

## Cold snare polypectomy: optimizing technique and technology (with videos)

Polypectomy is the basis of cancer prevention during colonoscopy.<sup>1</sup> It is the most common and arguably the most important procedure in GI medicine, and with high-quality mucosal inspection is performed in more than half of all colonoscopies.<sup>2</sup> Yet, despite its importance, the evidence base for specific polypectomy techniques remains limited.<sup>3,4</sup>

This limited evidence base may explain the observed variation in polypectomy practice and outcomes, including data questioning the effectiveness of polypectomy. For example, we know that incomplete polypectomy is a factor contributing to interval colorectal cancer occurring after colonoscopy.<sup>5</sup> The recent Complete Adenoma Resection (CARE) study showed high rates (>10%) of incomplete histologic clearance after hot snare polypectomy for polyps sized 5 to 20 mm.<sup>6</sup> We also know that polypectomy techniques in the United States are highly variable<sup>7</sup> and that the CARE study showed significant variation among endoscopists in rates of complete resection.

With limited clinical trial evidence to guide practice, polypectomy techniques should emphasize safety, efficiency, and effectiveness. Adverse events after colonoscopy are most commonly related to polypectomy, for which electrocautery is the major factor. The emergence of cold resection techniques eliminates the risk of perforation and delayed bleeding, and visual feedback allows real-time evaluation for immediate bleeding.

### THE TECHNIQUE OF COLD SNARING

Cold snaring is now the primary technique for the resection of polyps up to 10 mm in size.<sup>4</sup> Evidence for its safety and efficiency is now established, even in patients taking anticoagulants and antiplatelet agents.<sup>8</sup> Although large-capacity cold forceps can be used to remove tiny

polyps (1-2 mm) in a single piece, cold snaring is more effective and efficient than cold forceps resection for diminutive lesions ( $\leq 5$  mm).<sup>9</sup>

The technique of cold snaring is fundamentally different from hot snare resection (Fig. 1, Video 1, available online at [www.giejournal.org](http://www.giejournal.org)).<sup>4,10</sup> Table 1 outlines the key differences, which are focused on securing a 2-mm to 4-mm clear margin of normal tissue so that histologic eradication of neoplastic tissue can be assured. The lesion first should be positioned at 5 o'clock with a straight colonoscope and the snare opened and lowered over the lesion. A margin of

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normal tissue is best achieved by anchoring the tip of the snare catheter several millimeters distal to the lesion, advancing the catheter forward while angling the instrument tip down and right into the colon wall. Once anchored, the snare wire should then be closed in a continuous maneuver ("close and cut") while forward pressure on the snare catheter is maintained, with down and right angulation of the instrument tip. As the snare wire is closed, it will capture a margin of normal tissue. Gas insufflation should be maintained because suction may promote submucosal tissue entrapment, which may prevent tissue transection. Immediate bleeding with cold snaring is typically insignificant, and in my experience, delayed bleeding does not occur. In comparison (Table 1), polypectomy with electrocautery requires a different technique, to avoid capture of excess normal tissue. With cold snaring, the ensnared polyp should not be lifted or tented during snare closure (to preserve the margin of normal tissue and keep the specimen within the defect).

