Nursing Coordination in Endoscopic Submucosal Dissection for Large Colorectal Polyp Lesions $ $20 mm in Diameter: A Post-Print

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Abstract

Objective To investigate the nursing coordination techniques for endoscopic submucosal dissection (ESD) in the treatment of large colorectal polypoid lesions with diameter $ $20 mm.

Methods Patients who underwent ESD for colorectal tumors in the Department of Gastroenterology at Beijing Hospital from November 2016 to December 2019 were screened. Patients with lesion diameter $ $20 mm and biopsy pathology of colorectal adenoma or adenocarcinoma were selected, and the nursing coordination techniques during the procedure were analyzed and summarized.

Results A total of 82 patients with 82 lesions were included in the study. En bloc resection was achieved in 67 (81.71%) cases, and curative resection in 59 (71.95%) cases. Delayed postoperative bleeding occurred in 1 (1.22%) case, which was re-treated with endoscopic hemostasis and discharged after recovery; minor intraoperative perforation occurred in 1 (1.22%) case, which was closed with hemostatic clips and effectively managed with conservative postoperative treatment.

Conclusion ESD is safe and effective for treating large colorectal polypoid lesions with diameter $ $20 mm, but requires endoscopy nurses to perform adequate preoperative preparation, intraoperative coordination, and postoperative care. Efficient and tacit physician-nurse cooperation during the procedure is crucial for successful surgery, reduced operation time, and decreased complications.

Full Text

Nursing Cooperation in Endoscopic Submucosal Dissection for Colorectal Polyps with Diameter $ $20 mm

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Abstract

Objective To explore nursing cooperation techniques in endoscopic submucosal dissection (ESD) for colorectal polyps with diameter ≥ MATH_1 mm. **Methods** Patients who underwent ESD for colorectal tumors in the Department of Gastroenterology at Beijing Hospital from MATH_2 to MATH_3 were retrospectively analyzed. Patients with lesion diameter ≥ MATH_4 mm and biopsy pathology confirming colorectal adenoma or adenocarcinoma were selected, and nursing cooperation skills during the procedures were analyzed and summarized. **Results** Among MATH_5 patients who underwent ESD for colorectal tumors during the study period, those with lesion diameter ≥ MATH_6 mm were included, yielding MATH_7 lesions. En bloc resection was achieved in MATH_8 % (MATH_9 cases), and curative resection in MATH_{10} % (MATH_{11} cases). Delayed postoperative bleeding occurred in MATH_{12} % (MATH_{13} cases), managed successfully with endoscopic hemostasis; intraoperative mild perforation occurred in MATH_{14} % (MATH_{15} cases), closed with hemostatic clips and managed conservatively. **Conclusion** ESD is safe and effective for treating large colorectal polyps ≥ MATH_{16} mm, but requires endoscopy nurses to perform thorough preoperative preparation, skilled intraoperative cooperation, and meticulous postoperative care. Efficient and tacit cooperation between physicians and nurses during surgery is crucial for procedural success, shorter operation time, and reduced complications.

Keywords: Large colorectal polyps; Endoscopic submucosal dissection; Nursing cooperation; Delayed bleeding

1. Materials and Methods

Endoscopic submucosal dissection (ESD) has emerged as a preferred treatment for early gastrointestinal tumors due to its minimal invasiveness, low cost, rapid recovery, and minimal impact on quality of life, with outcomes comparable to surgical resection. ESD is now the first-line treatment for colorectal laterally spreading tumors (LST). Literature indicates that ESD for colorectal protruding lesions achieves high en bloc resection rates with low local recurrence. For lesions

> MATH_{17} mm, ESD has become the preferred treatment modality. However, due to the extreme thinness of gastrointestinal mucosa, particularly in the esophagus and colon, ESD carries risks of bleeding and perforation. Large colorectal polyp lesions pose greater challenges due to their extensive area, variable location, and long procedure duration, increasing risks of anesthesia complications, perforation, and bleeding. This study retrospectively analyzed nursing cooperation techniques in ESD for large colorectal polyps $ $20 mm to provide guidance for endoscopic nursing practice.

1.1 Preoperative Preparation

Equipment Preparation: ESD-specific transparent cap, injection needle, Dual knife (Olympus KD- MATH_{18} U), IT knife (Olympus MATH_{19} U), hot biopsy forceps (Olympus FD- MATH_{20} UR), Nanwei hemostatic clips, snare, foreign body forceps, spray catheter, specimen needles, and specimen containers.

