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REVIEW ARTICLE

ENDOSCOPIC RESECTION OF SESSILE COLONIC POLYPS

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ABSTRACT

Background: Sessile polyps are generally considered one of the most difficult polyps to remove endoscopically many polyps that might be considered endoscopically resectable are sent for surgical resection. Many endoscopists appear to refer large sessile polyps for surgical resection. Indeed, there is incentive to remove them endoscopically. sessile polyps are associated with the greatest risk of postpolypectomy bleeding and of perforation. They may take a substantial amount of time to remove. **Aim of the work:** The aim of the work is to view the role of endoscopy in resection of sessile colonic polyps and review different techniques of endoscopic resection identifying their safety and efficacy. Time consuming, rate of complete and incomplete resection, complications as bleeding or perforation intra operative or delayed post operatively, rate of recurrancy and rate of conversion to surgery. **Patient and Methods:** A prospective study was held in Al-Azhar University Hospitals between A total of 20 patients with sessile colonic polyps were included in this study who were admitted for endoscopic resection Biopsy forceps in complete resection of colonic polyps in: 7 cases (35%) Endoscopic sub mucosal resection (EMR) technique using submucosal injection in: 5 cases (25%). Cold snare technique in: 4cases (20%) and Hot snare technique in: 4cases (20%). at the Department of Surgeryof Sayed Galaal Hospital Alazhar University during the period from April 2019 to October 2019. **Results:** Location of sessile polyps detected - sigmoid colon: 7 cases (35%), - ascending colon and caecum: 10 cases (50%) - descendin colon: 2 cases (10%) ,- transverse colon: 1 case (5%). Size of polyps detected ranged from (0.5 mm to 40mm). The majority of polyps (83.3%) removed (including both successful and incomplete resection) were benign. These included tubular (n = 9), villous (n = 4), and tubulovillous adenomas (n = 4). In addition, one case serrated adenoma and one hyperplastic polyp were removed. Invasive adenocarcinoma . Complete resection occurred in 95% cases, one case failed to be resected during technique failed. Bleeding during procedure occurred in one case (5%), and that settled spontaneously, delayed bleeding occurred in one case (5%) after two weeks and blood transfusion was done . ,perforation occurred in one case that transferred to surgical interference (5% of cases) ; transverse colostomy was done and after one month we use colonoscopy to be sure that perforation completely healed and then closure colostomy was done. **Conclusion:** Endoscopic resection of sessile colonic polyps presents a number of unique challenges. the majority of benign sessile colonic polyps can be safely and successfully removed endoscopically There are more than one procedure for endoscopic resection according to size, shape and location of the polyps in our study we use biopsy forceps for small polyps cold snare and hot snare techniques for polyps in larger size and endoscopic mucosal resection for the largest polyps . submucosal saline injection is important in lifting the mucosa of the flat or sessile polyps and makes it easier for complete resection now surgical transferring is only for complicated cases or failed endoscopy not the first choice.

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INTRODUCTION

Colonic polyps are abnormal growths of tissue projecting from the mucosa of the colon. They may be classified according to their behavior (neoplastic or non-neoplastic), and according to

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morphology (sessile or pedunculated); sessile (flat, arising directly from mucosal layer) or pedunculated (extending from the mucosa through a fibrovascular stalk) (*shussman N, WexnerSD.2014*). The identification of colonic polyps can reduce colorectal cancer (CRC) mortality through earlier polyp's diagnosis of cancers and removal of of polyps, which are the precursor lesion of (CRC) (*Bonnington SN, Rutter. 2016*).

Sessile polyps are generally considered one of the most difficult polyps to remove endoscopically. Many polyps that might be considered endoscopically resectable are sent for surgical resection. Many endoscopists appear to refer large sessile polyps for surgical resection. Indeed, there is incentive to remove them endoscopically. Large sessile polyps are associated with the greatest risk of postpolypectomy bleeding and of perforation. They may take a substantial amount of time to remove. (Onken JE, Friedman JY, *et al.* 2002).

