



Colonoscopic Polypectomy: Techniques and New Method



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Abstract

Colorectal polypectomy is an efficacy method for the prevention of colonrectal cancer, indeed, removing cancer precursor, reduces CRC incidence e mortality. Several techniques has been developed to remove polyps and are chosen according to the polyp size, shape and type. The goals of colonoscopic polypectomy are complete resection and retrieval of precancerous lesions in a safe way.

Keywords: Colonoscopic polypectomy; Biopsy; Snare; Electro surgery; Retrieval; Tattooing

Introduction

Colorectal polypectomy is an efficacy method for the prevention of colonrectal cancer, indeed, removing cancer precursor, reduces CRC incidence e mortality [1,2]. Despite proven effectiveness, polyp resection techniques are limited by lack of evidence and are based on expert opinion and uncontrolled observational studies [3-5]. Proper removal of polyp needs not only skillness by experienced endoscopist but a complete knowledge of the characteristics of endoscopic instruments and accessories, according to morphology and size of the colorectal polyp, in order to avoid complications and to reduce the occurrence of incomplete polypectomy, which is one of the major cause of interval colon cancer [6,7].

In the CRC screening era, detection and resection of all polypoid lesions are the main goals of quality colonoscopy and the successful polypectomy has to be effective in complete resection, efficient in retrieval all lesions, safe in minimizing the risk of complication such as perforation or bleeding. Furthermore, the resection must provide an accurate histological diagnosis with evaluation of the margins and the base for possible infiltration of the underlying layers.

Polypectomy Techniques

There are several techniques to remove polyps and these are classified according to accessories used with or without use of electro surgery. The choice of technique depends on the

morphology, the size, the location of polyps and the experience of the endoscopist [8,9].

Nowadays the superficial neoplastic lesions of gastrointestinal tract are stratified in three categories by Paris endoscopic classification: protruded (type 0-I), superficial (type 0 to II) and excavated (type 0 to III). The protruded lesions are subdivided into pedunculated (0-Ip), if polyps have a head connected with a stalk, sessile (0-Is), if polyps are broad based without a connecting stalk and semipeduncolated (0-Isp) [10-12]. Based on size it's possible to identify three types of polyps: achieved in 90% of diminutive polyps and 100% of polyps <3mm in size when performed with chromoendoscopy diminutive: <5mm, intermediate: between 6-9mm and large: >10mm.

The optimal method to polypectomy is removing polyps in one piece ("en bloc resection") but, if the size of polyp is larger than 2cm, it can be required to remove in multiple pieces ("piecemeal resection"). For the diminutive lesion (<5mm) the technique that should be chosen is cold forceps biopsy with standard forceps or use jumbo forceps. It consists to grasp polyp and remove it with a firm pull with high retrieval rate and low complication rate [13]. A recent prospective study shows that forceps ensure 96% of cases complete resection for polyps between 1 and 3mm and 76% of cases for polyps between 4 and 5mm [14]. Another study has shown that complete resection was and washing and postresection examination [15].

Hot forceps biopsy consists in thermal ablation of polyps with coagulation current through electrosurgical unit, so it's similar to cold forceps except it uses electrocautery to remove polyp tissue. However, it can make difficult the histological diagnosis and has a risk of delayed bleeding or hypercoagulation syndrome [16-18] so hot biopsy forceps is not recommended as a standard method.

For polyps ≥ 5 mm [19,20] snare excision is commonly used. There are several types of wire loop snare the choice of them is usually due to endoscopist's preference as there are no controlled trials demonstrating superiority of any one device over another.

For polyps 6-9mm in size cold snare polypectomy (CSP) is recommended. This method consists in cutting the polyp with only the mechanical strength of the snare closed to guillotine the tissue capturing also 1 to 2mm of normal tissue around the polyp. CSP seems better for polyps ≥ 5 mm as shown in a recent study in which it is adequate for complete and safe removal and shorten withdrawal time of the colonoscopy procedure [21]. It allows efficient resection of polyp tissue in a single piece with lower rate of incomplete resection than biopsy [22] and is almost without risk [23], except insignificant bleeding that usually stops in few seconds [21]. Repici et al. [24] in an observational study, demonstrated the safety of cold snare for polyps less than 10mm, with low rate of bleeding (1,8%) and no delayed bleeding or perforation. In every case some bleeding, especially in patients taking anticoagulants, is immediately displayed and can be endoscopically treated. For these reasons, recently, the ESGE guidelines recommends against the use of cold biopsy forceps (CBF) excision because of high rates of incomplete resection. Only in the case of a polyp sized 1-3mm where cold snare polypectomy is difficult or not possible, cold biopsy forceps may be used [25].

The predominant technique for polyps 10-19mm in size is standard snare excision with electrocautery: hot snare polypectomy (HSP). It is effective and safe and may be aided by the saline lift technique: the saline solution can be injected into the submucosa under the polyp with suitable needle. This method increases the distance between the polyp and the submucosa ensuring a complete removal of the polyp and reducing the risk of perforation [26]. Furthermore, the most of endoscopists use dilute epinephrine (1:10000 or 1:20000) to reduce the risk of bleeding taking advantage of vasoconstrictor properties. Unfortunately, the saline solution is rapidly absorbed so alternative agents have been studied with or without epinephrine including hyaluronic acid [27], dextrose solution [28], succinylated gelatin [29], hydroxyethyl starch [30], and recently povidone-iodine [31]. The electrosurgical is commonly used endoscopic tool for cutting or coagulating tissue and is responsible for almost all the complications associated with polypectomy [32]. Despite of this long history, the application of electrocautery in snare polypectomy has not yet been standardized due to lack of large controlled trials.

