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Original Article

# Comparison of the clinical efficacy of cold snare polypectomy using a thin-wire snare and thick-wire snare for small colorectal polyps

Hong Jin Yoon, Yunho Jung*, Young Sin Cho, and Il-Kwun Chung

A B S T R A C T

*Background:* Cold snare polypectomy (CSP) is an established technique for resecting small colorectal polyps without electrical current. This study aimed to compare the clinical effectiveness of thin-wire mini-snares and thick-wire mini-snares during CSP for small colorectal polyps.
*Methods:* We prospectively enrolled 120 patients with colon polyps (5–8 mm in diameter) who underwent CSP between July and December 2017. Patients were randomly divided into two groups (thick-snare and thin-snare) according to the thickness of the snares. The complete resection rate (CRR), polyp characteristics, technical factors, and histopathologic features of resected specimens were carefully analysed.
*Results:* In total, 137 eligible polyps were successfully resected using CSP (thin-snare group: $n$ = 66, thick-snare group: $n$ = 71). The location, size, morphology, and histologic findings of the polyps did not show statistically significant differences between the two groups. The CRR (thin-snare: 77.3% vs. thick-snare: 84.5%, $P$ = 0.068), retrieval rate (100% in both groups), and the rates of tissue fly-away ($P$ = 0.069), containing submucosal tissue (7.6% vs. 9.9%, $P$ = 0.637), and intraprocedural or delayed polypectomy bleeding were not significantly different between the two groups. The CRR was significantly lower in sessile serrated lesions than in adenomas (odds ratio, 0.1; 95% confidence interval, 0.12–0.57; $P$ = 0.010).
*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.



Keywords: Adenoma; Colonic polyps; Hemorrhage

## Introduction

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.[1–3] 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.[4,5] 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.[3] 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.[6,7] Furthermore, for polyps that are smaller than 10 mm, the CRR of CSP has shown non-inferiority compared to HSP, and complications such as delayed polypectomy bleeding and perforation are less common in CSP than in HSP.[8,9] For these reasons, the current guidelines from both the US Multi-Society Task Force and the European Society of Gastrointestinal Endoscopy endorse CSP as the standard treatment for small or diminutive polyps.[10,11]

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.[12] Several studies have demonstrated that the thin-wire snare has a superior CRR compared to the conventional thick-wire snare.[6,13] However, the conventional thick-wire snare is still in widespread use, and some studies suggest that there is no significant difference in CRR.[14] Therefore, this study aims to compare the clinical effectiveness of the thin wire mini-snare and the thick wire mini-

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snare during CSP in small colorectal polyps.

## Methods

### *Study population*

This was a prospective randomized controlled trial (RCT) at a tertiary university hospital. Patients who underwent CSP for 5- to 9-mm polyps between July 2017 and October 2017 were enrolled. 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; all sample collections and clinical data recordings were approved by the institutional ethics committee of Soonchunhyang University Chenoan Hospital (SCHCA 2017-08-034-003).

### *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 (Fig. 1, 2).

### *Histopathologic evaluation*

Board-certified experienced pathologists in gastrointestinal pathology reviewed all specimens and diagnosed them histologically using the World Health Organization criteria. The complete

