Cold snare polypectomy: Does snare type influence outcomes?

Said Din,1,3 Alex J. Ball,1,3 Stuart A. Riley,1 Panagiota Kitsanta2 and Shawinder Johal1

1Department of Gastroenterology, 2Department of Histopathology, Sheffield Teaching Hospitals and 3Department of Oncology, University of Sheffield, Medical School, Sheffield, UK

Background and Aim: Cold snare techniques are widely used for the removal of small and diminutive polyps. The influence of snare type on the effectiveness of cold snare polypectomy is unknown.

Methods: Cold snare polypectomy of 3–7-mm polyps was undertaken using either a thin wire mini-snare (0.30 mm) or a thick wire mini-snare (0.47 mm). Primary outcome was endoscopic completeness of excision. Consensus regarding endoscopic assessment of completeness of excision was standardized and aided by chromoendoscopy. Secondary outcomes included: completeness of histological excision, polyp 'fly away', polyp retrieval rate, early or delayed bleeding and perforation.

Results: One hundred and fifty-seven polyps were removed ranging from 3 to 7 mm, 62% were situated in the left side of the colon and 89.4% were sessile. Endoscopic completeness of excision was significantly higher with the thin wire snare compared to the thick wire snare (90.2% vs 73.3%, P < 0.05). There was a numerical trend towards a higher complete histological excision rate with the thin wire snare, but this did not reach statistical significance (73.3% vs 65.2%, P = 0.4). There was a fair level of agreement (kappa = 0.36) between endoscopic and histological completeness of excision. Polyp 'fly away' occurred less often with the thin wire snare (14.6% vs 35.3%, P = 0.002), but there was no significant difference in polyp retrieval rate (84.3% vs 83.8%, P = 0.94). There were no complications with either snare.

Conclusion: Snare type appears to be an important determinant of completeness of excision when removing small polyps by the cold snare technique.

Key words: cold snare, efficacy, polypectomy, small polyp, snare type

INTRODUCTION

OVER 90% OF polyps removed during colonoscopy are small (<10 mm)1,2 and have a low risk of containing advanced pathology or developing into cancer.3,4 Resection techniques should therefore be both safe and effective. Whereas many studies have shown that removal of small polyps is safe, residual or recurrent tissue may be found in 29–61% following removal with biopsy forceps5–9 and 3–14% following snare polypectomy.9–11 This is of importance as interval cancer rates of 10–27% have been associated with incomplete polyp resection.12,13 Furthermore, incomplete or uncertain histological excision can lead to diagnostic uncertainty and impacts on surveillance intervals.

The cold snare technique has been recommended for the removal of small polyps as a result of its safety profile, speed of resection and effectiveness.15,16 However, a large selection of snares is available which differ in size, shape and wire thickness, but the comparative effectiveness of snare type is not known.

The Exacto™ cold snare (US Endoscopy, Mentor, OH, USA) was specifically designed for cold snare polypectomy. It is approximately one-third thinner (wire diameter 0.30 mm) and has a different shape (shield) than the traditional oval Olympus mini-snare (Olympus, Tokyo, Japan) (wire diameter 0.47 mm) (Fig. 1; Table 1). Anecdotal reports suggest that the Exacto snare is more effective for cold snare polypectomy. We carried out a service evaluation comparing the efficacy of the Exacto snare with the Olympus snare during a switch-over of the snare used within our endoscopy department.

METHODS

Study approval

THE PRESENT STUDY and associated documents were registered and approved as a service evaluation by the Sheffield Teaching Hospitals Clinical Effectiveness Unit (project number 5927). All patients signed a written informed consent form so that they could be contacted following their colonoscopy.
Patients

This was a prospective single-center study conducted at Northern General Hospital, Sheffield, UK, between July 2013 and January 2014. Consecutive adult patients attending for diagnostic colonoscopy who were found to have one or more sessile or flat polyps measuring 3–7 mm were considered eligible for the study. Patients taking anticoagulants or clopidogrel were excluded from the study, as were those where polyps were identified behind folds making assessment of completeness of excision difficult.

Process to standardize completeness of endoscopic excision

Prior to the study, five endoscopists viewed 20 video clips of cold snare polypectomy, before and after indigocarmine dye spraying, in order to agree on criteria for the assessment of completeness of endoscopic polyp resection. Completeness of excision was defined as ‘complete’ (no evidence of residual tissue at the excision margin or polyp base), ‘incomplete’ (any evidence of residual tissue at the excision margin or polyp base) or ‘uncertain’.

