

## Case Report

# Recurrent delayed postoperative hemorrhaging after endoscopic mucosal resections of rectal polyps in patients with diabetes mellitus: a brief literature review

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Received February 15, 2019; Accepted June 5, 2019; Epub August 15, 2019; Published August 30, 2019

**Abstract:** The current study reports a case of intractable wound bleeding due to an endoscopic mucosal resection of a rectal polyp in a patient with diabetes mellitus. A 68 year old patient with a history of type 2 diabetes for 20 years reported to the hospital due to 2-year-rectal bleeding. Colonoscopy results revealed a giant pedunculated solitary polyp in the rectum. An endoscopic mucosal resection of the rectal polyp was performed. After the resection, the polyp measured 1.3 cm × 1.1 cm × 0.9 cm. Histological evaluation results revealed a villous tubular adenoma with moderate atypical hyperplasia. The patient experienced postoperative wound bleeding three times and underwent emergency endoscopic hemostasis treatment five times, without complete wound recovery. Bleeding and perforation are major complications associated with endoscopic mucosal resections. Recurrent delayed hemorrhaging after endoscopic mucosal resections of rectal polyps has rarely been reported. Perhaps the current case can provide reference for future clinical practice, inspiring more choices and better strategies for treatment of diabetes associated poor wound healing.

**Keywords:** Recurrent delayed hemorrhaging, endoscopic mucosal resection, rectal polyp, diabetes mellitus

## Introduction

Endoscopic mucosal resections (EMR) are an important advance in the field of therapeutic endoscopy. It is a widely accepted procedure for treatment of colon polyps. EMR has been associated with several complications, including bleeding, perforations, and electrocoagulation syndrome [1]. Although rates of these complications are low, they can seriously affect patient management. Of these complications, bleeding is the most frequent. It is generally classified as either early bleeding or delayed postoperative hemorrhaging. Several studies have demonstrated that incidence rates of delayed postoperative hemorrhaging range from 0.3-3.6% [2, 3]. The time between EMR and delayed PPB varies. It can be up to two weeks, but most cases happen within one week from the procedure [4]. Delayed postoperative hemorrhaging is considered clinically important

if it results in hospitalization, a blood transfusion, or if repeat colonoscopy or surgery procedures are necessary to treat the bleeding site.

Factors that increase the risk of immediate bleeding have been well-studied. Many studies exist regarding delayed postoperative hemorrhaging, but with contradictory results [5]. Several features have been established as risk factors for delayed postoperative hemorrhaging, such as large lesions and location in the proximal colon. However, many risk factors remain equivocal and inconsistent. Moreover, there are less obvious risk factors, such as age, sex, and concurrent diseases (hypertension), that few studies have examined (**Table 1**).

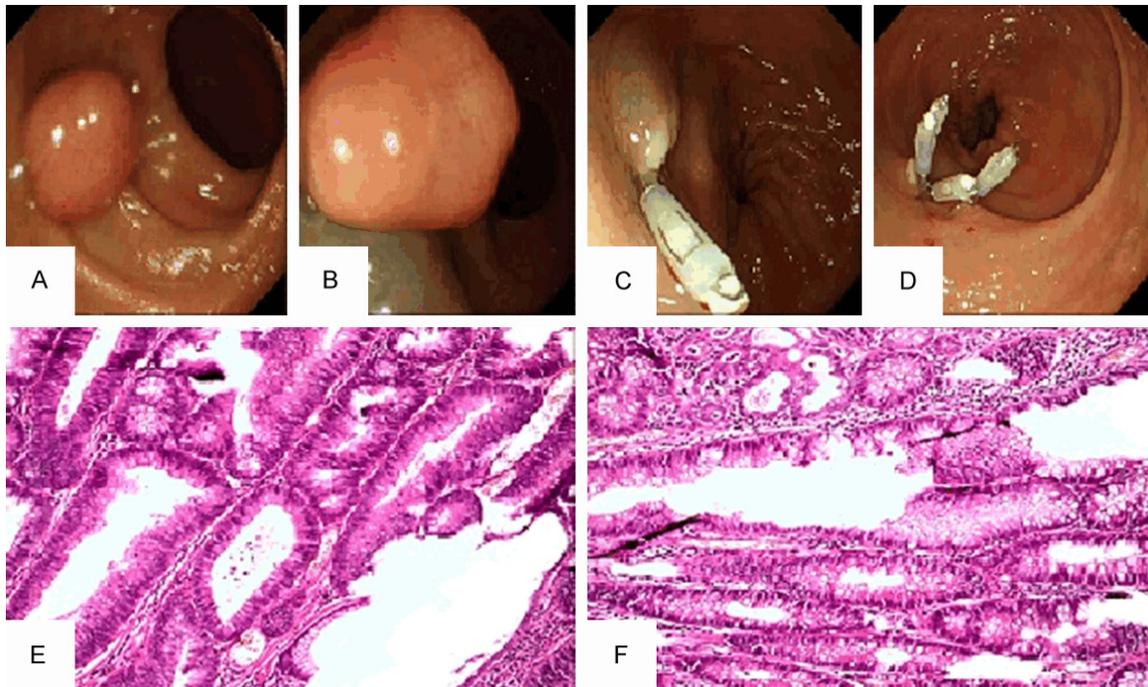
There have been contradictory conclusions concerning whether diabetes mellitus is a risk factor for delayed postoperative hemorrhaging [7], although a recently published study showed