There are 3 basic options for removal of colonic polyps: standard polypectomy; advanced resection techniques, known as endoscopic mucosal resection (EMR) and endoscopic submucosal dissection (ESD); and surgical removal. In the past 10 years, the use of surgical removal has significantly decreased. All noninvasive, nonmalignant polyps can be removed endoscopically. Even very superficial stage 1A cancers can be removed endoscopically, without surgical removal of the bowel. The choice among these techniques is based on the size and shape of the polyp. (Repici A, Hassan C, Vitetta E, *et al.* 2012). Endoscopic mucosal resection (EMR) has become the preferred method for the removal of sessile or laterally spreading lesions ≥ 10 mm given the lower rate of complications and mortality as compared to surgical management (Holt BA, Bourke MJ. 2012) (Ahlenstiel G, Hourigan LF, Brown G, *et al.* 2014). Endoscopic mucosal resection (EMR) and endoscopic submucosal dissection (ESD) are being increasingly adopted worldwide for management of large colon polyps. These techniques are being favored over invasive surgery given their favorable outcomes. There is ongoing research targeted at making these endoscopic procedures simplified and time efficient, which includes development of new tools for dissection, hemostasis and submucosal elevation prior to resection.

(Hwang JH, Konda V, *et al.* 2015) An important aspect of successful Endoscopic resection is a sufficient and long-lasting submucosal cushion formation, wherein fluid is injected between the lesion and deeper submucosal layers, to allow safe and *en bloc* removal of sessile polyp, and preventing adverse events, like bleeding and perforation. The most commonly used solution to achieve the submucosal cushion is normal saline (NS). Other solutions as 50% dextrose, glycerol, sodium hyaluronic acid, succinylated gelatin, fibrinogen mixture have degrees of success. (Yandrapu H, Desai M, Siddique S, *et al.* 2017) research to determine the ideal submucosal injection is still ongoing.

EMR of large colonic polyps is also roughly three times less expensive than surgical management, and this effect is amplified among older patients with multiple comorbidities (Keswani RN, Law R, Ciolino JD, *et al.* 2016). One of the biggest challenges in the removal of large, flat and sessile polyps comes from a lack of awareness and access to high-quality EMR services. Sessile serrated polyps were notably more difficult to remove in their entirety compared with adenomas; large, sessile serrated polyps are most likely to progress to cancer. The best way to avoid the incomplete removal of a lesion is to perform EMR (Bhurwal A, Bartel MJ Heckman MG, *et al.* 2016). The aim of the work is to view the role of endoscopy in resection of sessile colonic polyps and review different techniques of endoscopic resection identifying their safety and efficacy. Time consuming, rate of complete and incomplete resection, complications as bleeding or perforation intra operative or delayed post operatively, rate of recurrence and rate of conversion to surgery.

MATERIALS AND METHODS

Between April 2019 and Oct 2019. 20 patients with sessile colonic polyps were included in this study who were admitted for endoscopic resection at the Department of Surgery

Inclusion criteria

- Sessile polyp in the colon found during colonoscopy.
- Indication for endoscopic treatment
- ≥ 18 years old

Exclusion criteria

- Suspicion of malignancy, as determined by endoscopic proven malignancy at biopsy
- Prior endoscopic resection attempt presence of synchronous distal advanced carcinoma that requires surgical resection
- The inability to provide informed consent.

Methods

Bowel preparation: Dietary restriction 2 days before endoscopy day (only transparent fluids as apple juice accepted on the day before endoscopy). Patients took 12 sackets of epimag on 2 litres of water along the day. 25 drops of picolax / cup of water / 3 times per day. Enema was done 3 times per day before endoscopy (and 3 sackets of magnesium citrate were added to enemas). Patient prepared on the day of colonoscopy without enema. Procedures were performed as day cases using sedations as midazolam and pethidine. There are a lot of techniques used for resection of colonic polyps We used Biopsy forceps complete resection of colonic polyps in: 7 cases. Endoscopic submucosal resection (EMR) technique using submucosal injection in: 5 cases. Cold snare technique in: 4 cases. Hot snare technique in: 4 cases.

Endoscopic mucosal resection technique: **A-** Placement of markings for the incision line. **B-** Sub mucosal injections of saline at the most distant margin. **C-** Mucosal elevation with sub mucosal injections of saline under and around the lesion. **D-** Circumferential mucosal incision around the polyp. **E-** Sub mucosal incision with a needle-knife through the small-caliber tip transparent hood. **f-** Complete resection of the polyp in one piece.