Through two rounds of the consensus process, the multi-rater kappa agreement was 0.49, 95% CI (0.27–0.70) and 0.51 (0.32–0.71) respectively, suggesting a moderate level of agreement between endoscopists in judging endoscopic completeness of excision.

Polypectomy protocol

Four experienced endoscopists carried out all procedures using conventional colonoscopes (CF-Q260 AI, CF-H260AI; Olympus Medical Systems, Tokyo, Japan). Prior to the study, endoscopists familiarized themselves with the Exacto snare for a trial period to avoid bias as a result of the learning-curve effect.

Prior to polypectomy, polyp size, site and morphology were noted. Polyps were sized using large-capacity biopsy forceps (1332–40; Boston Scientific, Natick, MA, USA) as a guide (closed diameter 2.4 mm, fully open jaw tips 8 mm). When the polyp margin was not clearly apparent, the site was sprayed with dilute indigocarmine (0.1%) prior to polypectomy. Polyps were excised without tenting in the 5–8 o’clock position with the aim of capturing a rim of normal mucosa. When more than one polyp was encountered during the procedure, the same snare was used. Polyps were retrieved by suctioning through the biopsy channel of the colonoscope into a polyp trap. The polypectomy site was then visually assessed for any evidence of residual tissue by washing the site with water, ensuring good luminal distension and applying 0.1% indigocarmine. When excision was judged incomplete or uncertain, targeted biopsies were taken from areas of residual tissue, margin and base using large capacity biopsy forceps. All samples were sent in separate pots to an expert pathologist who was blinded to the endoscopic findings. Criteria for confirming completeness of histological excision were based on the NHS bowel cancer screening pathology guidelines and defined by the absence of residual tissue at resection margin in any dimension.

All patients were followed up by a phone call 48 h and 2 weeks after the procedure to assess for any complications.

Study outcomes

Primary outcome was endoscopic completeness of excision. Secondary outcome measures were: completeness of histological excision, polyp ‘fly away’ (polyp remains within or adjacent to the polypectomy site), retrieval rate, early bleeding (48 h), delayed bleeding (2 weeks) and perforation.
Statistical analysis

Kappa statistics ($\kappa$) and 95% confidence intervals were calculated to assess interobserver agreement between the multiple raters using the formula by Fleiss.\textsuperscript{18} Kappa values were classified as: poor, 0.00–0.20; fair, 0.21–0.40; moderate, 0.41–0.60; good, 0.61–0.80; and excellent, 0.81–1.00.\textsuperscript{19}

Cold snare technique has a reported complete excision rate of 86–89%.\textsuperscript{9–11} We determined that at least 56 patients per group would be required comparing the two snares with an $\alpha$-value of 0.05 and a power of 80%. In the first half of the study, polypectomy was done with the Exacto snare before switching to the Olympus snare.

Categorical variables were compared using the $\chi^2$-test or Fisher’s exact test where appropriate. Student’s $t$-test was used for continuous variables. $P$-values of <0.05 were considered statistically significant. Statistical analysis was done using SPSS version 21.

RESULTS

ONE HUNDRED AND twelve patients were included in the study (mean age 63.5 years, range 29–85 years, 65.2% male). There were slightly more males and older patients in the Exacto polypectomy group, but there were no significant differences in polyp characteristics between the two groups (Table 2).

One hundred and sixty-one eligible polyps were detected and cold snare resection was technically feasible in 157 polyps. Median polyp size was 4.0 mm (3–7 mm), 62% were located in the left colon, 89.4% were sessile (Paris 1s)\textsuperscript{20} and most were tubular adenomas (60%). There was a failure to resect four polyps with the Olympus snare and polypectomy was completed using diathermy.

For the accurate attribution of completeness of excision, we restricted the analysis to those polyps where excision was judged as complete or incomplete. Endoscopic completeness of excision was significantly better with the Exacto snare compared to the Olympus snare (90.2% vs 73.3%, $P = 0.008$). There was also a numerical trend towards a higher complete histological excision rate with the Exacto snare, but this did not reach statistical significance (73.3% vs 65.2%, $P = 0.4$). There was no statistically significant difference between the Exacto and Olympus snares when we combined the polyps classified as uncertain with those that were incompletely excised for the completeness of endoscopic (83.1% vs 68.8%, $P = 0.008$) and histological excision (49.4% vs 44.1%, $P = 0.5$). Where the completeness of excision was assessable, there was a fair level of agreement (kappa = 0.36) between endoscopic and histological assessment.