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**Table 1.** Characteristics of included studies

Study	Country	Total patients	Delayed postoperative bleeding rate (%)	Risk factors	Non-risk factors
Watabe et al. [6]	Japan	3138	1.2	Polyp size, hypertension	Sex, age, platelet count, alcohol, smoking, diabetes mellitus, hyperlipidemia
Sawhney et al. [7]	USA	4592	0.9	Resuming anticoagulation, polyp size	Diabetes, coronary artery disease, lung disease, hypertension, aspirin use
Buddingh et al. [8]	Netherland	39	N/A	Polyp size, polyp location, Gender (female)	Age, polyp type
Gimeno-Garcia et al. [9]	Spain	364	2.8	Age, polyp size, polyp histological features	Sex, alcohol hypertension, cardiovascular disease, renal failure, cirrhosis, use of NSAIDs, use of warfarin, bowel preparation
Kim et al. [10]	South Korea	3253	1.3	Polyp size (large), shape (pedunculated), polyp location	Hypertension, diabetes mellitus, cardiac disease, cerebrovascular disease, hyperlipidemia, chronic kidney disease, liver cirrhosis, and asthma or chronic obstructive pulmonary disease, body mass index, anticoagulants use and antiplatelet use
Wu et al. [11]	USA	4655	0.6	Age, piecemeal polypectomy, need for additional sedation, concurrent diverticulosis, intraprocedural bleeding	Gender, race, BMI, smoking, alcohol use, history of abdominal surgery, concurrent comorbidities, aspirin/NSAID use, clopidogrel/ticlopidine use, double anti-aggregation agents use, warfarin use, history of polypectomy, family history of polyps, bowel preparation status, number of polyps and polyp histology
Choung et al. [12]	South Korea	3788	1.1	Polyp size, endoscopist's experience, polyp location, use of warfarin, hypertension	Age, sex, diabetes mellitus, ischemic heart disease, cardiovascular disease, dyslipidemia, chronic renal disease, chronic liver disease, aspirin use, aspirin + clopidogrel, anticoagulants, smoking, alcohol
Zhang et al. [13]	China	5600	0.6	Age, polyp (size, pathology), immediate post-polypectomy bleeding	Sex, number of resected polyps, polypectomy method
Kwon et al. [14]	South Korea	1745	1.2	Polyp size (large), shape (pedunculated), polyp location, body mass index	Age, sex, hypertension, diabetes mellitus, antiplatelet use, tumor histology, endoscopist experience, intubation time, or preventive prophylaxis such as hemoclip use and argon plasma coagulation
Moon et al. [15]	South Korea	8327	1.1	Polyp (size, location)	Age, sex, hypertension, diabetes mellitus, cerebral vascular accident, coronary heart disease, use of antiplatelets, polyp size, polyp histology, polyp shape and polyp location
Liu et al. [16]	China	709	5.8	Polyp size, operative modality	Polyp pathology, polyp location, bowel preparation, operative experience
Tsuruta et al. [17]	Japan	1660	2.6	Age (under 60 years old), polyp size, polyp shape	Sex, polyp location, endoscopist's experience
Jaruvongvanich et al. [5]	USA	14313	1.5	Hypertension, cardiovascular disease, large polyps, polyp location	Age, sex, alcohol use, smoking, diabetes, cerebrovascular disease, pedunculated morphology, carcinoma histology

N/A not available.