Improvements in technology have seen the introduction of more sophisticated electrosurgical generators in which Endocut mode (ERBE) has been widely used for its better quality for polypectomy because rapidly modifies the current in response to changes in the tissue impedance [33]. Alternating cutting and coagulation cycles allow performing a controlled cutting with sufficient hemostasis during the entire cutting process and minimizing depth and spread of thermal injury. For removing large pedunculated polyp, it need apply energy early and closing the snare slowly, it will help to avoid complications such as bleeding. The electrocautery snare should be placed around the stalk approximately one-half to one-third the distance between the polyp head and the colon wall, allowing sufficient resection margin in case of malignancy and leaving residual and visible stump of stalk after resection that can be grabbed in the event of bleeding.

To prevent bleeding in pedunculated polyp with head ≥ 20 mm or a stalk ≥ 10 mm in diameter, it's useful pretreatment of the stalk with injection of dilute adrenaline and/or to place a nylon loop (endoloop) [34] around the stalk below the resection point or hemoclips across the polypectomy stalk [25]. Now, for resection of large sessile lesion and flat colorectal laterally spreading tumors (LSTs) ≥ 20 mm advanced techniques are been developed as endoscopic mucosal resection (EMR) and endoscopic submucosal dissection (ESD).

When performing endoscopic polypectomy with snare, the polyp should be always place in the 5 to 7 o'clock position and it's important to identify polyp's margins through high definition/resolution endoscopes with electronic chromo-endoscopy (NBI, FICE, LBI, iSCAN) which helps for clear visualization of polyps' margins. Adding biologically inert blue dye (methylene blue or indigo carmine) to the saline used to lift the polyp helps in defining the borders of a flat/sessile lesion. Then the infiltration of the submucosa must be always started in the proximal part (anatomically) of the polyp base, so that the polyp will rise from the side of the vision and will not tip over.

When electrocautery is used the endoscopists should minimize the duration of energy delivery to limit the damage to the colonic wall. Every part ensnared should be lifted away from the wall: this can be done by tenting the polyp toward the center of the lumen just before application of current to prevent deep perforation. If islets of adenomatous tissue between resected pieces or margins of polypectomy remain should be used the argon plasma coagulation to electrocute but the efficacy is unclear because this method is however associated with polyp recurrence [11,35].

After polypectomy if the pieces are relatively small they can be suctioned through the suction channel [23] otherwise an endoscopic net, wire basket or forceps can be used for retrieval of a resected large polyp or tissue that will not pass, especially if located in the right colon.

New Method

Recently “*under-water*” polypectomy has been used during water-aided colonoscopy. For the first time this technique has been described by Kenneth Binmoeller [36] for removing flat colorectal lesions. The bowel lumen is filled with water rather than air and submucosal injection of the lesion is not required. Furthermore, this technique increases the proportion of complete resection and reduces the possible complications: bleeding, transmural burns, and perforation. Both cold and hot snare could be used safely because water does not affect the conductivity of the tissue during polypectomy. However further studies are needed to validate the technique.

Another new method is use of carbon dioxide insufflation during polypectomy because reduce discomfort of patient during and after procedure since CO₂ is absorbed faster than air [37,38].

Problems of Polypectomy

When we are faced with a polyp hardly approachable due to their location in a tight turn or behind a colonic fold we could use some ploys: lock the dials on the endoscope or ask an assistant to hold the scope position (for polyps in tight bends), do the retroflexion of the scope tip (only in the right colon), use a side-viewing duodenoscope [39,40] or cap-assisted colonoscope for polyps behind folds. However standardized guideline doesn't exist and the choice depends on the experience and preference of the operator.

After polypectomy surveillance intervals are based on complete removal of all adenomas and in case of incomplete polypectomy, residual neoplastic tissue could progress to malignancy. It has been estimated that up to 27% of interval cancers may be due to incomplete endoscopic resection [6,41]. In the CARE study [42] it has been showed that residual adenoma is common after HSP and it is variable by type and size of polyps. The authors concluded that the rates of incomplete resection significantly varied between endoscopists (6.5%-22.7%), suggesting that individual operator factor and an appropriate training are the most important contributions to correct and successfully polypectomy [43,44].

Tattooing

After polypectomy is necessary to assess the opportunity to make a tattoo of the lesion especially when polyp has large size, if we are not sure that removal has been completed or other sessions will be needed to remove it and if there are indicators of suspicious of malignancy. Furthermore, if the lesion is located in the rectum, in the cecum or near to the ileocecal valve should not be tattooed. Tattooing consist in injection of permanent staining agent into the gut wall to create a mark to identify the site from inside or outside the lumen and it is typically done with at least two submucosal injections of dye on contralateral sides of the

bowel near the lesion. It should be made few centimeters distal (3cm) to the lesion or on three or four sites circumferentially to avoid the risk of tumor seeding [45].

A double injection with a saline injection into the submucosa to form a bleb following by an injection of dye using a second syringecan improve efficacy of tattooing and prevent inflammatory complications [46,47] because it avoids that the dye can penetrate into the colon wall. There are many types of dye (methylene blue, indigo carmine, toluidine blue, hematoxylin) but only two persisted for more than 24 hours: indocyanine green and India ink [48]. These were limited by difficulties including lack of permanence, infection because not sterile solution or complex preparation and complication [49-54]. More recently dilute sterile and biocompatible pre-packaged suspension of pure carbon particles was developed so it's the only dye approved by the Food and Drug Administration. However cases of peritonitis and submucosal fibrosis have been reported by this suspension [55].

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