DISCUSSION

SOME ENDOSCOPISTS MAY assume that leaving a small amount of residual adenoma may be safe because of the low risk of malignant transformation. However, incomplete resection has been implicated in 10–27% of interval colorectal cancers.\textsuperscript{12–14,21} Although this is more likely to occur for larger polyps,\textsuperscript{22,23} most polyps encountered during colonoscopy are small (<10 mm).\textsuperscript{1,2} Studies have reported incomplete resection rates of up to 61% with standard cold biopsy forceps,\textsuperscript{8,15} 18% with jumbo forceps\textsuperscript{24} and 17% with hot biopsy forceps.\textsuperscript{25} Snaring with or without diathermy is a better alternative with incomplete resection rates of 5% and 11%, respectively,\textsuperscript{8,10} but risk of delayed

| Table 2: Patient details and polyp characteristics |
|----------------------------------|------------------|------------------|
|                                  | Exacto\textsuperscript{16} cold snare ($n = 56$) | Olympus mini-snare SD-210-10 ($n = 56$) | $P$-value |
| Male/Female                      | 42/14            | 32/24            | 0.05   |
| Age (years)$^1$                  | 66.0 ± 10.9      | 61.0 ± 10.3      | 0.015  |
| No. eligible polyps detected ($n = 161$) | 89               | 72               |        |
| Median polyp size, mm (range)    | 4.0 (3–7)        | 4.0 (3–7)        | 0.16   |
| Location                         |                  |                  |
| Right colon (proximal to splenic flexure) | 38              | 23               |        |
| Left colon                       | 51               | 49               |        |
| Paris classification             |                  |                  |
| 1s                               | 78 (87.6%)       | 66 (91.7%)       | 0.4    |
| 2a                               | 11 (12.4%)       | 6 (8.3%)         |        |
| Histology                        |                  |                  |
| Adenoma                          | 55 (61.8%)       | 39 (54.2%)       |        |
| Serrated                         | 2 (2.2%)         | 0                |        |
| Hyperplastic                     | 19 (21.3%)       | 22 (30.6%)       |        |
| Other$^4$                        | 13 (14.6%)       | 11 (15.3%)       |        |

$^1$Results are expressed as mean ± standard deviation.
$^4$Not assessable or not retrieved.

Exacto\textsuperscript{16} cold snare (US Endoscopy, Mentor, OH, USA; Olympus mini-snare SD-210-10 (Olympus, Tokyo, Japan).

Polyp ‘fly away’ occurred less often with the Exacto snare (14.6% vs 35.3%, $P = 0.002$), but there was no significant difference in the polyp retrieval rate between the two groups (84.3% vs 83.8%, $P = 0.9$). There were no complications with either snare. Overall effectiveness of the two snare types is described in Table 3.

© 2015 The Authors
Digestive Endoscopy © 2015 Japan Gastroenterological Endoscopy Society
Complications

<table>
<thead>
<tr>
<th></th>
<th>Exacto™ cold snare N = 89</th>
<th>Olympus mini-snare SD-210-10 N = 72</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endoscopic excision</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>74 (83.1%)</td>
<td>44 (61.1%)</td>
<td>0.008</td>
</tr>
<tr>
<td>Incomplete</td>
<td>8 (9.0%)</td>
<td>16 (22.2%)</td>
<td>0.008*</td>
</tr>
<tr>
<td>Uncertain</td>
<td>7 (7.9%)</td>
<td>8 (11.1%)</td>
<td></td>
</tr>
<tr>
<td>Failure to resect</td>
<td>0</td>
<td>4 (5.5%)</td>
<td></td>
</tr>
<tr>
<td>Histological excision</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>44 (49.4%)</td>
<td>30 (44.1%)</td>
<td>0.4</td>
</tr>
<tr>
<td>Incomplete</td>
<td>16 (18.0%)</td>
<td>16 (23.5%)</td>
<td>0.5*</td>
</tr>
<tr>
<td>Uncertain</td>
<td>29 (32.6%)</td>
<td>22 (32.4%)</td>
<td></td>
</tr>
<tr>
<td>Polyp fly away</td>
<td>13 (14.6%)</td>
<td>24 (35.3%)</td>
<td>0.002</td>
</tr>
<tr>
<td>Retrieval rate</td>
<td>75 (84.3%)</td>
<td>57 (83.8%)</td>
<td>0.94</td>
</tr>
<tr>
<td>Complications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early bleeding</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Late bleeding</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Perforation</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

*Comparison of complete excision vs incomplete and uncertain excision combined.

Exacto™ cold snare (US Endoscopy, Mentor, OH, USA; Olympus mini-snare SD-210-10 (Olympus, Tokyo, Japan).

bleeding and perforation is increased with hot snare. Cold snare polypectomy may therefore offer a good compromise.