The Injection Technique (1) The needle is brought into view in the endoscopic field and then inserted into the lesion or in the mucosa immediately adjacent to the lesion in a quick, followed by initiation of injection. Slight withdrawal of the needle catheter may be needed to find the correct sub mucosal plane, as evidenced by a visible lift. (2) Once the needle is brought into the endoscopic field, the injection begins in the lumen, and then the needle is injected into the lesion. With this approach, the sub mucosal plane is found relatively immediately as the actively injecting needle enters the lesion. Saline was used in injection and lifting

Cold snare procedure: (A) Snaring of the polyp with 1-2 mm rim of normal tissue around it. (B) Fully closing the snare and maintaining this position by the nurse. (C) Starting of an upwards powerfully pulling of the snare and subsequent peeling of the polyp, muscularis mucosa and upper submucosa. (D) Continuing pulling the snare. (E) Complete eradication of

Table 1. Procedures used for resection in our study

Procedures	Number (%)
Cold biopsy forceps	7 (35%)
Cold snare	4 (20%)
Hot snare	4 (20%)
Endoscopic mucosal resection with mucosal lifting	5 (25%)

Table 2. Size of the detected sessile polyps

Procedure	N=20	%	Median(range)
Biopsy forceps	7	35	2.75 (0.5-5mm)
Cold snare	2	20	7.5 (6-9mm)
Hot snare	6	20	14.5 (10-19mm)
Endoscopic mucosal resection with submucosal injection	5	25	25 (20-30mm)

Table 3. Time to resect the lesions on EMR

Time to resect detected polyps	Saline (no 5)
Mean ± SD	29.7 ±6.2
Range	25-35

Table 4. Pathological finding

Pathological finding	No	Percentage
Tubular	9	45%
Villous	5	25%
Tubulovillous	4	20%
Serrated adenoma	1	5%
Hyperplastic	1	5%
Invasive adenocarcinoma	1	5%

Table 5.

Procedure	No of cases (per %)	Complete resection	In-complete resection
Forceps biopsy	7 (35%)	7	-
Cold snare	4 (20%)	4	-
Hot snare	4 (20%)	4	-
EMR	5 (25%)	4 (80%)	One case transferred to surgical intervention

the polyp with CSP technique. (F) Submucosal chord (“nipple” sign) after polypectomy which disappears with air insufflation.

Statistical analysis and data interpretation: Data were fed to the computer and analyzed using IBM SPSS software package version 22.0. Qualitative data were described using number and percent. Quantitative data were described using median (minimum and maximum) for non-parametric data and mean, standard deviation for parametric data after testing normality using Shapiro–Wilk test. Significance of the obtained results was judged at the (0.05) level.

Ethical consent: The nature of the study was clearly explained to each patient. An informed written consent was obtained. Also, an approval from the local committee was taken.

RESULTS

This study included 20 cases with 20 sessile colonic polyps. Among these patients, there were 8 (40%) males and 12 (60%) females. Their ages spanned between 20 – 60 years old with mean age of 31.57 ± 9.05 years. 7 (35%) patients are smokers and 13 (65%) patients are nonsmokers. Patients complain and indication of endoscopy: * asymptomatic : 1 case * fecal occult blood: 2 cases * bleeding per rectum: 10 cases * abdominal pain and changing bowel habit: 5 cases * iron deficiency anemia: 2 cases.

Procedures of sessile colonic polyps resection: Biopsy forceps in complete resection of colonic polyps in: 7 cases (35%) Endoscopic submucosal resection (EMR) technique using sub mucosal injection in: 5 cases (25%). Cold snare technique in: 4 cases (20%) and Hot snare technique in: 4 cases (20%).

Size of the detected sessile polyps :

Submucosal Injection: we used Lifting technique in the endoscopic mucosal resection.

The primary efficacy endpoints were:

- Total injected volume needed to complete the EMR procedure.
- Time to resect the lesion completely.

Time to resect the lesions on EMR:

Pathological finding: Polyps located in the distal 5 cm of the rectum were excluded, as proximal to the dentate line makes them most amenable to transanal surgical resection. Two patients with sessile lesions associated with ulcerative colitis (dysphasia—associated lesion or mass) were also excluded. - The majority of polyps (83.3%) removed (including both successful and incomplete resection) were benign.