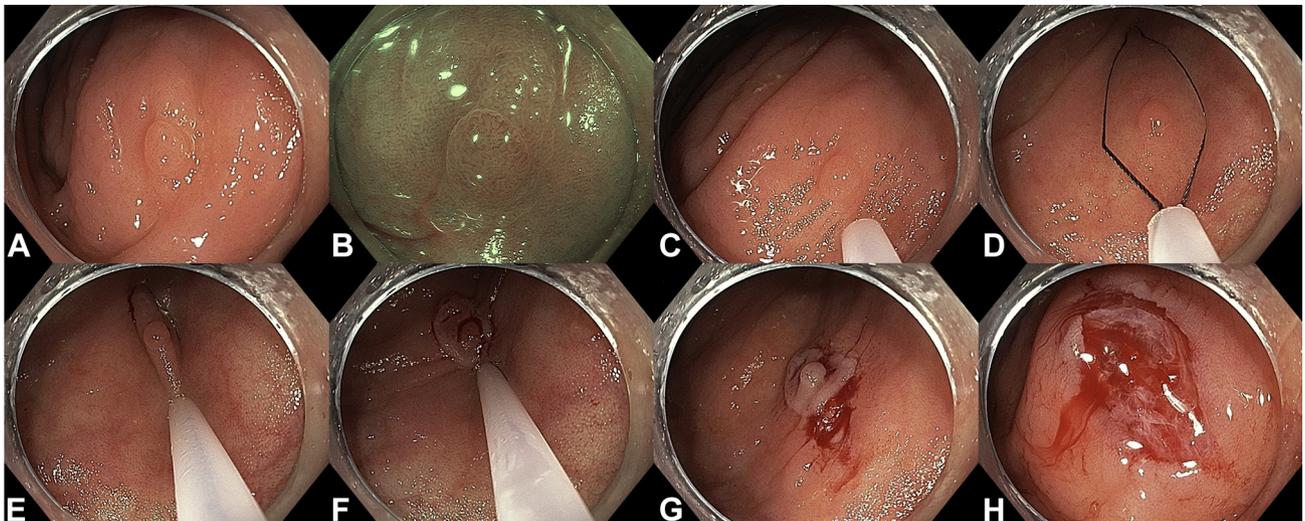
### TECHNOLOGY FOR COLD SNARING

The mainstay of cold snaring is the minisnare, measuring 9 to 15 mm in opening diameter. However, clinical trial



This video can be viewed directly from the GIE website or by using the QR code and your mobile device. Download a free QR code scanner by searching "QR Scanner" in your mobile device's app store.

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**Figure 1.** The technique of cold snaring. **A**, Detect. A diminutive polyp in the proximal colon. **B**, Characterize. Image enhancement with narrow-band imaging and optical magnification shows an adenoma. **C**, Align and measure. The polyp is aligned with the instrument channel, and the snare catheter tip is used to measure the lesion size (2 mm). **D**, Open. The snare (Exacto; US Endoscopy, Mentor, Ohio) is opened and positioned to capture the lesion and a margin of normal tissue. **E**, Anchor. The catheter is advanced while the instrument tip is angled down and to the right. **F**, Close and cut. The snare is closed continuously to transect the tissue. **G**, Retrieve. When the catheter is anchored to the colon wall during snare closure, the lesion remains within the defect for easy suction. **H**, Inspect. The defect is inspected to ensure complete resection and absence of bleeding (minor bleeding is typical).

**TABLE 1. Differences in technique between hot and cold snaring**

	Cold snaring	Hot snaring
Position of the lesion	5 o'clock	5 o'clock
Margin of normal tissue	Yes: at least 2 mm	Minimal
Tenting of lesion	No: snare sheath should remain anchored to the colon wall	Yes: for application of electrocautery
Snare closure	Continuous until polyp guillotined	Snare closure stopped once resistance detected (or mark on snare handle reached)
Aspiration	No (maintain insufflation)	Yes
Electrocautery	No	Yes

Adapted from Hewett DG. Colonoscopic polypectomy: Current techniques and controversies. *Gastroenterol Clin North Am* 2013;42:443-58. Used with permission.

evidence has not been available to guide snare choice for effective cold snaring. In this issue of *Gastrointestinal Endoscopy*, Horiuchi et al<sup>11</sup> report a randomized controlled trial of snare types for cold snare polypectomy for small polyps.<sup>11</sup> The study compared cold snare resection by using a snare specifically designed for cold snaring (Exacto; US Endoscopy, Mentor, Ohio) and a traditional polypectomy snare designed for use with electrocautery (SnareMaster SD-210U-10; Olympus America, Center Valley, Pa).