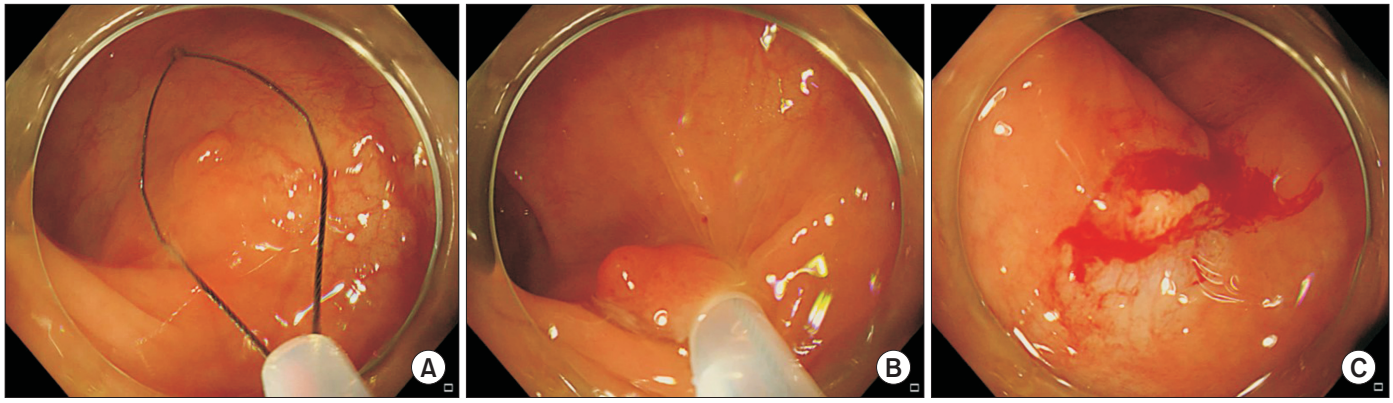


**Fig. 1.** (A–C) Cold snare polypectomy using a thin-wire snare.

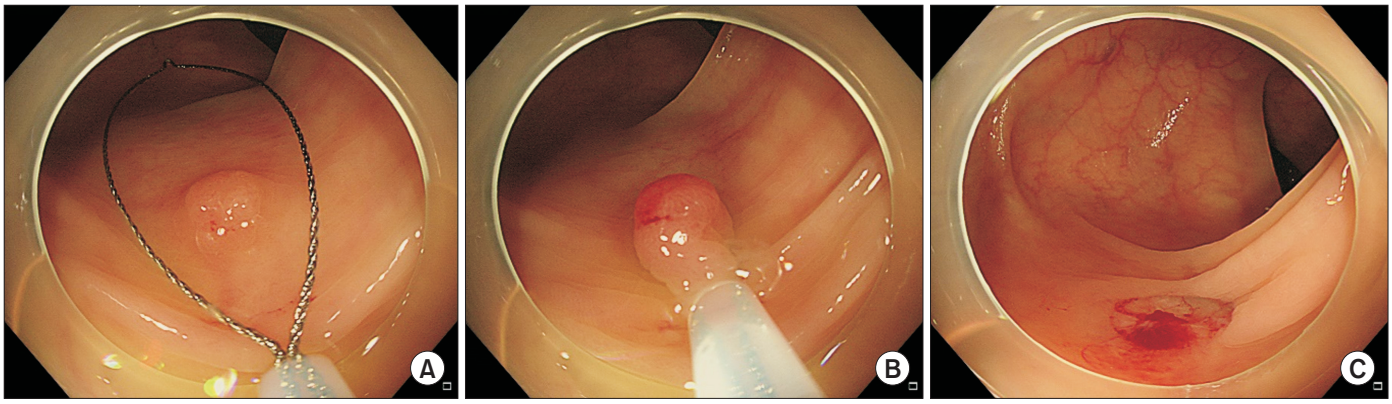


**Fig. 2.** (A–C) Cold snare polypectomy using a thick-wire snare.

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*

Based on a literature review,[13] we assumed a CRR of 80% for the thin-wire snare group and an expected decrease to 55% for the thick-wire snare group. With a power of 0.8 and a two-sided significance level of 5% (0.05), we determined the sample size. Accounting for a 10% dropout rate, this resulted in a total study population of 114 participants, divided evenly with 56 participants in each group. 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

CSP was performed on 120 patients, resulting in the removal of 137 polyps. There were no significant differences between the thin-snare group and the thick-snare group in terms of various factors, including age (60.0 ± 12.1 vs. 61.6 ± 10.3, $P = 0.400$), the indication for the procedure ($P = 0.647$), the experience of the endoscopist ($P = 0.495$), the size of the polyps ($P = 0.157$), the morphology of the polyps ($P = 0.927$), and the pathological findings ($P = 0.773$) (Table 1).

The en bloc rate and resected specimen retrieval rate were 100% in both groups. The CRR was 77.3% (51/66) in the thin-snare group and 84.5% (60/71) in the thick-snare group, with no statistically significant difference between the two groups. There were no significant differences in specimen size (8.1 ± 3.4 mm vs. 7.6 ± 4.6 mm, $P = 0.487$) and the rates of specimens containing submucosal tissue (7.6% vs. 9.9%, $P = 0.637$) between the two groups. The depth of submucosa in resected specimens was 500.8 ± 403.8 μm in the thin-snare group (5 cases) and 409.3 ± 196.5 μm in the thick-snare group (7 cases), with no statistically significant difference between the two groups (Table 2).