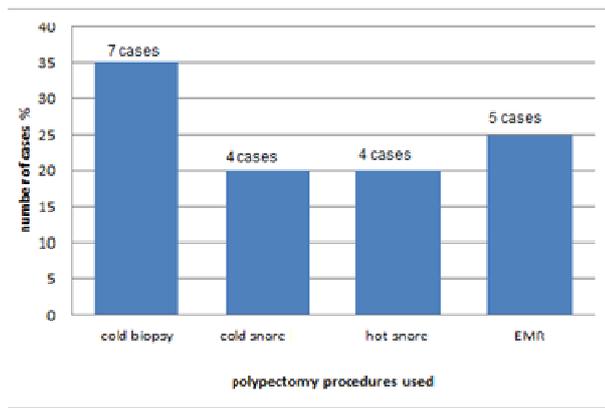


Fig. 1. Procedures for polyp's resection

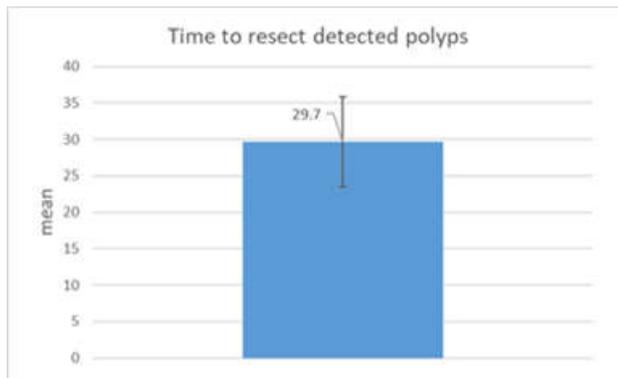


Fig. 2. Time to resect detected polyps

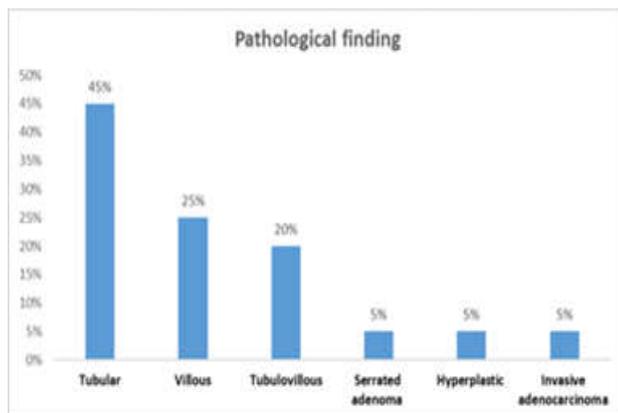


Fig. 3. Pathological finding

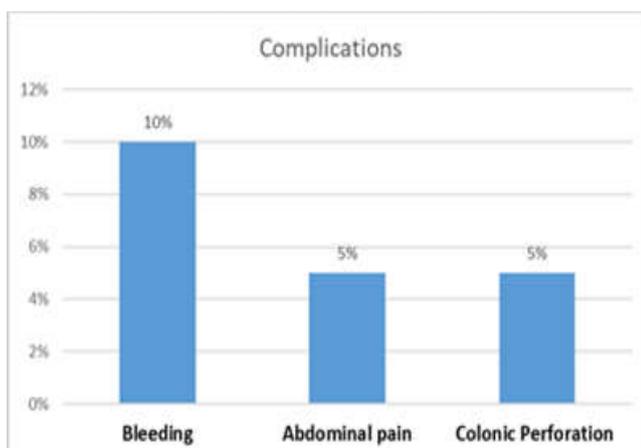


Fig 4. Complications

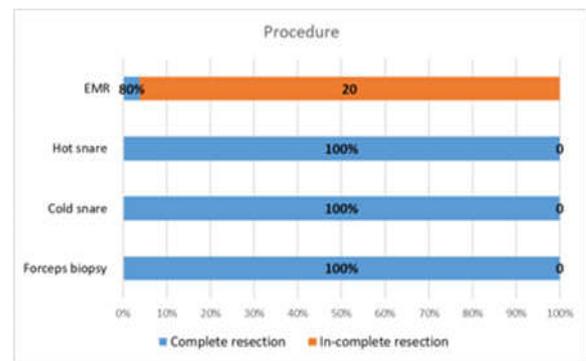


Fig. 5. Resection according to each procedure used

These included tubular ($n = 9$), villous ($n = 4$), and tubulovillous adenomas ($n = 4$). In addition, one case serrated adenoma and one hyperplastic polyp were removed. Invasive adenocarcinoma (stage: T1N1M0) was identified in one patient necessitating a laparoscopic oncologic (anterior rectosigmoid) resection.

