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Does the size of the cold snare affect the outcome of cold snare polypectomy in the colon? A KASID prospective multicenter study

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Background/Aims: Cold snare polypectomy (CSP) is recommended for colorectal polyps <10 mm; however, the impact of snare size on clinical outcomes remains unclear. This study evaluated the efficacy and safety of 10-mm and 15-mm snares for CSP of small colorectal polyps. **Methods:** In this prospective multicenter study, patients with 4–10 mm non-pedunculated polyps underwent CSP with either a 10-mm or 15-mm snare. Both snares had identical wire thickness and hexagonal loop design. The primary outcome was histological complete resection rate (CRR). Secondary outcomes included adverse events and technical parameters. **Results:** In total, 182 patients were enrolled (10-mm group: n=92; 15-mm group: n=90). Baseline characteristics, including age, sex, polyp size, morphology, location, and pathology, were comparable between groups. Histological CRRs were 90.2% in the 10-mm group and 91.1% in the 15-mm group (P=0.483). No significant differences were observed in the presence of submucosal tissue within specimens (P=0.523), iatrogenic ulcer size (P=0.532), hematoma occurrence (P=0.391), or intraprocedural bleeding requiring hemostasis (6.5% vs. 5.6%; P=0.974). No cases of delayed bleeding or perforation were reported. Logistic regression analysis identified iatrogenic ulcer size >8 mm as an independent predictor of complete resection (odds ratio, 3.89; 95% confidence interval, 1.15–13.21; P=0.029); snare size was not significantly associated with CRR (P=0.519). **Conclusions:** CSP using either a 10-mm or a 15-mm snare for 4–10 mm non-pedunculated colorectal polyps showed no significant difference in complete resection or safety outcomes within this size range. (Clinical Research Information Service [CRIS], KCT0005031) **(Intest Res 2026;24:76-83)**

Key Words: Colonic polyps; Polypectomy; Treatment outcome

INTRODUCTION

Colorectal polypectomy remains a cornerstone in the prevention and treatment of colorectal cancer, with evidence demonstrating its ability to reduce incidence by up to 53% in individuals who undergo the procedure compared with those who do not.[1] The optimal technique for polypectomy, however, requires careful consideration of multiple factors, including the histological features, size, and location of the polyp. Central to this decision is the goal of achieving *en bloc* or complete resection to minimize local recurrence while ensuring procedural safety and reducing complications.

Among emerging techniques, cold snare polypectomy (CSP) has gained considerable attention for the resection of diminutive and small polyps. CSP is generally performed using a 10–15 mm mini-oval snare or a dedicated cold snare, partic-

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ularly for polyps measuring less than 10 mm. After gentle air aspiration, the polyp is ensnared and mechanically transected without electrocautery, thus eliminating the need for submucosal injection. This approach is both safe and effective.[2-4] A meta-analysis of diminutive polyps (1–5 mm) demonstrated that the incomplete resection rate was significantly lower with CSP (4.4%; 95% confidence interval [CI], 2.9–6.1) than with forceps biopsy (9.9%; 95% CI, 7.1–13.0), leading to the recommendation of CSP over forceps resection for this size range.[5] Furthermore, comparative analyses of CSP and hot snare polypectomy (HSP), which uses electrocautery, revealed no significant differences in complete resection or tissue retrieval rates for polyps <1 cm. However, CSP was associated with significantly shorter procedure times.[6,7] Based on these findings, recent international guidelines recommend CSP as the preferred technique for resecting polyps <10 mm.[4,8]

Despite these advantages, one technical factor that remains underexplored is the size of the snare used during CSP. In routine clinical practice, endoscopists often use snares of different sizes interchangeably, depending on lesion characteristics and procedural convenience. Larger snares may facilitate improved capture and stability for certain lesions but may also increase bleeding risk or reduce precision for smaller targets. Conversely, smaller snares may present technical limitations when used for polyps at the upper end of the size range. At present, evidence is limited regarding whether snare size influences clinical outcomes—particularly resection completeness, bleeding risk, or overall safety—for polyps measuring 4–10 mm, the most frequently encountered size range in routine colonoscopy.

Therefore, this prospective study aimed to compare the efficacy and safety of CSP using 10-mm versus 15-mm snares for polyps measuring 4–10 mm by evaluating complete resection rates (CRRs) and the incidence of immediate and delayed bleeding, with the goal of informing best practices and providing evidence-based guidance for optimal snare selection in CSP.