Drug Preparation: MATH_{21} mL normal saline, methylene blue injection, epinephrine MATH_{22} mg, sodium hyaluronate injection, and simethicone.

Patient Preparation: Routine preoperative laboratory tests, electrocardiogram, and chest radiography. Antiplatelet and anticoagulant medications were discontinued MATH_{23} weeks preoperatively. Patients fasted for MATH_{24} hours and received thorough bowel preparation. Nurses reviewed patient history, including previous endoscopic examinations and treatments.

Anesthesia Method: Due to the large lesion size and unpredictable procedure duration, all procedures were performed under general anesthesia with endotracheal intubation or laryngeal mask airway in the operating room, with ventilator-assisted respiration to ensure patient safety and comfort.

1.2 Intraoperative Nursing Cooperation

Patient Positioning: After intubation or laryngeal mask placement in supine position, patients were assisted to lateral or supine positions according to lesion location and endoscopist requirements. Anesthesiologists protected the head and cervical spine, while soft pads protected pressure points and safety straps were secured.

Endoscope Insertion: The endoscope tip was fitted with an appropriately sized transparent cap and secured with tape. The endoscope was advanced to the target lesion using sterile water irrigation, with simethicone defoaming agent as needed to achieve clear visualization.

Marking: The electrosurgical unit was set to soft coagulation mode at maximum power MATH_{25} W. The lesion margin was marked approximately MATH_{26} mm outside the border using a Dual knife (without extending

the blade) to avoid perforation or major bleeding. Double markings were made on the anal side to distinguish orientation.

Injection: Submucosal injection was performed to achieve adequate lesion elevation. The standard solution consisted of MATH_{27} mL normal saline mixed with methylene blue and epinephrine MATH_{28} mg. For larger lesions, this solution was mixed with sodium hyaluronate in a MATH_{29} : MATH_{30} ratio to achieve optimal viscosity and elevation. An appropriate injection needle diameter was selected to ensure smooth injection and reduce procedure time. Injection began outside the marking points with small volumes; once submucosal elevation was confirmed without extravasation, additional volume was injected while reporting the amount to the endoscopist until the lesion was sufficiently lifted, separating the submucosal layer from the muscularis propria.

Incision and Dissection: The electrosurgical unit was set to ENDO CUT Q mode (effect MATH_{31} , cutting duration MATH_{32} , interval MATH_{33}) and FORCED COAG mode (effect MATH_{34} , maximum power MATH_{35} W). Two nurses assisted the endoscopist: one circulating nurse managed instrument transfer and fluid administration while monitoring vital signs, and one scrub nurse controlled the knife handle with the right hand and adjusted knife length at the biopsy channel with the left hand, maintaining the dissection plane in the submucosal layer. The scrub nurse alternated between Dual knife and nano knife as required, using tape or labels to mark frequently exchanged accessories (injection needle, Dual knife, nano knife) at the biopsy channel for rapid identification and controlled insertion speed near the lesion to prevent perforation.

Traction Techniques: For large colorectal lesions, particularly LSTs, maintaining a clear visual field and operative space was essential. Common traction methods included:

Gravity Traction: Patient positioning was adjusted to use the lesion's weight, causing dissected tissue to fall away from the dissection site. This method was ineffective for difficult locations and scarred tissue.

Dental Floss Traction: A hemostatic clip with dental floss was introduced through the biopsy channel and attached to the oral side of the dissected lesion. The floss was tightened externally to improve exposure, requiring reinsertion of the endoscope, suitable for rectal lesions.

Internal Rubber Band Traction: For lesions in the cecum and ascending colon, a rubber band technique provided excellent exposure, shortening procedure and anesthesia time while reducing risks. Our department innovated using orthodontic rubber bands: one end was clipped to the anal side of the dissected lesion, and the other end was clipped to normal mucosa on the oral side after insufflation and scope advancement, maintaining tension to expose the submucosal layer. After complete dissection, the oral side clip was removed with foreign body forceps to retrieve the specimen.

[Figure 1: see original paper] Process of the innovative orthodontic rubber band internal traction method

Hemostasis: The Dual knife and hot biopsy forceps were used to manage oozing, exposed vessels, and lesion margins. For oozing, the knife tip could be used for coagulation without extending the blade to avoid deep injury. For visible vessels, hot biopsy forceps were applied. Lesion margins were treated with hot biopsy forceps coagulation.