**Figure 1.** Endoscopic mucosal resection of a rectal polyp (A-D). After the resection, the polyp measured 1.3 cm × 1.1 cm × 0.9 cm. Histological evaluation results revealed a villous tubular adenoma with moderate atypical hyperplasia (E, F).

that it was not. However, this was an unexpected finding because positive control of blood sugar has shown undisputed health benefits [18]. Jaruvongvanich et al. suggested that cardiovascular diseases, hypertension, polyp size, and polyp location are associated with delayed postoperative hemorrhaging, while age, sex, alcohol use, smoking, diabetes mellitus, cerebrovascular disease, pedunculated morphology, and carcinoma histology are not. These results are according to a meta-analysis that investigated risk factors for delayed postoperative hemorrhaging, including twelve articles and involving 14,313 patients [5]. Therefore, the confirmation of risk factors for delayed postoperative hemorrhaging is essential for the reduction of risks of complications and bleeding. The current study presents an extremely rare case, in which a diabetes mellitus patient experienced postoperative wound bleeding three times and emergency endoscopic hemostasis treatment five times, with no complete wound recovery. Perhaps the current case can provide reference for future clinical practice, leading to safer and better strategies for treatment of patients with diabetes mellitus associated with poor wound healing.

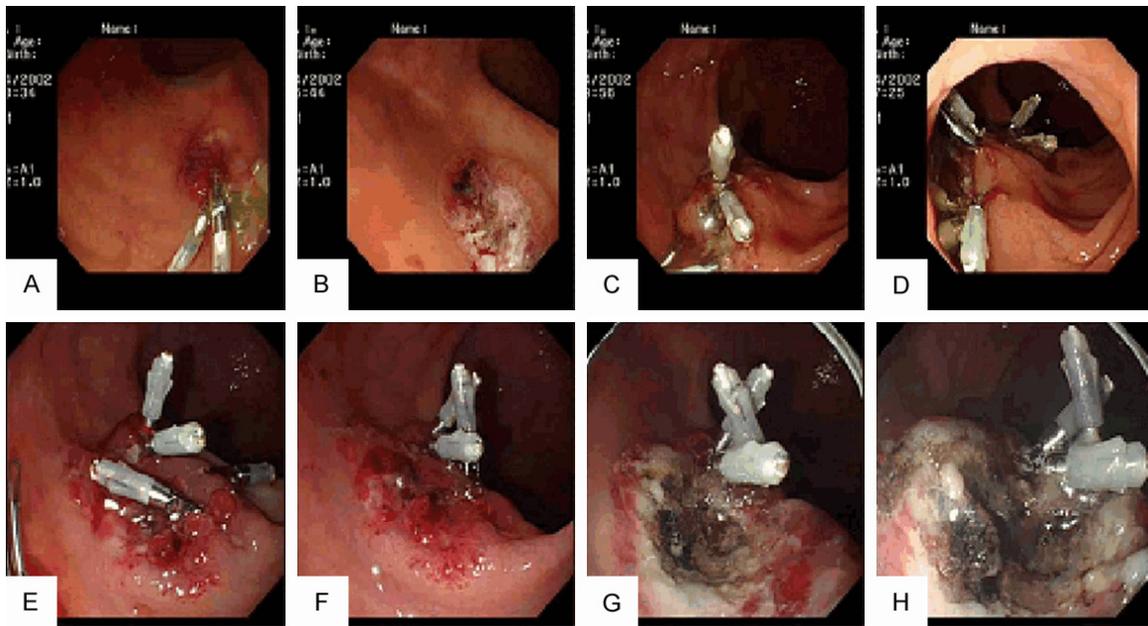
### Case presentation

A 68 year old man was admitted to the hospital due to 2-year-rectal bleeding. The patient had a history of type 2 diabetes for 20 years. Physical examinations and laboratory data, including serum tumor markers, were normal. Colonoscopy examination results revealed a pedunculated polyp presenting a mushroom-shaped appearance in the rectum (**Figure 1A**).

