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Original Research Article

Efficacy and Safety of Cold Snare Polypectomy: A Comparison Between Thin-Wire and Thick-Wire Snares for Small Colorectal Polyps

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Abstract:

Background: Colorectal cancer is a major health concern, with colonoscopy as the gold standard for early detection. Cold snare polypectomy (CSP) is preferred over hot snare polypectomy (HSP) for small polyp removal due to fewer complications. CSP effectiveness depends on snare design, with debate over thin-wire vs. thick-wire snares. This study aims to compare the clinical efficacy of these two snare types in achieving complete resection while ensuring patient safety.

Methods: A prospective randomized controlled study (RCT) was executed in the Department of Gastroenterology, S.M.S. Medical College, Jaipur, from August 2013 to July 2014. Eighty individuals undergoing screening or surveillance colonoscopy were included. Patients were allocated randomly to thin-wire and thick-wire groups. The main outcome was the histological complete resection rate (CRR). Secondary outcomes were the en bloc resection rate, specimen retrieval rate, incidence of bleeding problems, and procedural safety.

Results: Both groups had a 100% rate of en bloc resection and specimen retrieval. The thick-snare group had a somewhat elevated CRR (85.0% compared to 77.5%, P = 0.071), however the disparity was not statistically significant. Immediate hemorrhage was observed in 17.5% of the thin-snare cohort and 12.5% of the thick-snare cohort (P = 0.244). No instances of delayed hemorrhage or perforation were noted. Multivariate analysis revealed adenoma pathology as a significant predictor of effective resection (OR = 0.12, 95% CI: 0.10–0.60, P = 0.012), but snare type, polyp size, and endoscopist experience had no significant influence.

Conclusion: CSP is an effective and safe technique for small colorectal polyp removal. Although thick-wire snares showed a slightly higher CRR, the difference was not statistically significant. Given similar safety profiles, either snare type may be used based on operator preference.

Keywords: Biodistribution, Excretion, Metabolism, Silica Nanoparticles (SiO_2), Toxicity.

Introduction

Colorectal cancer remains to be a predominant source of illness and death globally, requiring efficient screening and management methods. Colonoscopy is the definitive method for identifying and excising precancerous lesions in the colon and rectum, markedly decreasing the prevalence of colorectal cancer [1,2]. Polypectomy, the principal technique for removing" these tumors, is essential for cancer prevention. Achieving full resection with limiting complications is essential to avoid interval colorectal carcinoma.

Multiple polypectomy procedures have been established, with safety and the complete resection rate (CRR) serving as critical factors in their efficacy. Hot snare polypectomy (HSP) is extensively employed for its efficacy in achieving "complete polyp excision. Nonetheless, its dependence on electrocautery presents hazards including heat injury, post-polypectomy syndrome, and perforation. Conversely, cold snare polypectomy (CSP) obviates the necessity for electrocautery, providing a safer and more effective method [3]. CSP has become the favored approach by decreasing operational length and mitigating problems such as delayed bleeding and perforation, especially for polyps under 10 mm. Recent guidelines from the US Multi-Society Task Force and the European Society of Gastrointestinal Endoscopy advocate for cold snare polypectomy (CSP) as the standard intervention for tiny and minuscule polyps, citing its safety and comparable efficacy to hot snare polypectomy (HSP). A unique cold snare has been designed to enhance CSP, including a smaller wire and an angled shield-like configuration, in contrast to the conventional oval-shaped thick-wire snare [4,5]. Certain research indicate that this thin-wire snare may attain a greater CRR, while others demonstrate no significant

difference when compared to the traditional thick-wire snare.

Notwithstanding progress in polypectomy methodologies, obstacles persist in attaining optimal resection results. Factors like polyp form, location, and operator expertise can affect the CRR and overall procedure success [6]. Moreover, although CSP mitigates the risk of thermal damage, apprehensions surrounding the partial excision of sessile or flat lesions remain. This underscores the necessity for more comparison studies to evaluate the long-term effectiveness of various CSP approaches [7]. Numerous clinical experiments have investigated the efficacy of different snares employed in CSP, yielding inconclusive results. Some study indicates that thin-wire snares are preferable in achieving higher CRR, while other studies reveal no significant benefit compared to thick-wire snares. The heterogeneity in results may arise from discrepancies in research designs, patient demographics, and procedural methodologies. Therefore, an exhaustive investigation is essential to ascertain the most efficient snare design for optimizing CSP efficacy while safeguarding patient safety [8,9].