In the univariate analysis of independent factors related to CRR, the pathologic diagnosis of the polyp (adenoma: 82.3% vs. sessile serrate lesions [SSL]: 57.1%, $P = 0.008$) 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 ($P = 0.068$), polyp size (5–6 mm: 82.0% vs. 7–8 mm: 78.4%, $P = 0.716$), polyp morphology (polypoid: 83.3% vs. non-polypoid: 80.9%, $P = 0.631$), polyp location (right colon: 77.0% vs. left colon: 88.0%, $P = 0.114$), and level of endoscopist experience (expert: 85.2% vs. less experienced: 75.0%, $P = 0.135$). 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 (odds ratio, 0.1; 95% confidence interval [CI], 0.12–0.57; $P = 0.010$) (Table 3).

**Table 1 Baseline Characteristics**

| Factor | Thin-snare group ($n = 66$) | Thick-snare group ($n = 71$) | *P*-value |
|---|---|---|---|
| Age (yr, mean ± SD) | 60.0 ± 12.1 | 61.6 ± 10.3 | 0.400 |
| Sex (%) | | | 0.010 |
| Male | 42 (63.6) | 59 (83.1) | |
| Female | 24 (36.4) | 12 (16.9) | |
| Indication (%) | | | 0.647 |
| Screening | 47 (71.2) | 46 (64.8) | |
| Surveillance | 19 (28.8) | 25 (35.2) | |
| Endoscopist experience (%) | | | 0.495 |
| Expert | 37 (56.1) | 44 (62.0) | |
| Less experienced | 29 (43.9) | 27 (38.0) | |
| Polyp size (mm, mean ± SD or %) | 6.2 ± 1.1 | 6.0 ± 0.8 | 0.157 |
| 5–6 | 41 (62.1) | 59 (83.1) | |
| 7–8 | 25 (37.9) | 12 (16.9) | |
| Polyp morphology (%) | | | 0.927 |
| Polypoid | 3 (4.5) | 3 (4.2) | |
| Non-polypoid | 63 (95.5) | 68 (95.8) | |
| Polyp location (%) | | | 0.108 |
| Right colon | 41 (62.1) | 46 (64.8) | |
| Left colon | 25 (37.9) | 25 (35.2) | |
| Pathologic findings (%) | | | 0.773 |
| Adenoma | 63 (95.5) | 67 (94.4) | |
| SSL | 3 (4.5) | 4 (5.6) | |

SD, standard deviation; SSL, sessile serrated lesion.

**Table 2 Clinical and Histological Outcomes According to Snare Type**

| Factor | Thin-snare group ($n = 66$) | Thick-snare group ($n = 71$) | *P*-value |
|---|---|---|---|
| En bloc resection rate (%) | 66 (100) | 71 (100) | |
| Complete resection rate (%) | 51 (77.3) | 60 (84.5) | 0.068 |
| Retrieval rate (%) | 66 (100) | 71 (100) | |
| Tissue fly-away (%) | 3 (4.5) | 0 (0.0) | 0.069 |
| Complication (%) | | | |
| Immediate bleeding | 11 (16.7) | 7 (9.9) | 0.239 |
| Delayed bleeding | 0 (0.0) | 0 (0.0) | |
| Perforation | 0 (0.0) | 0 (0.0) | |
| Specimen size (mm, mean ± SD) | 8.1 ± 3.4 | 7.6 ± 4.6 | 0.487 |
| Depth of specimen (%) | | | 0.637 |
| Muscularis mucosa | 61 (92.4) | 64 (90.1) | |
| Submucosa | 5 (7.6) | 7 (9.9) | |
| Depth of submucosa (μm, mean ± SD) | 500.8 ± 403.8 (5 cases) | 409.3 ± 196.5 (7 cases) | 0.610 |

SD, standard deviation.