METHODS

1. Patients

This prospective, randomized study was conducted at 4 tertiary hospitals between March 2020 and March 2021. Eligible patients were those with non-pedunculated colorectal polyps measuring 4–10 mm who underwent CSP. Exclusion criteria included polyps <3 mm or >11 mm, use of antiplatelet or anticoagulant agents within 5 days before the procedure, and a diagnosis of inflammatory bowel disease. In total, 220 patients were enrolled and randomly assigned to undergo CSP with either a 10-mm snare (n=110) or a 15-mm snare (n=110). After histopathological evaluation, 38 lesions with non-neoplastic histology were excluded, leaving 182 polyps for the final analysis (Fig. 1).

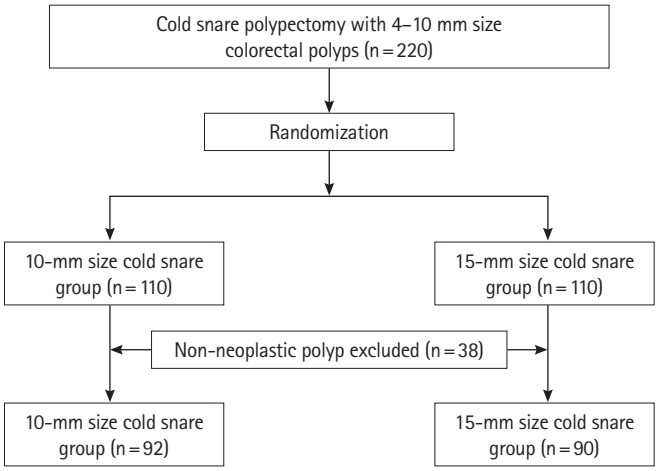

Fig. 1. Study design and population.

2. Polypectomy Protocol

Prior to polypectomy, information regarding polyp size, location, and morphology was documented. Polyp size was measured using biopsy forceps (closed diameter, 2.4 mm; fully opened, approximately 7 mm). During resection, the polyp was positioned at the 5–7 o'clock orientation and resected with an adequate margin to ensure complete removal. No submucosal injection was performed. If multiple polyps were detected, the same snare was used for all resections.

Cold snaring was performed using one of two dedicated snares (10 mm or 15 mm; SnareMaster Plus, Olympus, Tokyo, Japan) with identical wire thickness and a hexagonal loop design. These snares are specifically designed for cold polypectomy, featuring a thin yet rigid wire that enables sharp mechanical transection without electrocautery, thereby minimizing thermal injury. The hexagonal loop facilitates stable lesion capture, reduces slippage risk, and supports *en bloc* resection with adequate margins (Table 1, Figs. 2 and 3).

Resected polyps were aspirated through the colonoscope's working channel into a polyp trap and retrieved. The resection site was irrigated with water, and luminal distention was performed to assess iatrogenic ulcer size, resection completeness, and bleeding status. The size of iatrogenic ulcers was measured using biopsy forceps (closed diameter, approximately

Table 1. Summary of Snare Characteristics

	Snare (model name)	
	Olympus SD-400U-10	Olympus SD-400U-15
Shape of the snare loop	Hexagon	Hexagon
Indication for use	Hot cut & Cold cut	Hot cut & Cold cut
Maximum insertion portion diameter (mm)	0.26	0.26
Rotation of the snare loop	No	No
Working length (cm)	230	230
Loop width (mm)	10	15
Diameter of the snare loop wire (mm)	0.3	0.3
Sheath material	Teflon	Teflon