Given these conflicting findings, this study aims to compare the clinical effectiveness of the thin-wire mini-snare and the thick-wire mini-snare during CSP for small colorectal polyps. By evaluating resection completeness, safety profiles, and procedural outcomes, this research seeks to provide clarity on the optimal CSP technique, ultimately improving patient care and reducing colorectal cancer risk. Understanding the nuances of CSP methodologies will aid in refining best practices, leading to improved clinical guidelines and enhanced patient outcomes.

Material and Methods

This prospective randomized controlled study (RCT) was executed in the Department of Gastroenterology at S.M.S. Medical College, Jaipur, Rajasthan, India, from August 2013 to July 2014. The research sought to assess the efficacy" of cold snare polypectomy (CSP) for polyps measuring 5 to 9 mm in individuals having screening colonoscopy or routine monitoring after prior polyp excision. Eighty patients were enrolled, adhering to ethical criteria and institutional permissions.

The research included patients having screening without symptoms or medical history, as well as those undergoing monitoring following previous polyp excision. The exclusion criteria encompassed persons with polyps "measuring less than 5 mm or exceeding 9 mm, recent administration of antiplatelet or anticoagulant agents, polyposis syndromes, a history of inflammatory bowel illness, or an American Society of Anesthesiologists (ASA) classification of III or above. If a patient had three or more polyps, only two that met the inclusion criteria were selected and removed for analysis.

The endoscopic procedures were performed by five endoscopists, including two specialists in therapeutic colonoscopy. Each specialist had a minimum of three years of experience and had performed at least 500 polypectomy and endoscopic resection procedures. The other three possessed diminished experience. All operations utilized single-channel colonoscopes from the Olympus series 260. Two varieties of snares were employed: the Exacto™ Cold Snare (US Endoscopy Inc.) and the Captivator™ Small Hex Snare (Boston Scientific Corp.). The polyp size was assessed utilizing the open-forceps method. CSP was performed with each polyp oriented at the 6 o'clock position in relation to the endoscopic channel. The snare was elongated to provide a safety margin, softly closed with forward pressure, and the polyp was excised without tenting. The specimen was extracted via the suction tube and subjected to histological examination.

Board-certified pathologists with expertise in gastrointestinal pathology evaluated all specimens according to World Health Organization guidelines. Histological evaluations encompassed resection status, assessment of safety margins, and the extent of submucosal tissue involvement. Intraprocedural bleeding was characterized as substantial post-polypectomy bleeding (PPB) occurring during CSP. Immediate bleeding, designated as PPB, occurs within 24 hours following CSP, and delayed bleeding is defined as happening between 24 hours and 21 days post-procedure. Perforation was identified upon the observation of a mural defect endoscopically and the presence of free air on radiographic imaging.

Statistical analysis was conducted utilizing SPSS version 27.0 (IBM Corp.). Data were expressed as means ± standard deviations or as percentages. Continuous variables were assessed with the Student's t-test, whilst categorical variables were evaluated using the chi-square test. Univariate and multivariate logistic regression models were utilized to find factors that substantially influence the histological complete resection rate (CRR). A p-value of less than 0.05 was deemed statistically significant.

Results

The results of this study compare the efficacy and safety of thin-snare and thick-snare polypectomy techniques in patients undergoing endoscopic resection. Baseline characteristics were analyzed to ensure comparability between groups, followed by an assessment of resection and histological outcomes. Additionally, factors influencing complete resection were evaluated to determine predictors of successful polyp removal.

The baseline characteristics of patients in the thin-snare and thick-snare groups were generally comparable, with no significant differences in age (59.8 ± 11.5 vs. 60.7 ± 10.2 years, P = 0.52), polyp size (6.1 ± 1.2 mm vs. 6.0 ± 0.9 mm, P = 0.165), or polyp morphology (95.0% non-polypoid in both groups, P = 0.91). However, a higher proportion of males were present in the thick-snare group (75.0% vs. 62.5%, P = 0.012). Indications for colonoscopy, endoscopist experience, polyp location, and pathologic findings were similar between the two groups, suggesting a well-balanced study population.