Wound Closure: Based on lesion size and physician preference, metal clips were used to close the artificial ulcer. Literature indicates that closure reduces postoperative bleeding. For effective clip placement:

- Appropriate clip size (typically MATH_{36} mm opening) was selected based on wound size
- The clip was rotated to align perpendicular to the wound
- The endoscopist approximated the wound edges while the nurse advanced the sheath and deployed the clip
- Closure proceeded from one side to the other, capturing adequate muscularis propria on both sides
- For large defects, the scope was advanced across the wound to capture the far edge before deployment

CO_2 Insufflation: Due to prolonged procedure time, continuous air insufflation causes abdominal distension and pain. Studies demonstrate that CO_2 significantly reduces postoperative discomfort. All procedures used CO_2 as the insufflation medium. Nurses monitored for abdominal softness, CO_2 pump alarms, and performed suction as needed.

Complication Management: The scrub nurse anticipated bleeding events by preparing hemostatic instruments (hot biopsy forceps, clips) and adjusting coagulation settings. Upon bleeding, the nurse immediately identified the location and nature (oozing vs. spurting), prepared appropriate accessories, and instructed the circulating nurse to maintain supplies for orderly hemostasis.

1.3 Postoperative Care

Vital signs were monitored with fasting and fluid supplementation. Antibiotics were administered routinely, with hemostatic agents as indicated. Bowel movements, abdominal pain, and physical signs were observed. Chest and abdominal radiographs were obtained postoperatively.

2. Discussion

A total of MATH_{37} patients with MATH_{38} lesions were included. En bloc resection was achieved in MATH_{39} % (MATH_{40} cases), piecemeal resection in MATH_{41} % (MATH_{42} cases), and surgery was aborted in MATH_{43} % (MATH_{44} cases). Curative resection

was achieved in MATH_{45} % (MATH_{46} cases). Delayed postoperative bleeding occurred in MATH_{47} % (MATH_{48} cases), managed successfully with endoscopic hemostasis and medication. Mild intraoperative perforation occurred in MATH_{49} % (MATH_{50} cases), closed with clips and managed conservatively without delayed perforation.

ESD enables complete resection of large lesions with accurate pathological assessment while minimizing residual disease, recurrence, and metastasis. The main complications are intraoperative or postoperative perforation and bleeding. Reported delayed bleeding rates for colorectal ESD range from MATH_{51} % to MATH_{52} %. Our bleeding and perforation rates were significantly lower, attributed to meticulous nursing cooperation.

Key nursing cooperation elements include:

1. **Comprehensive preoperative assessment** of patient history, vital signs, and lesion characteristics, with thorough preparation of instruments, particularly for bleeding and perforation prevention.
2. **Effective submucosal injection**: Sodium hyaluronate mixed with normal saline and methylene blue achieves elevation > MATH_{53} mm, providing excellent visualization and adequate dissection time. Studies confirm sodium hyaluronate is efficient, safe, and reduces complications.
3. **Precise dissection technique**: The nurse maintains the knife in the submucosal plane, controls insertion speed, and exchanges accessories rapidly yet safely near the lesion.
4. **Traction techniques**: For large lesions, internal rubber band traction provides superior exposure, shortens procedure time, and improves efficiency. Our innovative orthodontic rubber band method is cost-effective and simple.
5. **Hemostatic clip cooperation**: Successful closure requires tacit cooperation between nurse and endoscopist, mastering opening, rotation, and deployment timing to completely cover the muscularis propria.
6. **CO_2 insufflation**: Using CO_2 instead of air prevents abdominal distension and reduces perforation risk during lengthy procedures.
7. **Anticipatory complication management**: The scrub nurse prepares hemostatic instruments preemptively, monitors for bleeding, and maintains communication with the circulating nurse for continuous supply.

Endoscopy nurses must master comprehensive theoretical knowledge of ESD indications, contraindications, procedures, and complications, combined with extensive clinical practice, to anticipate needs, communicate effectively, and achieve efficient, tacit cooperation with endoscopists, ensuring safe and successful procedures.

Conflict of Interest Statement

The authors declare no conflict of interest.

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Note: Figure translations are in progress. See original paper for figures.