSP was performed on 80 patients, resulting in the removal of 100 polyps. This study included endoscopy examinees who underwent screening without any specific symptoms or medical history, or who had undergone regular surveillance after removal of polyps before. We excluded subjects who had a colorectal polyp diameter < 5 mm or > 9 mm, anti-platelet agent or anti-coagulant use within 1 week before polypectomy, polyposis of the alimentary tract, a history of inflammatory bowel disease, and an American Society of Anaesthesiologists class III or higher. If three or more polyps were observed in a patient, only two polyps that met the study inclusion criteria were removed. This study was conducted in accordance with the Declaration of Helsinki;

Endoscopic Procedure

CSP was performed by five endoscopists in this study. Among them, two were experts in therapeutic

colonoscopy, while the remaining three had less experience. An expert endoscopist was defined as a gastroenterologist who had conducted at least 500 therapeutic colonoscopic procedures, such as polypectomy, endoscopic mucosal resection, and endoscopic submucosal dissection over a span of 3 years. Single-channel colonoscopes (series 260; Olympus America Corp.) were used for all procedures. Two kinds of snares (Exacto™ Cold Snare; US Endoscopy Inc., Captivator™ Small Hex; Boston Scientific Corp.) were used for polypectomy. A dedicated cold snare has a maximum snare diameter of 9 mm, and the snare wire thickness is 0.30 mm. A traditional oval mini-snare (Captivator™ Small Hex; Boston Scientific Corp.) has a maximum snare diameter of 13 mm, and the snare wire thickness is 0.43 mm. The polyp size was estimated using the open-forceps technique. CSP was performed after randomization. Each polyp was positioned as close to the 6 o'clock direction of the endoscopic channel as possible. When the snare was fully extended, it left normal tissue around the polyp, ensuring an adequate margin. The snare was gently closed by applying forward pressure on the snare catheter, and the polyps were transected without tenting. Afterward, the polyp was retrieved via the suction channel into a trap. All polypectomy sites were carefully screened for residual polyps.

Histopathologic Evaluation

Board-certified experienced pathologists in gastrointestinal pathology reviewed all specimens and diagnosed them histologically using the World Health Organization criteria. The complete resection status, safety margin, and depth of submucosa tissue in the resected specimen were examined.

Definitions of Factors

Intraprocedural bleeding was defined as significant post-polypectomy bleeding (PPB) developing during CSP. Immediate bleeding was defined as PPB occurring within 24 hours after CSP and delayed PPB as occurring between 24 hours and 21 days after the procedure. A perforation was defined as a condition where both a mural defect was observed endoscopically and the presence of free air was detected in a radiographic image taken after the procedure.

Statistical Analysis

We used SPSS version 22.0 (IBM Corp.) for the statistical analysis. Data are expressed as means ± standard deviations or as numbers (%). Continuous variables were compared using the Student t-test, and categorical variables were compared using the chi-square test. Univariate and multivariate logistic regression analyses were conducted to identify factors affecting significantly affecting the histological CRR. A P-value < 0.05 was considered to indicate statistical significance.

Results

Table 1: Baseline Characteristics

Variables	Thin wire group N=50	Thick wire group N=50	P Value
Age (yr, mean \pm SD)	62.6 \pm 12.2	63.7 \pm 10.5	0.412
Gender			
Male	32 (64)	40 (80)	0.012
Female	18 (36)	10 (20)	
Indication			
Screening	35 (70)	32 (64)	0.440
Surveillance	15 (30)	18 (36)	
Polyp size (mm, mean \pm SD or %)	6.4 \pm 1.2	6.2 \pm 0.8	0.150
5-6	31 (62)	41 (82)	
7-8	19 (38)	9 (18)	
Polyp morphology			
Polypoid	3 (6)	2 (4)	0.912
Non-polypoid	47 (94)	48 (96)	
Polyp location			
Right colon	30 (60)	33 (66)	0.110
Left colon	20 (40)	17 (34)	
Pathological findings			
Adenoma	48 (96)	47 (94)	0.750
SSL	2 (4)	3 (6)	

There were no significant differences between the thin-snare group and the thick-snare group in terms of various factors, including age, the indication for the procedure, the size of the polyp, the morphology of the polyps and the pathological findings.

Table 2: Clinical and Histological Outcomes According to Snare Type

	Thin wire group N=50	Thick wire group N=50	P Value
En bloc resection rate (%)	50 (100)	71 (100)	
Complete resection rate (%)	39 (78)	42 (84)	0.072
Retrieval rate (%)	50 (100)	71 (100)	
Tissue fly-away (%)	2 (4)	0 (0.0)	0.075
Complication (%)			
Immediate bleeding	8 (16)	4 (8)	0.264
Delayed bleeding	0	0	
Perforation	0	0	
Specimen size (mm, mean \pm SD)	8.2 \pm 3.5	7.5 \pm 4.6	0.414
Depth of specimen (%)			0.634
Muscularis mucosa	46 (92)	45 (90)	
Submucosa	4 (8)	5 (10)	
Depth of submucosa (μ m, mean \pm SD)	500.8 \pm 403.8	409.3 \pm 196.5	0.660

The en bloc rate and resected specimen retrieval rate were 100% in both groups. The CRR was 78% in the thin- snare group and 84% in the thick-snare group, with no statistically significant difference between the two groups. There were no significant differences in specimen size and the rates of

specimens containing submucosal tissue between the two groups. The depth of submucosa in resected specimens was 500.8 \pm 403.8 μ m in the thin-snare group and 409.3 \pm 196.5 μ m in the thick-snare group, with no statistically significant difference between the two groups.