Complications

- Bleeding is one of the complications of endoscopic resection requiring hospital admission occurred in 2 of the patients: one with delayed haemorrhage requiring transfusion but no other intervention; one with an intraprocedural bleeding episode that settled spontaneously.
- One case with abdominal pain, but no peritonism or free gas on plain radiography, which resolved after 24 h of inpatient observation.

Perforation of the sigmoid colon during endoscopic resection occurred in one case that cause leakage and peritonitis (not responded to conservative treatment) and treated by surgical interference and managed by right hypochondrial incision and delivery of transverse colon and (transverse-colostomy) was done. second seat colonoscopy was done after one and half months, sigmoidal injury healed; and closure colostomy was done.

Complete resection rate according to each procedure used: All polyps detected resected completely by endoscopy except one case transferred to surgical interference (5%).

DISCUSSION

Sessile polyps are generally considered one of the most difficult polyps to remove endoscopically many polyps that might be considered endoscopically resectable are sent for surgical resection. Many endoscopists appear to refer large sessile polyps for surgical resection. Indeed, there is incentive to remove them endoscopically. Large sessile polyps are associated with the greatest risk of postpolypectomy bleeding and of perforation. They may take a substantial amount of time to remove (Piraka, Saeed *et al.*, 2017). Large sessile polyps are generally considered the most difficult polyps to remove endoscopically. A series from a large US medical center suggested that many polyps that might be considered endoscopically resectable are sent for surgical resection. 17 Many endoscopists anecdotally appear to refer large sessile polyps for surgical resection. Indeed, there is little incentive to remove them endo-scopically.

Large sessile polyps are associated with the greatest risk of postpolypectomy bleeding and of perforation. They may take a substantial amount of time to remove, and there is no difference in reimbursement for the work associated with removal of a large sessile polyp compared with a very small polyp, except for minor increments for submucosal injection. (Douglas K. Rex, 2005). This study was conducted in the general surgery department at Al-Azhar university hospitals (Sayed-Galal and Al-Hussein hospitals). This prospective study included twenty patients presented by sessile colonic polyps for endoscopic resection ten cases came with bleeding per rectum for differential diagnosis, five cases came with fecal occult blood and two cases with abdominal pain and changing bowel habit. Ten polyps located on ascending colon (50%) and seven cases on sigmoid colon (35%). Complete resection occurred in 95% of polyps, one case (5% of all cases) failed to be resected completely by colonoscopy that referred to surgical interference after perforation occurred during procedure and tranverse colostomy was done after a lot of trials failed lifting of mucosa by saline injection technique on EMR; it was a case of sessile adenocarcinoma polyp.

In our study bleeding is one of the complications of endoscopic resection occurred in 2 of the patients (10%): one with delayed haemorrhage after two weeks of intervention (5% of all cases) requiring hospital admission and blood transfusion but no other intervention; one with an intraprocedural bleeding episode that settled spontaneously. Use of EMR for colon polyps involved the use of saline injection. Saline is available ubiquitously and is relatively inexpensive; it can be used without any restrictions or concern for chemical or allergic reactions or interactions. However, there are at least 2 main disadvantages. Saline dissipates quickly, and large volumes with frequent injections may be needed for complex, large polyp resections, which increase the procedure time. The submucosal cushion that saline creates typically does not last long, especially when several injections are made into the mucosa and the submucosa, which create multiple "leak" sites. Saline injection can be used to help remove small lesions (Repici; 2017).