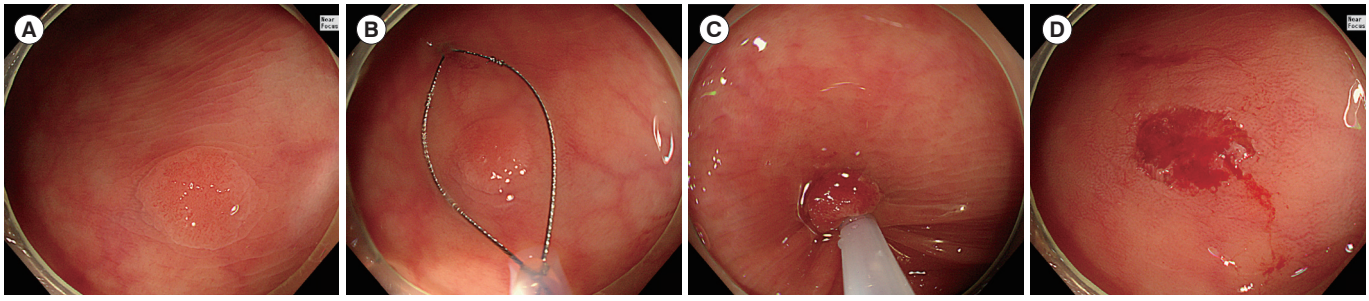

Fig. 2. Cold snare polypectomy with a 10-mm dedicated snare. (A) A 6-mm flat elevated polyp in the descending colon. (B) Positioning of the snare around the lesion. (C) Transection with an adequate margin. (D) Post-resection mucosal defect.

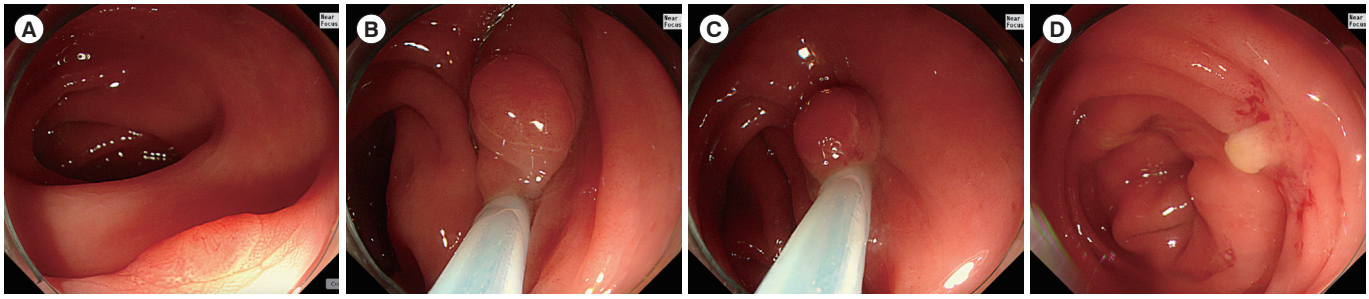

Fig. 3. Cold snare polypectomy with a 15-mm dedicated snare. (A) A 7-mm sessile polyp in the sigmoid colon. (B) Positioning of the snare around the lesion. (C) Transection with an adequate margin. (D) Post-resection mucosal defect.

2.5 mm; fully opened, approximately 7 mm) to ensure standardized assessment. Bleeding was evaluated after 1 min; if grade ≥3 bleeding persisted, endoscopic hemostasis was performed.[9] All resected specimens were individually submitted to experienced gastrointestinal pathologists for histological evaluation of complete resection.

3. Study Outcomes

The primary outcome was the histological CRR. Secondary outcomes included technical aspects of CSP (e.g., retrieval rate and fly-away rate), histological characteristics of resected specimens (pathologic diagnosis and depth of resection), and adverse events (e.g., bleeding or perforation).

4. Ethical Considerations and Statistical Analysis

This study was approved by the institutional ethics committee and is registered under KCT0005031 at the Clinical Research Information Service (https://cris.nih.go.kr/cris/en/index.jsp). Informed consent was obtained from all patients before enrollment. The study was conducted in accordance with the

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Table 2. Baseline Characteristics

Variable	10-mm size cold snare (n=92)	15-mm size cold snare (n=90)	*P*-value
Age (yr), mean±SD	61.5±10.7	63.6±9.3	0.278
Male sex	61 (66.3)	63 (70.0)	0.426
Indication			0.454
Screening	48 (52.1)	45 (50.0)	
Surveillance	44 (47.9)	45 (50.0)	
Preparation quality (good)	87 (94.6)	81 (90.0)	0.313
Antithrombotic			0.561
Antiplatelet	3 (3.3)	0	
Anticoagulant	7 (7.6)	5 (5.6)	
Polyp size (mm), mean±SD	6.2±1.4	6.0±1.2	0.101
4–6 mm	54 (58.7)	62 (68.9)	
7–10 mm	38 (41.3)	28 (31.1)	
Polyp type			0.654
Flat	21 (22.8)	25 (27.8)	
Sessile	71 (77.2)	65 (72.2)	
Polyp location			0.393
Right colon	40 (43.5)	44 (48.9)	
Left colon	52 (56.5)	46 (51.1)	
Pathology			0.239
Adenoma	75 (81.5)	78 (86.7)	
SSA/P	17 (18.5)	12 (13.3)	

Values are presented as number (%) unless otherwise indicated.
SD, standard deviation; SSA/P, sessile serrated adenoma/polyp.