Table 3: Factors Associated with Complete Resection

	Univariate		Multivariate		
	CR (n = 75)	Non-CR (n = 25)	P-value	OR (95% CI)	P-value
Age (yr, mean \pm SD)	62.1 \pm 10.3	60.5 \pm 11.4	0.525		
Snare type (%)			0.072	2.7 (0.96–7.48)	0.07
Thin wire	40	14			

Thick wire	35	11			
Polyp size (%)			0.733	1.3 (0.42–4.0)	0.654
5–6	56	16			
7–8	18	10			
Polyp morphology (%)			0.631		
Polypoid	3	2			
Non-polypoid	72	23			
Polyp location (%)			0.114		
Right colon	44	19			
Left colon	31	5			
Pathologic findings (%)			0.008	0.1 (0.12–0.57)	0.010
Adenoma	72	22			
SSL	2	3			

In the univariate analysis of independent factors related to CRR, the pathologic diagnosis of the polyp was the only factor statistically significantly associated with the CRR. In contrast, no statistically significant associations were found for other factors, such as snare type, polyp size polyp morphology, polyp location. In the multiple logistic regression analysis, the pathologic diagnosis of the polyp was the only independent factor related to the CRR, and the CRR was significantly lower in SSLs than in adenomas.

Discussion

Colonoscopy is the most important tool for detecting and eliminating precancerous lesions of the colon and rectum, and polypectomy has been proven to be effective in preventing colorectal cancer. [17-19] Various polypectomy methods have been used, and safety and the complete resection rate (CRR) are important factors to consider when choosing the polypectomy technique because incomplete resection of polyps causes the development of interval cancer. [20,21] Traditionally, hot snare polypectomy (HSP) is a widely used and generally safe method, although it can occasionally lead to severe side effects such as perforations and post-polypectomy syndrome.¹⁹ Conversely, cold snare polypectomy (CSP) does not employ an electrosurgical unit, making it a safer and more straightforward approach. CSP can reduce the duration of the procedure compared to HSP and prevent complications arising from thermal damage. [22,23]

There were no significant differences between the thin-snare group and the thick-snare group in terms of various factors, including age, the indication for the procedure, the size of the polyp, the morphology of the polyps and the pathological findings. The en bloc rate and resected specimen retrieval rate were 100% in both groups. The CRR was 78% in the thin-snare group and 84% in the thick-snare group, with no statistically significant difference between the two groups. There were no significant differences in specimen size and the rates of specimens containing submucosal tissue between the two groups. The

depth of submucosa in resected specimens was $500.8 \pm 403.8 \mu\text{m}$ in the thin-snare group and $409.3 \pm 196.5 \mu\text{m}$ in the thick-snare group, with no statistically significant difference between the two groups. According to previous studies, the rate of histologically confirmed CRR after CSP varied from 65% to 93%. [24,25] The CRR in polypectomy of small polyps remains an ongoing issue due to large differences between studies. A recent study showed that the CRR was significantly higher in the extended CSP group, which had a ≥ 1 mm circumferential resection margin during snaring (439/449 [98%]) than in the conventional CSP group (222/263 [84%], $P < 0.001$). This highlights the importance of ensuring a sufficient resection margin during snaring. However, the factors contributing to the increase in the CRR have not been fully investigated. [26]

A wide selection of snares is now available, with options differing in size, shape, and wire thickness, but there is a lack of comparative studies on the effectiveness of snare types. A dedicated cold snare with thin wire monofilament was developed to improve the CRR when performing CSP. Compared to the traditional braided snare generally used in polypectomy, the snare is thinner and has a distinctive rhombus shape. Hewett [27] reported that the cold snare allowed efficient resection of polyp tissue in a single piece with margins of normal tissue to ensure complete resection. In the univariate analysis of independent factors related to CRR, the pathologic diagnosis of the polyp was the only factor statistically significantly associated with the CRR. In contrast, no statistically significant associations were found for other factors, such as snare type, polyp size polyp morphology, polyp location. In the multiple logistic regression analysis, the pathologic diagnosis of the polyp was the only independent factor related to the CRR, and the CRR was significantly lower in SSLs than in adenomas. This is likely because the boundary of SSL was unclear, and the shape was flat in most cases. The overall CRR was lower than in previous studies, which could be due to several reasons. Although these factors were not statistically significant and CSP

was conducted before it became widely used in our country. Therefore, there might have been a lack of awareness about the importance of the circumferential resection margin when performing CSP.

Conclusion

In conclusion, when performing CSP for small polyps, the snare thickness does not seem to have a significant effect on the clinical outcomes, including CRR and the occurrence of complications. Among the factors associated with the CRR, the histologic finding of the polyp, such as SSL, was the only risk factor for in- complete resection.

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