In our study there were two cases of sessile colonic polyps mean size was 7.5mm completely resected by cold snare technique with no delayed bleeding or perforation. Cold snare polypectomy is the preferred resection method for small and diminutive polyps, while hot snare polypectomy and endoscopic mucosal resection (EMR) are recommended for polyps ≥ 10 mm (Thoguluva Chandrasekar *et al.*, 2018). Cold snare polypectomy for removal of non-pedunculated colonic polyps ≤ 10 mm especially those in the 4- to 10-mm range. commonly results in a small amount of immediate bleeding the bleeding is typically from capillaries, as small polyps do not usually contain large blood vessels, and almost invariably stops quickly and spontaneously. Compared with hot snare polypectomy or endoscopic mucosal resection, cold snare polypectomy also results in less delayed bleeding and shorter procedure times (Kawamura *et al.*, 2018). There are 2 clinically important challenges associated with EMR. The first is a higher risk of delayed bleeding, referred to as post-EMR bleeding, which occurs in approximately 5% to 10% of cases. Typically, within a week of the procedure, patients present with hematochezia that may require hospitalization, blood transfusion, and repeat colonoscopy. The second challenge is a significant recurrence rate of approximately 15% (ranging from approximately 6% to 30% across studies) at the first surveillance colonoscopy (Hassan *et al.*, 2016).

Traditionally, earlier use of EMR for colon polyps involved the use of saline injection. Saline is available ubiquitously and is relatively inexpensive and it can be used without any restrictions or concern for chemical or allergic reactions or interactions. However, there are at least 2 main disadvantages. Saline dissipates quickly, and large volumes with frequent injections may be needed for complex, large polyp resections, which increase the procedure time. The submucosal cushion that saline creates typically does not last long, especially when several injections are made into the mucosa and the submucosa, which create multiple "leak" sites. Saline injection can be used to help remove small lesions (Uraoka *et al.*, 2009). In our study we use saline injection in endoscopic mucosal resection of seven cases (35%) mean time needed for complete resection was 29.7 min (+/- 60) and the mean total injected saline volume was 31.6 ml (+/- 32.1); complete resection occurred in three cases (60% of EMR cases), one case failed to be lifted by saline injection (20%) and one case complicated with perforation and surgical interference was done.

Limitations of the study: The observational nature and the small study size are important limitations of this work. It must be a lot of studies on early identification and removal of these lesions because it is a highly effective method of preventing morbidity and mortality from colorectal carcinoma. Also endoscopic mucosal resection (EMR) and submucosal injection technique need a lot of special studies on its rule and comparative studies must be between a lot of substances that accepted all over the world to be injected and identify differences and cost benefits.

Conclusion

Endoscopic resection of sessile colonic polyps presents a number of unique challenges. The majority of benign sessile colonic polyps can be safely and successfully removed endoscopically. There are more than one procedure for endoscopic resection according to size, shape and location of the polyps in our study we use biopsy forceps for small polyps cold snare and hot snare techniques for polyps in larger size and endoscopic mucosal resection for the largest polyps. Submucosal saline injection is important in lifting the mucosa of the flat or sessile polyps and makes it easier for complete resection. Now surgical transferring is only for complicated cases or failed endoscopy not the first choice. Research of best practices in endoscopic techniques, and materials used for submucosal injection for lifting is ongoing, and much remains to be learned on resection of sessile polyps and how to face all complications suspected endoscopically also; decreasing time consuming, patient staying in hospital

REFERENCES

- Wickramasinghe DP, Samaranayaka SF, Lakmal C, Mathotaarachchi S, Kanishka Lal C, Keppetiyagama C, *et al.* Types and patterns of colonic polyps encountered at a tertiary care center in a developing country in South Asia. *Anal Cell Pathol (Amst)* 2014;2014:248142.
- Bonnington SN, Rutter MD. Surveillance of colonic polyps: are we getting it right? *World J Gastroenterol* 2016).
- National Cancer Institute. Surveillance, Epidemiology, and End Results Program. Cancer Stat Facts: colon and rectum cancer. [Accessed August 9, 2017].