Declaration of Helsinki and was approved by the institutional review boards of the participating hospitals (IRB No. SCHCA 2019-08-044-004).

The null hypothesis was that the difference in CRR between the 10-mm and 15-mm snare groups would be 9.5%. Based on a previous study, the CRR for the 10-mm snare group was assumed to be 88%, whereas the CRR for the 15-mm snare group was set at 97.5%.[2,10] With a two-sided α of 0.05 and 80% power, the minimum required sample size was calculated as 207 patients. After incorporation of an anticipated 5% dropout rate, the final required sample size was 218 patients. All statistical analyses were performed using SPSS version 24.0 (IBM Corp., Armonk, NY, USA). Categorical variables were compared between groups using either the chi-square test or Fisher exact test, as appropriate.

RESULTS

1. Patient and Polyp Characteristics

In total, 182 patients were included in the study: 92 in the 10-mm CSP group and 90 in the 15-mm group. The mean ages were 61.5±10.7 years and 63.6±9.3 years, and the mean polyp sizes were 6.2±1.4 mm and 6.0±1.2 mm, respectively, with no significant differences between the groups ($P=0.278$ for age; $P=0.101$ for polyp size). Baseline characteristics, including sex distribution, indication for colonoscopy, bowel preparation quality, use of antithrombotic agents, and other polyp features, were also comparable between groups. Sessile morphology was the most common finding (77.2% vs. 72.2%), lesions were slightly more prevalent in the left colon (56.5% vs. 51.1%), and adenomas represented the predominant pathology (81.5% vs. 86.7%) (Table 2).

2. Comparison of Procedural and Clinical Outcomes

For the primary outcome of histological complete resection, the overall CRR was 90.7% (90.2% in the 10-mm group vs. 91.1% in the 15-mm group; $P=0.483$) (Table 3). No significant differences were observed between groups in specimen depth containing submucosal tissue ($P=0.523$), iatrogenic ulcer size ($P=0.532$), or hematoma occurrence ($P=0.391$). No cases of

Table 3. Comparison of Technical Factors and Adverse Events

Variable	10-mm size cold snare (n=92)	15-mm size cold snare (n=90)	*P*-value
Histological complete resection	83 (90.2)	82 (91.1)	0.483
Depth of specimens			0.523
Muscularis mucosa	42 (45.7)	39 (43.3)	
Submucosa	15 (16.3)	16 (17.8)	
Iatrogenic ulcer size			0.532
≤8 mm	68 (73.9)	66 (73.3)	
>8 mm	24 (26.1)	24 (26.7)	
Fly away	4 (4.3)	6 (6.7)	0.360
Retrieval rate	92 (100)	90 (100)	-
Hematoma	11 (12.0)	13 (14.4)	0.391
Intraprocedural bleeding			0.974
Spontaneous hemostasis after 1 min	14 (15.2)	16 (17.8)	
Requiring endoscopic hemostasis	6 (6.5)	5 (5.6)	
Adverse events			-
Delayed bleeding	0	0	
Perforation	0	0	

Values are presented as number (%).

Table 4. Comparison of Complete and Incomplete Resection between the 2 Groups

Variable	Category	Complete resection	Incomplete resection	*P*-value
Snare size	10 mm	90.2 (83/92)	9.8 (9/92)	0.519
	15 mm	91.1 (82/90)	8.9 (8/90)	
Polyp size	4–6 mm	90.5 (105/116)	9.5 (11/116)	0.578
	7–10 mm	90.9 (60/66)	9.1 (6/66)	
Polyp shape	Flat	84.8 (39/46)	15.2 (7/46)	0.257
	Sessile	92.6 (126/136)	7.4 (10/136)	
Polyp location	Right colon	92.9 (78/84)	7.1 (6/84)	0.544
	Left colon	88.8 (87/98)	11.2 (11/98)	
Pathology	Adenoma	92.2 (141/153)	7.8 (12/153)	0.110
	SSL	82.8 (24/29)	17.2 (5/29)	
Depth of specimens	MM	90.5 (67/74)	9.5 (7/74)	0.587
	SM	90.0 (27/30)	10.0 (3/30)	
Iatrogenic ulcer size	≤8 mm	88.1 (118/134)	11.9 (16/134)	0.046
	>8 mm	97.9 (47/48)	2.1 (1/48)	

Values are presented as % (number/number).
SSL, sessile serrated lesion; MM, muscularis mucosa; SM, submucosa.

delayed bleeding or perforation were reported in either group. Intraprocedural bleeding that resolved spontaneously within 1 minute occurred in 15.2% and 17.8% of patients, whereas bleeding requiring endoscopic hemostasis occurred in 6.5% and 5.6% of patients in the 10-mm and 15-mm groups, respectively ($P=0.974$).