Endoscopists may be more aggressive in capturing polyps during cold snare polypectomy. The present study suggests that cold polypectomy with a thin wire snare (Exacto) is more effective than a thick-wired snare (Olympus). However, completeness of histological excision was not statistically significant, despite a numerical trend in favor of the Exacto snare. We calculated that it would require 266 patients per group to determine whether there was a 10% difference in histological completeness of resection between the snares with an α-value of 0.05 and 80% power.

Despite fair agreement between the endoscopic and histological findings, discrepancy between the histological and endoscopic completeness of resection with both the Exacto (73.3% vs 90.2%) and Olympus snares (65.2% vs 73.3%) is likely to be due to a lack of biopsies from all the polypectomy sites and differences in the mounting process, crush artefacts or fragmentation of small polyps. Previous studies have consistently shown lower histological than endoscopic complete resection rates.

No published studies have assessed the efficacy of the Exacto snare, therefore comparisons cannot be made. However, higher rates of complete endoscopic and histological excision have been reported with the Olympus snare comparing the cold snare with the double biopsy forceps technique. Unlike the present study, most polyps were 5 mm and removed by a single operator. Criteria for confirming completeness of excision were not stated or examined by a single expert histopathologist. In the present study, assessment of the polypectomy site was standardized and enhanced by using indigocarmine. Targeted biopsies were taken only when excision was judged to be uncertain or incomplete, as we believe this was more likely to reduce sampling errors and increase the detection of residual tissue.

Polyp ‘fly away’ occurred significantly less with the Exacto snare, but, surprisingly, this did not translate into an improved retrieval rate. The reason for this difference is not clear, but it may relate to the thinner snare wire diameter requiring less squeeze pressure to achieve a clean cut compared to the thicker snare wire diameter of the Olympus snare. Polyp retrieval rates in our study are comparable to other series of similar-sized polyps (81–96%). Reduced polyp ‘fly away’ is of benefit as more time can be spent examining the polypectomy site and ensuring excision is complete.

Although our study was not powered to detect a difference in complications, none occurred with either snare. This is in keeping with the findings of several studies where cold snare polypectomy has been reported to be extremely safe. Variations in polypectomy technique, endoscopists’ attitudes about the aggressiveness of their removal strategy, and difficulties of assessing post-polypectomy site are all important factors that may influence the quality of polypectomy. Therefore, rates of complete polypectomy may actually be lower in practice. The only reliable way to ensure residual tissue is not left behind is to resect a 1–3-mm rim of normal tissue during cold snare polypectomy. This may be influenced by the choice of snare and technique used. For instance, stiff or barbed snares facilitate tissue capture and entrapment of normal tissue at the lesion margin, whereas thin or monofilament snares enable a more precise and cleaner cut compared to thick or braided snares. Despite choosing the correct snare, failure to assess the extent of the lesion may result in inaccurate snare placement, potentially leaving residual tissue behind. In a study by Pattullo et al., an impressive 100% complete endoscopic excision was achieved by using suction pseudopolyp, which more readily enables the endoscopist to resect the lesion and a rim of surrounding normal tissue without any complications.

Although endoscopists are in a good position to assess completeness of excision, findings of the complete adenoma resection (CARE) study suggest that some endoscopists do this poorly with a greater than three-fold variation between them. Chromoscopy has been shown to enhance the characterization and delineation of the polypectomy site and may assist the endoscopist, but the role of other
image-enhanced technologies is uncertain. It is therefore reassuring to have histological confirmation of complete excision despite its limitations.

The present study has several important strengths. Endoscopic assessment for completeness of excision was standardized with a low threshold for excluding cases considered uncertain. We believe our strategy to assess evidence of residual tissue was particularly robust because of the time spent washing the post-polypectomy site and applying indigocarmine. This was also a multi-operator study and the results are generalizable to a typical endoscopic unit.

However, the present study has a number of limitations. The endoscopists could not be blinded to the snare type and the study design was open such that the results are susceptible to investigator bias. Biopsies were not taken from the margin and base of all polypectomy sites as this is prone to sampling errors and completeness of excision was not verified in follow-up examinations.

In conclusion, our findings suggest that snare type may be an important factor determining polypectomy outcomes. A larger randomized controlled trial powered according to the findings of the present study would be useful to confirm the best snare type.

ACKNOWLEDGMENT

We would like to thank the University of Sheffield statistical services unit for their contribution.

CONFLICT OF INTERESTS

Authors declare no conflict of interests for this article.

REFERENCES


© 2015 The Authors
Digestive Endoscopy © 2015 Japan Gastroenterological Endoscopy Society