- Karita M, Tada M, Okita K, Kodama T endoscopic therapy of early colon cancer 1991
- Repici A, Hassan C, Vitetta E, *et al.* Safety of cold polypectomy for <10mm polyps at colonoscopy: a prospective multicenter study. *Endoscopy.* 2012
- Holt BA, Bourke MJ. Wide field endoscopic resection for advanced colonic mucosal neoplasia: current status and future directions. *Clin Gastroenterol Hepatol.* 2012
- Uraoka T, Saito Y, Yamamoto K, Fujii T. Submucosal injection solution for gastrointestinal tract endoscopic mucosal resection and endoscopic submucosal dissection. *Drug Des Devel Ther.* 2009
- Ahlenstiel G, Hourigan LF, Brown G, *et al.* Actual endoscopic versus predicted surgical mortality for treatment of advanced mucosal neoplasia of the colon. *Gastrointest Endosc.* 2014
- Keswani RN, Law R, Ciolino JD, *et al.* Adverse events after surgery for nonmalignant colon polyps are common and associated with increased length of stay and costs. *Gastrointest Endosc.* 2016
- Jayanna M, Burgess NG, Singh R, *et al.* Cost analysis of endoscopic mucosal resection vs surgery for large laterally spreading colorectal lesions. *Clin Gastroenterol Hepatol.* 2016
- Onken JE, Friedman JY, Subramanian S, *et al.* Treatment patterns and costs associated with sessile colorectal polyps. *Am J Gastroenterol.* 2002
- Bhurwal A, Bartel MJ, Heckman MG, *et al.* Endoscopic mucosal resection: learning curve for large nonpolypoid colorectal neoplasia. *Gastrointest Endosc.* 2016
- Sease J Removing a large flat colon polyp by EMR without surgery. [Accessed September 5, 2017].
- Hwang JH, Konda V, *et al.* Endoscopic mucosal resection *Gastrointest Endosc* 2015);82:215-26
- Yandrapu H, Desai M, Siddique S, *et al.* Normal saline solution versus other viscous solutions for submucosal injection during endoscopic mucosal resection: a systematic review and meta-analysis. *Gastrointest Endosc* 2017)
- Yousef Alshamali, Ahmad Al Taleb, Talal Al-Taweel (2018). Rare Benign Large Lymphoid Colonic Polyp. *Case Reports in Gastrointestinal Medicine.* 2018, Vol.2018, p.1.
- Lee CK, Shim JJ, Jang JY. Cold snare polypectomy vs. cold forceps polypectomy using double-biopsy technique for removal of diminutive colorectal polyps: a prospective randomized study. *Am J Gastroenterol.* 2013;108:1593–1600
- Monkemuller KE, Fry LC, Jones BH, Wells C, Mikolaenko I, Eloubeidi M. Histological quality of polyps resected using the cold versus hot biopsy technique. *Endoscopy.* 2004;36:432–436.
- Lee SH, Shin SJ, Park DI, *et al.* Korean guideline for colonoscopic polypectomy. *Clin Endosc.* 2012;45:11–24
- Tsai FC, Strum WB. Prevalence of advanced adenomas in small and diminutive colon polyps using direct measurement of size. *Dig Dis Sci.* 2011;56:2384–2388.
- Yamano H, Matsushita H, Yamanaka K, *et al.* A study of physical Efficacy of different snares for endoscopic mucosal resection. *Dig Endosc.* 2004;16(Suppl 1):S85–S88.
- Boulay BR, Carr-Locke DL. Current affairs: electrosurgery in the endoscopy suite. *Gastrointest Endosc.* 2010;72:1044–1046.
- Sumiyama K, Tajiri H. History of ESD. In: Fukami N, editor. *Endoscopic submucosal dissection: principles and practice.* New York (NY): Springer-Verlag New York; 2015. pp. 3–8.
- Piraka C, Saeed A, Waljee AK, Pillai A, Stidham R, Elmunzer BJ. Cold snare polypectomy for non-pedunculated colon polyps greater than 1 cm. *Endosc Int Open.* 2017;5(3):E184–E189.
- Repici A, Hassan C, Vitetta E, *et al.* Safety of cold polypectomy for 10mm polyps at colonoscopy: a prospective multicenter study. *Endoscopy.* 2017;44(1):27–31.
- Kawamura T, Takeuchi Y, Asai S, Yokota I *et al.* A comparison of the resection rate for cold and hot snare polypectomy for 4-9 mm colorectal polyps: a multicentre randomised controlled trial (CRESCENT study) 2018 Nov;67(11):1950-1957.
- Hassan C, Repici A, Sharma P, *et al.* Efficacy and safety of endoscopic resection of large colorectal polyps: a systematic review and meta-analysis. *Gut.* 2016;65:806–20.
- Uraoka T, Saito Y, Matsuda T, Ikehara H, Gotoda T, Saito D *et al.* (2009) Endoscopic indications for endoscopic mucosal resection of laterally spreading tumors in the colorectum. *Gut* 55:1592–1597.