The authors used cold snare polypectomy for all polyps 10 mm or smaller, irrespective of shape. Only patients of class I and II (American Society of Anesthesiologists Physical Status Classification System) were included, and anticoagulant and/or antiplatelet agents were not discontinued (10.5%). A transparent cap was used for all procedures, and the cold snaring technique was as described in Table 1.<sup>4,10</sup> The primary outcome was the rate of complete resection, which was defined histopathologically

from the resected specimen. Specimens were retrieved en bloc and mounted on plates before formalin fixation to preserve morphologic orientation. This technique, often used in Japan, allows tissue sectioning to be aligned with polyp orientation and its surrounding mucosa, enabling examination of the lateral and vertical margins; complete resection was confirmed if both margins were free of neoplasia.

Findings were of a significantly higher complete resection rate for polyps removed with the Exacto snare (91% vs 79%;  $P = .015$ ). The difference was most prominent for polyps 8 to 10 mm in size (83% vs 45%). Specifically, incomplete resection was observed in 33 polyps overall (15.7%), and the majority of these lesions ( $n = 26$ , 79%) were 6 to 10 mm in size (15 were 8-10 mm: Exacto = 3, SnareMaster = 12). Rates of postpolypectomy bleeding were not significantly different between snare groups, with no delayed bleeding in either arm.

The unique contribution of this study is the comparison of snare types for cold snaring. The Exacto snare produced higher rates of complete resection and indicate that snare design may be important in optimizing the effectiveness of tissue resection. Indeed, some of the known variation in polypectomy outcomes may be attributable to differential performance of polypectomy snares.

Cold snaring requires en bloc lesion capture and mechanical transection of tissue. Without electrocautery, tissue cutting is effected by closure of the snare wire only. There are several design features of the Exacto snare that may form the basis of its superior performance. First, the unique shape of the open snare loop may more effectively encircle small and diminutive lesions and achieve a clear margin of normal tissue. The Exacto open loop resembles a shield, by opening to its maximum diameter relatively close to the tip of the snare catheter (compared with traditional oval or hexagonal shaped snares). When the catheter is advanced and angled into the colon wall during snare closure, this shape may more effectively capture normal tissue around the lesion. Second, the thinner snare wire (0.3 mm) may produce more effective tissue cutting compared with standard snares (the comparison snare in this study was 0.47 mm in wire diameter). Third, the catheter of the Exacto snare is made from a stronger polymer and is therefore much stiffer than other snares, which prevents the catheter from buckling on snare closure. In my experience with this snare, the combination of a thin wire and stiff catheter produces reliable tissue transection, often with audible feedback as the snare handle snaps closed on cutting. Traditional snares have softer catheters that typically buckle on full closure of the snare wire, without tissue transection.

There may be other engineering features of the Exacto snare that enhance its performance but which I have not identified. For example, other characteristics of the snare wire may be relevant for cutting, such as the type of metal, the number and orientation of the component filaments, or the configuration of the braid of these filaments.

## HOW CAN COLD SNARING BE OPTIMIZED?

Despite the apparent benefits of this snare, the results of the study by Horiuchi et al<sup>11</sup> also show that the effectiveness of polypectomy can be further improved. Similar to the CARE study findings,<sup>6</sup> a 9% overall rate of incomplete resection was observed even with the Exacto snare. However, unlike the CARE study, this study reported on margin involvement in the resected specimen, rather than tissue sampling of the margins of the polypectomy defect. It is unknown whether these two measures of completeness of resection are equivalent or whether either measure predicts residual neoplasia at long-term follow-up.

In any case, it is important to consider how to improve the complete resection rate with cold snaring. Are further

**TABLE 2. A proposed algorithm for when the lesion fails to cut with cold snaring**

<p>Stage 1</p> <p>While holding the snare tightly closed for 10-15 seconds:</p> <ul style="list-style-type: none"> <li>• Maintain full insufflation and avoid suction.</li> <li>• Ensure that the instrument insertion tube is straight.</li> <li>• Angulate the instrument tip down, or reduce tip angulation.</li> <li>• Straighten and stretch the length of the catheter external to the instrument.</li> <li>• Gently move the snare catheter forward and backward within the instrument channel.</li> </ul> <p>Stage 2</p> <ul style="list-style-type: none"> <li>• Partially reopen the snare (to about 1/3 of the snare handle; avoid fully opening the snare).</li> <li>• Slowly lift the lesion away from the colon wall.</li> <li>• Watch for the release of entrapped submucosa (a white band) beneath the lesion.</li> <li>• Lower the lesion (to prevent fly-away).</li> <li>• Re-close the snare fully to cut the lesion.</li> </ul>
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refinements in technique or technology needed? Are further technological improvements in the cutting performance of cold snares possible? What is the ideal margin of normal tissue (lateral and deep) to achieve complete resection?