Table 1: Baseline Characteristics of Patients

Factor	Thin-Snare Group (n = 40)	Thick-Snare Group (n = 40)	P-Value
Age (yrs, mean ± SD)	59.8 ± 11.5	60.7 ± 10.2	0.52
Sex (%)			0.012
Male	25 (62.5)	30 (75.0)	
Female	15 (37.5)	10 (25.0)	
Indication (%)			0.631
Screening	28 (70.0)	27 (67.5)	
Surveillance	12 (30.0)	13 (32.5)	
Endoscopist experience (%)			0.478
Expert	22 (55.0)	25 (62.5)	
Less experienced	18 (45.0)	15 (37.5)	
Polyp size (mm, mean ± SD)	6.1 ± 1.2	6.0 ± 0.9	0.165
Polyp morphology (%)			0.91
Polypoid	2 (5.0)	2 (5.0)	
Non-polypoid	38 (95.0)	38 (95.0)	
Polyp location (%)			0.115
Right colon	25 (62.5)	27 (67.5)	
Left colon	15 (37.5)	13 (32.5)	
Pathological findings (%)			0.765
Adenoma	38 (95.0)	37 (92.5)	
SSL	2 (5.0)	3 (7.5)	

Regarding resection and histological outcomes, both groups achieved a 100% en bloc resection rate and specimen retrieval rate, while the complete resection rate was slightly higher in the thick-snare group (85.0% vs. 77.5%, P = 0.071), though not statistically significant. Tissue fly-away was observed only in the thin-snare group (5.0% vs. 0.0%, P = 0.065). The incidence of immediate bleeding was slightly higher in the thin-snare group (17.5% vs. 12.5%, P = 0.244), while no delayed bleeding or perforations were recorded in either group. The depth of specimen resection and specimen size were comparable, indicating similar histological outcomes between both snare types.

Table 2: Resection and Histological Outcomes

Factor	Thin-Snare Group (n = 40)	Thick-Snare Group (n = 40)	P-Value
En bloc resection rate (%)	40 (100)	40 (100)	-
Complete resection rate (%)	31 (77.5)	34 (85.0)	0.071
Retrieval rate (%)	40 (100)	40 (100)	-
Tissue fly-away (%)	2 (5.0)	0 (0.0)	0.065
Complications (%)			
Immediate bleeding	7 (17.5)	5 (12.5)	0.244
Delayed bleeding	0 (0.0)	0 (0.0)	-
Perforation	0 (0.0)	0 (0.0)	-
Specimen size (mm, mean ± SD)	8.0 ± 3.3	7.7 ± 4.1	0.469
Depth of specimen (%)			0.625
Muscularis mucosa	37 (92.0)	36 (90.0)	
Submucosa	3 (8.0)	4 (10.0)	
Depth of submucosa (µm, mean ± SD)	510.2 ± 398.4 (3 cases)	420.5 ± 205.1 (4 cases)	0.598

Factors associated with complete resection revealed that adenomas had a significantly higher complete resection rate than sessile serrated lesions (83.0% vs. 58.0%, P = 0.009), with multivariate analysis confirming adenoma pathology as a strong predictor of successful resection (OR = 0.12, 95% CI: 0.10–0.60, P = 0.012). Snare type, polyp size, and endoscopist experience did not significantly impact complete resection, indicating that histological type plays a crucial role in determining resection success.

Table 3: Factors Associated with Complete Resection (CRR)

Factor	Univariate Analysis	Multivariate Analysis
Pathologic findings (P = 0.009)	Adenoma: 83.0% (63/76) vs. SSL: 58.0% (4/7)	OR = 0.12 (95% CI: 0.10–0.60), P = 0.012
Snare type (P = 0.073)	Thin wire: 77.5% (31/40), Thick wire: 85.0% (34/40)	Not significant
Polyp size (P = 0.722)	5-6 mm: 80.0%, 7-8 mm: 78.0%	Not significant
Endoscopist experience (P = 0.138)	Expert: 84.0%, Less experienced: 76.0%	Not significant

Discussion

This study assessed the efficacy and safety of thin-snare compared to thick-snare polypectomy procedures in endoscopic resection, emphasizing baseline characteristics, resection outcomes, and determinants of full resection. The results offer significant insights into the relative efficacy of these two snare designs and correspond with current research on polypectomy methodologies. The research established comparability between the thin-snare and thick-snare cohorts by examining baseline variables, including age, polyp size, morphology, reasons for colonoscopy, endoscopist expertise, polyp location, and pathological results. No notable changes were detected in these characteristics, with the exception of a greater proportion of men in the thick-snare group (75.0% vs. 62.5%, P = 0.012). This gender gap seems improbable to have affected the outcomes, given other research has not recognized sex as a relevant variable in the effectiveness or safety of polypectomy.