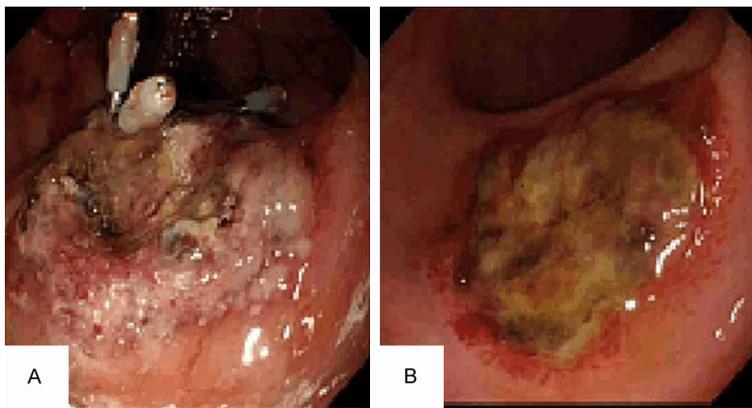
The patient underwent endoscopic mucosal resection (EMR) surgery of rectal polyps after providing informed consent. The surgery included 4 titanium clip-occlusion and left no wound bleeding (**Figure 1B-D**). After the resection, the polyp measured 1.3 cm × 1.1 cm × 0.9 cm. Histological evaluation results revealed a villous tubular adenoma with moderate atypical hyperplasia (**Figure 1E, 1F**). Routine treatment of acid suppression, hemostasis, and rehydration, as well as nutritional support and other symptomatic treatments, were given after surgery.

Three days after surgery, the patient defecated a bright red bloody stool of 200 mL. Emergency colonoscopy results revealed a small clot and 3

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**Figure 2.** Recurrent delayed hemorrhaging 3 days after surgery (A-D). Recurrent delayed hemorrhaging 6 days after surgery (E-H).



**Figure 3.** Postoperative wound on the 7<sup>th</sup> day after surgery (A); Postoperative wound on the 10<sup>th</sup> day after surgery (B).

titanium clips in the postoperative wound, with one titanium clip shedding. There was slight errhysis after repeated washing of the clot. Two residual-titanium clips were then removed. The wound was managed by coagulation using hot biopsy forceps. Furthermore, the wound surface was treated with 4 titanium clips and 2 Boston titanium clips (**Figure 2A-D**). After returning to the ward, somatostatin, ethylphenol sulfonamide, aminomethylbenzoic acid, hemagglutinin, and esomeprazole, as well as other nutritional support and symptomatic treatments, were administered.

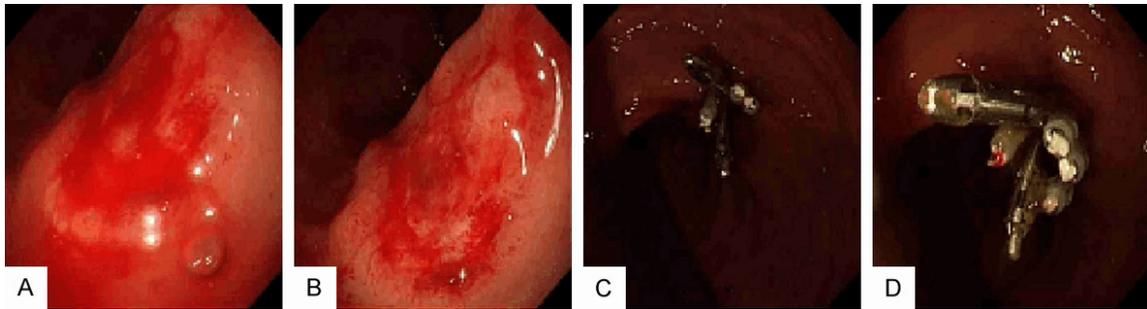
Six days after surgery, the patient defecated a dark red bloody stool of 100 mL again. Emergency colonoscopy results showed a large clot and 3 shedding titanium clips in the postoperative wound. These were then cleared by a basket. The wound was repeatedly treated with hot forceps and washed with ice salt-water until there was no fresh blood oozing (**Figure 2E-H**). Next, Yunnan White Drug-Powder was administered by enema hemostasis. The mesalazine suppository

was used for anti-inflammatory treatment. A re-examination of the enteroscopy was conducted the next day, finding that the wound was edematous with no bleeding (**Figure 3A**).

The colonoscopy was performed on the tenth day after surgery. The surface of the wound was found with white moss on the surface, without fresh blood oozing (**Figure 3B**). The patient began to eat soft food.