An unresolved issue with cold snare technique is how the endoscopist should respond when the snare wire fails to cut through ensnared tissue (likely reflecting submucosal tissue entrapment). In their article, Horiuchi et al<sup>11</sup> describe their technique: “captured tissue was guillotined repeatedly in order to remove the polyp completely.” Although the authors do not report how often this occurred or whether it occurred less with the Exacto snare, it would be more likely with lesions approaching 10 mm in size (which had the highest incomplete resection rate). It is possible that repeated maneuvers to open and/or close the snare might have compromised the rim of normal tissue, leading to involvement of the vertical and lateral margins and incomplete resection histologically.

My anecdotal approach when the snare fails to cut is shown in [Table 2](#) and [Video 2](#) (available online at [www.giejournal.org](http://www.giejournal.org)), although this has not been formally studied. The general principles are to (1) minimize deep submucosal entrapment by maintaining insufflation during snaring and avoiding suction, (2) maintain full snare closure for up to 10 seconds because slow transection may occur, (3) use techniques to maximize force transmission from the handle down the snare wire ([Table 2](#)), and, finally if required, (4) in a slow, controlled maneuver, partially reopen the snare to release entrapped submucosa while gently lifting the lesion away from the colon wall. The goal is to open the snare wire only slightly—just enough to release the white ribbon of excess submucosa, while keeping the snare wire “underneath” the transected lesion and its lateral rim of normal tissue. It is important to avoid reopening the snare fully, because this could disrupt the margin of normal tissue.

**TABLE 3. Uncertainties about cold snare polypectomy**

What is the best measure of polypectomy effectiveness?
What is the best method for measuring the complete resection rate?
How should completeness of resection be assessed in real time, immediately after polypectomy?
Is cold snaring as effective as hot snaring for all small polyps?
Is cold snaring effective for serrated lesions?
What is the ideal margin of normal tissue (lateral and deep) to achieve complete resection with cold snaring?
When is electrocautery required (what size, morphology, histology)?
Is piecemeal cold snaring effective and for what type of lesion?
What is the extent of variation in operator effectiveness for cold snaring?
What is the best technique to apply when the snare fails to cold resect?
Are further refinements in snare design possible to improve tissue capture and cutting performance?
Is cold snaring always safe in patients receiving antiplatelet/ anticoagulant therapy?

It is not known whether it is safe or effective to apply electrocautery to a lesion that has failed to cut with cold snaring. In fact, this is a limitation of the Exacto snare, because it does not have an electrocautery connection. However, I prefer not to apply electrocautery at this point because of the potential for thermal injury and delayed bleeding after capturing a wider and/or deeper margin of normal tissue than would be acceptable for hot snaring. Therefore, the lack of an electrocautery connection with the Exacto snare is not a practical limitation in my practice. I use electrocautery infrequently during routine colonoscopy, given the prevalence of small and diminutive lesions and my preference for cold snaring. Although I acknowledge the cost benefits of a single snare choice for all colorectal lesions, for polyps that require electrocautery (that are typically larger), I prefer to select the appropriate snare for the size, morphology, and location of the lesion.<sup>12</sup>

The study by Horiuchi et al<sup>11</sup> is a valuable contribution to the field of cold snare resection. Yet there remain many unanswered questions about polypectomy that require evaluation in controlled clinical trials (Table 3). Further research should continue to explore the variation in polypectomy outcomes and consider how it can be addressed by refinements in technique and technology for cold snare polypectomy.

## DISCLOSURE

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*Abbreviation: CARE, Complete Adenoma Resection study.*

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