**Table 3 Factors Associated with Complete Resection**

| Factor | Univariate | | | Multivariate | |
|---|---|---|---|---|---|
| | CR ($n$ = 111) | Non-CR ($n$ = 26) | $P$-value | OR (95% CI) | $P$-value |
| Age (yr, mean ± SD) | 62.1 ± 10.3 | 60.5 ± 11.4 | 0.517 | | |
| Snare type (%) | | | 0.068 | 2.7 (0.96–7.48) | 0.06 |
| Thin wire | 77.3 (51/66) | 22.7 (15/66) | | | |
| Thick wire | 84.5 (60/71) | 15.5 (11/71) | | | |
| Polyp size (%) | | | 0.716 | 1.3 (0.42–4.0) | 0.651 |
| 5–6 | 82.0 (82/100) | 18.0 (18/100) | | | |
| 7–8 | 78.4 (29/37) | 21.6 (8/37) | | | |
| Polyp morphology (%) | | | 0.631 | | |
| Polypoid | 83.3 (5/6) | 16.7 (1/6) | | | |
| Non-polypoid | 80.9 (106/131) | 19.1 (25/131) | | | |
| Polyp location (%) | | | 0.114 | | |
| Right colon | 77.0 (67/87) | 23.0 (20/87) | | | |
| Left colon | 88.0 (44/50) | 12.0 (6/50) | | | |
| Pathologic findings (%) | | | 0.008 | 0.1 (0.12–0.57) | 0.010 |
| Adenoma | 82.3 (107/130) | 17.7 (23/130) | | | |
| SSL | 57.1 (4/7) | 42.9 (3/7) | | | |
| Endoscopist experience (%) | | | 0.135 | 0.6 (0.21–1.43) | 0.224 |
| Less experienced | 75.0 (42/56) | 25.0 (14/56) | | | |
| Expert | 85.2 (69/81) | 14.8 (12/81) | | | |

CR, complete resection; OR, odds ratio; CI, confidence interval; SD, standard deviation; SSL, sessile serrated lesion.

## Discussion

Based on the results of several studies reporting favourable findings, CSP has been widely used as the technique of choice for resecting small colorectal polyps (less than 1 cm).[8,10,11] CSP leads to a superior CRR compared to cold forceps polypectomy (CFP) and has a lower risk of side effects than HSP because it prevents damage caused by electrocautery. A previous prospective RCT directly compared CSP with CFP for the colonoscopic resection of diminutive colorectal polyps (≤ 5 mm). The histologic eradication rate was significantly higher in the CSP group than in the CFP group (93.2% vs. 75.9%, $P$ = 0.009).[15] Furthermore, another RCT demonstrated that the CRR in the CSP group was significantly higher than that in the CFP group (93.8% vs.70.3%, $P$ = 0.013) for small polyps (5–7 mm).[16]

Compared to HSP, CSP omits the injection process, and the procedure is relatively simple since there is no equipment or procedure related to electrocauterization. CSP has been reported to exhibit similar efficacy to HSP in terms of the CRR. Therefore, CSP has been recommended for the removal of small polyps owing to its safety profile, speed of resection, and effectiveness.[9,15,17,18] According to previous studies, the rate of histologically confirmed CRR after CSP varied from 65% to 93%.[19,20] 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.[21] Other studies that reported high CRRs after CSP are often not applicable to routine endoscopic practice. This is because they are typically single-center studies and do not disclose the level of experience of the endoscopists involved or assess the impact of the type of snare used.[6,14]

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[22] 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 several studies, the CRR of CSP was significantly improved by using a dedicated cold snare compared to when a traditional HSP was used.[6,13] However, other studies have reported different results.[6]

We assessed the factors associated with the CRR during CSP. The CRR was not significantly associated with the type of snare used (thin-snare: 77.3% vs. thick-snare: 84.5%, $P$ = 0.068), polyp size, polyp morphology, polyp location, or the level of endoscopist experience (expert: 85.2% vs. less experienced: 75.0%, $P$ = 0.135). In additional analyses based on snare type, there were no significant differences in the en bloc resection and tissue retrieval rates. Furthermore, the rates of containing submucosal tissue (thin-snare: 7.6% vs. thick-snare: 9.9%, $P$ = 0.637) and the occurrence of intraprocedural or delayed polypectomy bleeding were not significantly different between the two groups. The pathologic diagnosis of the polyp (adenoma: 82.3% vs. SSL: 57.1%; odds ratio, 0.1; 95% CI, 0.12–0.57; $P$ = 0.010) was the only risk factor

statistically significantly associated with the CRR during CSP in our study. 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, less experienced endoscopists also participated in our study, 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.

There were some limitations in this study. Although this was a prospective RCT, the endoscopist was not blinded to the type of snare used. Due to the nature of research on endoscopic procedures, it is inevitable to see the shape of a snare during the procedure. It is unlikely that this influenced the procedure, but it may have caused bias. Furthermore, the number of SSLs was small, which may have affected the CRR of SSLs.

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.

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None.

## Data Sharing Statement

Research data are not shared.

## Conflicts of Interest

Yunho Jung has been an editor of the *International Journal of Gastrointestinal Intervention* (*IJGII*) since 2017; however, Yunho Jung has not been involved in the peer reviewer selection, evaluation, or decision process of this article. No other potential conflicts of interest relevant to this article were reported.

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