3. Factors Associated with Complete Resection

Of the 182 lesions analyzed, complete resection was achieved in 165 cases (90.7%); 17 cases (9.3%) were classified as incomplete resections. In univariate analysis, iatrogenic ulcer size was significantly associated with complete resection ($P=0.046$), and incomplete resection occurred less frequently when ulcer

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Table 5. Logistic Regression Analysis of Complete Resection Rate

Variable	Category	OR (95% CI)	*P*-value
Snare size	10 mm (reference)		
	15 mm	1.09 (0.38–3.16)	0.868
Polyp size	4–6 mm (reference)		
	7–10 mm	1.05 (0.13–8.26)	0.962
Pathology (%)	Adenoma (reference)		
	SSL	1.68 (0.45–6.26)	0.443
Iatrogenic ulcer size	≤8 mm (reference)		
	>8 mm	3.89 (1.15–13.21)	0.029

OR, odds ratio; CI, confidence interval; SSL, sessile serrated lesion.

size was >8 mm (Table 4). Logistic regression analysis confirmed that an iatrogenic ulcer size >8 mm was independently associated with a higher CRR (odds ratio, 3.89; 95% CI, 1.15–13.21; $P=0.029$) (Table 5). No significant associations were identified between complete resection and snare size ($P=0.519$), polyp size ($P=0.578$), polyp morphology ($P=0.257$), pathology ($P=0.110$), or depth of excision ($P=0.587$) (Table 4).

DISCUSSION

Several guidelines, including those from the European Society of Gastrointestinal Endoscopy[4] and the U.S. Multi-Society Task Force,[8] recommend CSP as the preferred method for removing colorectal polyps smaller than 1 cm. CSP has since become widely adopted in routine clinical practice, and various snare sizes are available. Despite its widespread use, limited data exist on the impact of snare size on clinical outcomes. In real-world practice, when colon polypectomy techniques such as endoscopic mucosal resection are performed with a relatively large snare (e.g., 15 or 20 mm), endoscopists often continue to use the same device to remove additional small polyps rather than switching to a smaller snare. This pragmatic approach may raise concerns, such as an increased risk of bleeding or difficulty in precisely capturing smaller lesions. Conversely, some clinicians argue that a larger snare may provide more stable capture and facilitate *en bloc* resection. These unresolved considerations highlight the need for a systematic comparison of snare sizes in CSP; however, direct comparative studies remain scarce.

In this prospective study, we compared the efficacy and safety of 10-mm and 15-mm cold snares for the removal of polyps measuring 4–10 mm, which represent the most commonly encountered lesions in clinical practice. Histological CRRs did not significantly differ between the 10-mm and 15-mm snare groups (90.2% vs. 91.1%), and there were no differences in complications such as delayed bleeding or perforation. The incidence of fly-away polyps was low (4.3% vs. 6.7%), retrieval rates were 100% in both groups, and other technical outcomes (e.g., specimen depth, ulcer size, and hematoma occurrence) also were not significantly different. These findings suggest that both snare sizes are equally effective and safe for the removal of polyps ≤10 mm.

Our results differed from those of a Japanese retrospective study by Noda et al.,[11] the first to evaluate CSP outcomes according to snare size, which compared a short (13 mm) and a long (27 mm) snare for polyps ≤10 mm. That study revealed a significantly higher histological CRR with the short snare than with the long snare (61.6% vs. 44.9%; $P<0.05$); there was no difference in complication rates. The authors suggested that shorter snares may allow more secure capture of surrounding normal mucosa, thereby providing a wider safety margin and reducing the likelihood of residual tissue at the resection margin. In contrast, our prospective study demonstrated no significant difference in histological CRRs between 10-mm and 15-mm snares; both groups achieved excellent retrieval rates and low rates of fly-away polyps. The discrepancy between our findings and the previous study may be attributable to differences in study design (prospective vs. retrospective), the magnitude of snare size difference (13 mm vs. 27 mm in the previous study compared with 10 mm vs. 15 mm in our study), snare shape (hexagonal vs. oval), wire characteristics, and operator experience. The generally higher CRRs reported in more recent studies, ranging from 90% to 98%,[2,6,10,12,13] are consistent with our results but substantially higher than those in the earlier study. This difference may reflect the timing of the earlier study, conducted before CSP was widely adopted (when oper-

ator proficiency was likely lower), as well as the potential negative impact of using a relatively large snare on CRR.