Twenty days after surgery, the patient defecated a bright red bloody stool of 100 mL, after forcibly solving the stool. Colonoscopy results

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**Figure 4.** Recurrent delayed hemorrhaging 20 days after surgery.

found a fresh blood clot covering the postoperative wound. There existed a small vessel with active bleeding after repeated washing of the blood clot. The wound was clamped with 5 titanium clips and 2 Boston titanium clips after rinsing with repeated norepinephrine and ice salt-water (**Figure 4A-D**). After routine fasting and hemostatic therapy, the patient was asked to rest in the bed. The color and character of the stool was closely examined. Three days later, the patient was allowed to eat.

Twenty-six days after surgery, the patient was discharged with no diarrhea and no hematochezia. There were no abnormalities in the blood, fecal occult blood, or colonoscopy results during three months of follow-ups.

### Discussion

With improvements made in equipment and techniques, EMR has become the standard for treatment for colorectal polyps and hemorrhagic complications after colonoscopy procedures. EMR can be well-controlled. However, delayed postoperative hemorrhaging is still the most significant EMR complication [19]. Delayed hemorrhaging, which develops from a few hours to a few days after EMR, manifests as continuous hematochezia. In severe cases, ischemic shock may develop due to hemorrhaging. Risk factors for delayed postoperative hemorrhaging have been investigated. Results have been inconsistent. Methods to predict or prevent delayed hemorrhaging, effectively, are also controversial [20]. Therefore, more caution is needed for delayed hemorrhaging 1-3 days after operations. Postoperative surveillance for hemorrhaging should be prolonged, avoiding serious outcomes.

Hemorrhaging develops after an EMR is treated by endoscopic hemostasis, transfusions, inter-

ventional procedures, and surgery [21]. Endoscopic treatments for hemorrhages include compression therapy with snares or forceps, injection of epinephrine or fibrous adhesives, mechanical ligation with hemoclips, and thermal therapy, such as argon plasma [22, 23]. No single technique has been reported to be superior to another in the prevention of delayed PPB. However, combinations of techniques might be more effective [24, 25].

Healing of acute wounds follows a certain order, including the inflammatory stage, proliferative stage, epithelialization stage, and remodeling stage. Sometimes these stages overlap [26, 27]. The complexity of healing is influenced by internal and external factors. These factors can regulate complex biochemical and cellular processes, eventually forming fibrous scar tissue to close the wound. Exact mechanisms of poor wound healing remain unclear, involving the interaction of systemic and local factors. Some wounds associated with a variety of underlying diseases or complications may continue for several months or even years [28].

Diabetes mellitus is a metabolic disease characterized by chronic hyperglycemia due to deficiency of insulin secretion or action. Long-term metabolism disorders of carbohydrate, fat, and protein can cause multiple system damage, leading to chronic progressive lesions, dysfunction, and failure in organs, such as the eyes, kidneys, nerves, heart, and blood vessels. Diabetic patients suffer from a series of biochemical metabolic disorders, mainly presenting as hyperglycemia. A major complication of hyperglycemia is slow healing processes after trauma or surgical treatment. Moreover, wound infections often occur since bacteria easily reproduce in a high-glucose environment [29].

The current patient underwent recurrent delayed hemorrhaging after EMR of rectal polyps.

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This was considered as delayed wound healing due to diabetic microvascular lesions. Microangiopathy is a specific complication of diabetes, which can involve all tissues and organs of the body. Typical changes of microangiopathy include a disturbance of microcirculation and thickening of the microvascular basement membrane. These play an important role in disabilities and deaths of diabetic patients [30]. The current patient experienced postoperative wound bleeding three times and emergency endoscopic hemostasis treatment five times, with no complete wound recovery. Finally, after comprehensive treatment measures and nutritional support, the wound healed.

Diabetes mellitus is a major chronic disease. It has become a worldwide epidemic. Delayed healing problems caused by diabetic neuropathy and microvascular disease will have long-term effects on patient health and clinical treatment. EMR is an important advancement in the field of therapeutic endoscopy. It has already been accepted as a minimally-invasive alternative to surgery in mucosal lesions affecting upper and lower gastrointestinal tracts. These procedures involve a high risk of complications. They should be performed by experienced and trained endoscopists. Perhaps the current case can provide reference for future clinical practice, leading to more choices and better strategies for treatment of diabetes associated poor wound healing.

### Disclosure of conflict of interest

None.

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