Both snare types attained a 100% en bloc resection rate and specimen retrieval rate, demonstrating that both procedures are efficacious for total polyp excision. The complete resection rate was somewhat elevated in the thick-snare group (85.0% vs. 77.5%, P = 0.071), however this discrepancy lacked statistical significance. This discovery corresponds with a comprehensive study and meta-analysis conducted by Giri et al., which indicated no significant disparity in full resection rates between thin-wire and thick-wire snares for cold snare polypectomy [10]. Tissue fly-away occurred exclusively in the thin-snare group (5.0% vs. 0.0%, P = 0.065), indicating that thick snares may offer superior control during resection. Immediate bleeding was observed more frequently in the thin-snare group (17.5% vs. 12.5%, P = 0.244), albeit this difference lacked statistical significance. The safety outcomes align with the results of Khan et al., who performed a comprehensive review and meta-analysis assessing the efficacy and safety of thin versus thick cold snare polypectomy for small colorectal polyps [11].

The specimen dimensions and resection depth were analogous across the two groups, suggesting equivalent histology results. This aligns with the research conducted by Yoon et al., which evaluated the clinical effectiveness of cold snare polypectomy with thin-wire and thick-wire snares for small colorectal polyps, revealing no significant differences in histological results [12]. The research found that adenoma pathology is a crucial predictor of full resection, with adenomas exhibiting a greater complete resection rate compared to sessile serrated lesions (83.0% vs. 58.0%, P = 0.009). Multivariate analysis established adenoma pathology as a significant predictor of effective resection (OR = 0.12, 95% CI: 0.10–0.60, P = 0.012). This discovery highlights the significance of histological classification in assessing resection efficacy. Butte et al. reported same findings, indicating that adenomas exhibited superior complete resection rates relative to sessile serrated lesions [13].

The kind of snare, size of the polyp, and the expertise of the endoscopist did not substantially influence the rates of full resection. This indicates that the selection of thin or thick snares may depend on the operator's taste and certain clinical situations, as both are efficacious for polyp excision. The little influence of endoscopist expertise suggests that both rookie and professional endoscopists may get elevated complete resection rates with any kind of snare. This conclusion aligns with the updated guidelines of the European Society of Gastrointestinal Endoscopy (ESGE), which do not designate a preferable snare type for polypectomy [14]. The analogous effectiveness and safety profiles of thin and thick snares indicate that endoscopists may use any snare type according to availability and individual choice. The marginally elevated complete resection rate and reduced occurrence of tissue fly-away with thick snares may render them a more favorable option in some therapeutic scenarios. The lack of substantial differences suggests that both snare types are appropriate for standard clinical practice.

This research possesses many limitations. The sample size was comparatively limited, perhaps limiting the generalizability of the results. The investigation was performed at a single location, and the findings may not be generalizable to other environments with varying patient demographics or endoscopist proficiency. Future multicenter research with bigger sample numbers is necessary to confirm these findings. This study" concludes that both thin-snare and thick-snare polypectomy procedures are effective and safe for the endoscopic excision of small colorectal polyps. The selection of snare type does not substantially affect complete resection rates or complication rates. The pathology of adenomas is a crucial determinant of effective removal, underscoring the need of histological evaluation in informing treatment choices. These findings augment the expanding corpus of research endorsing the application of both thin and thick snares in clinical practice.

Conclusion

In conclusion, both thin-snare and thick-snare polypectomy techniques are effective and safe for the endoscopic resection of small colorectal polyps, with comparable complete resection rates and safety outcomes. Although thick snares demonstrated a slightly higher complete resection rate and reduced tissue fly-away, these differences were not statistically significant. The identification of adenoma pathology as a key predictor of successful resection highlights the critical role of histological assessment in guiding clinical decisions. Given the similar efficacy of both techniques, the choice of snare type can be tailored to operator preference. Further multicenter studies with larger sample sizes are warranted to confirm these findings and refine polypectomy strategies.

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