In our study, iatrogenic ulcer size was the only factor significantly associated with CRR, suggesting that securing an adequate resection margin is more critical for achieving complete resection than the choice between 10-mm and 15-mm snares. Our findings are consistent with prior evidence underscoring the importance of margin capture for histological completeness. A previous study reported that extended CSP with a circumferential margin ≥1 mm significantly increased the R0 resection rate to nearly 98% without raising the risk of delayed bleeding or perforation.[13] Taken together, these results highlight that margin capture, rather than snare size itself, is the key determinant of complete resection. Nonetheless, as observed in the previous study,[11] the use of an excessively large snare (e.g., 27 mm) for small polyps may hinder proper capture and potentially reduce CRR, an issue that warrants further investigation in future research.

The present study also confirmed the procedural safety of CSP in both snare groups. There were no cases of perforation or delayed bleeding, and the rate of intraprocedural bleeding requiring hemostasis was comparable to or slightly lower than that reported in previous studies (approximately 6.6%–20%).[14-17] Specifically, intraprocedural bleeding requiring hemostatic intervention occurred in 6.5% of patients in the 10-mm group and 5.6% in the 15-mm group, indicating a comparable and favorable safety profile regardless of snare size. We also hypothesized that a larger snare size might achieve greater resection depth. However, the proportions of specimens containing the submucosal layer were 16.3% in the 10-mm snare group and 17.8% in the 15-mm snare group, with no statistically significant difference (P=0.523). A previous randomized controlled trial comparing HSP and CSP reported that approximately 24% of CSP specimens included the submucosal layer, which is slightly higher than in the present study but not substantially different.[18] Notably, that study compared resection techniques, rather than snare sizes, and demonstrated that CSP generally yields a shallower resection depth than HSP.

This study had several limitations. First, the endoscopists were not blinded to the type of snare being used, which may have introduced bias. However, a randomized lottery method was utilized to allocate snare type when a polyp was detected, thereby minimizing operator selection bias. Second, the size difference between the 2 snares (10 mm vs. 15 mm) may not represent a substantial contrast compared with a previous study that examined more extreme differences.[11] We specifically selected these sizes because they are the most commonly used in clinical practice and, importantly, were available from the same manufacturer with identical wire thickness and shape. This design allowed us to isolate snare size as the primary variable while controlling for other device-related factors. Third, because this was a multicenter study, variability in operator experience and procedural techniques across centers could have influenced the outcomes.

Despite these limitations, to the best of our knowledge, this was the first prospective, multicenter study to compare CSP outcomes according to snare size, providing clinically relevant evidence to inform everyday endoscopic practice. These findings support the use of either 10-mm or 15-mm snares for CSP of small colorectal polyps, with comparable efficacy and safety profiles. Given the similar performance observed within this range, snare selection may reasonably be guided by operator preference and procedural context. Future studies should investigate whether extremely large snares or other device characteristics, such as snare shape or wire properties, influence resection quality, particularly in specific lesion types or challenging anatomical locations.

In conclusion, CSP using either a 10-mm or a 15-mm snare for non-pedunculated colorectal polyps measuring 4–10 mm demonstrated comparable CRRs and similar safety profiles, with no significant differences in adverse events such as bleeding. Within this commonly used size range, snare selection may therefore be based on operator preference and procedural considerations, rather than expected differences in clinical efficacy.

ADDITIONAL INFORMATION

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Conflict of Interest

Lee Y is an editorial board member of the journal but was not 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.

Data Availability Statement

Data analyzed in this study are available from the corresponding author upon reasonable request.

Author Contributions

Conceptualization: Chun J, Lee Y, Gweon T, Jung Y. Data curation: Chun J, Gweon T, Jung Y. Formal analysis: Chun J, Jung Y. Investigation: Lee Y, Gweon T. Methodology: Chun J, Jung Y. Project administration: Jung Y. Supervision: Jung Y. Writing – original draft: Choi S. Writing – review & editing: all authors. Approval of final manuscript: all authors.

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