

# A Management Algorithm Based on Outcomes of Clinically Significant Delayed Bleeding After Wide-Field Endoscopic Mucosal Resection of Large Colonic Lesions

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## BACKGROUND & AIMS:

Bleeding is the main complication of wide-field endoscopic mucosal resection (WF-EMR) for large colonic lesions. Few studies have examined bleeding outcomes after WF-EMR and there are no evidence-based guidelines for management of bleeding in this group. We analyzed outcomes of patients with clinically significant post-EMR bleeding (CSPEB) and present a management algorithm based on our findings.

## METHODS:

In a prospective study, we collected data from WF-EMR of sessile colorectal polyps 20 mm or larger from 1039 patients who participated in the Australian Colonic Endoscopic resection multicenter study from July 2008 through May 2012. Data included patient and lesion characteristics and procedural, clinical, and histologic outcomes. Patients participated in a structured telephone interview 14 days after the procedure; independent predictors of a moderate or severe outcome by American Society of Gastrointestinal Endoscopists criteria, or any intervention for hemostasis, were identified.

## RESULTS:

Sixty-two patients had CSPEB (6.0%); 34 were managed conservatively (55%) and 27 underwent colonoscopy (44%). One patient had primary embolization. Endoscopic therapy was applied in 21 cases; 14 had active bleeding. Two of the conservatively managed cases underwent colonoscopy for rebleeding after discharge. On multivariable analysis, moderate or severe bleeding events were associated with hemodynamic instability (odds ratio, 12.3;  $P = .046$ ) and low level of hemoglobin at presentation (odds ratio, 0.50 per 1.0 g/dL;  $P = .005$ ). Intervention for hemostasis was associated with hourly or more frequent hematochezia (odds ratio, 36.7;  $P = .001$ ), American Society of Anesthesiologists grade 2 or higher (odds ratio, 20.1;  $P < .001$ ), and transfusion (odds ratio, 18.7;  $P = .003$ ).

## CONCLUSIONS:

Based on a multicenter prospective study, CSPEB resolves spontaneously in 55% of patients. We developed a risk factor-based algorithm that might assist physicians in the management of bleeding. Patients responding to initial resuscitation can be observed, with a lower threshold of intervention for those with the identified risk factors.

Keywords: ACE Resection Study; Colonic Polyps; Polypectomy; Colorectal Neoplasms; Hemorrhage.

Abbreviations used in this paper: ASA, American Society of Anesthesiologists; ASGE, American Society of Gastrointestinal Endoscopists; ICU, intensive care unit; CSPEB, clinically significant postendoscopic bleeding; WF-EMR, wide-field endoscopic mucosal resection.

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Wide-field endoscopic mucosal resection (WF-EMR) of colonic advanced mucosal neoplasia (large sessile polyps and laterally spreading tumors  $\geq 20$  mm in size) by specialist endoscopists at a tertiary referral center is efficacious and safe.<sup>1</sup> It has significant advantages compared with surgery because most patients can be discharged the same day, including those with significant comorbidity.<sup>2</sup> Prospective case series have reported on the incidence of bleeding after WF-EMR, but studies generally have been small and performed at a single center, with varied definitions of bleeding and approaches to follow-up evaluation.<sup>3-8</sup> Bleeding outcomes were reported descriptively in these studies, however, events were infrequent and a statistical analysis of factors associated with poorer outcomes was not possible. There have not been any studies examining the outcomes of bleeding after WF-EMR or published guidelines for the management of bleeding in this specific setting. Insights derived from post WF-EMR bleeding may serve to inform the management of bleeding after standard polypectomy, an area that likewise has only a small body of evidence from which to infer best practice.

We aimed to examine factors associated with moderate-severe American Society of Gastrointestinal Endoscopists (ASGE) outcome or intervention for hemostasis (endoscopic intervention, angiographic embolization, or surgery) in patients with clinically significant postendoscopic bleeding (CSPEB) after WF-EMR. We also aimed to construct a bleeding management algorithm based on these findings in combination with consensus clinician opinion.

## Methods

Consecutive patients referred to 1 of 7 Australian academic hospitals for the management of sessile colorectal polyps 20 mm or larger were enrolled in this prospective observational study. All lesions initially were identified and referred by a nationally accredited consultant endoscopist. Data were recorded in a comprehensive centralized database from July 2008 to May 2012. Institutional review board approval was obtained at each center. Written informed consent was obtained from each patient on the day of the procedure.

Patients were excluded if they did not undergo EMR because of suspicion of malignancy or for technical reasons. There were no other exclusion criteria.

Standardized advice was provided to patients on management of antithrombotic medications. Patients were advised to cease antiplatelet agents for 7 days before WF-EMR and recommence 5 days after the procedure. Management of anticoagulant therapy was standardized with reference to recognized guidelines,<sup>9</sup> with patients advised to cease warfarin for 4 doses before WF-EMR. Bridging therapy with intravenous heparin or subcutaneous enoxaparin was used in patients with

mechanical heart valves for the period that the international normalized ratio was subtherapeutic. Warfarin was recommenced on the day after WF-EMR.

All WF-EMR procedures were performed by a study investigator or a senior therapeutic endoscopy fellow under their direct supervision. All study investigators were gastroenterologists with significant prior colonic EMR experience after training in high-volume tertiary referral centers in Australia or overseas. Colonoscopy was performed using Olympus 180 or 190 series variable-stiffness colonoscopes (Q180/190 PCF/CF; Olympus, Tokyo, Japan). The WF-EMR technique was standardized across all centers, and has been described in detail previously.<sup>2,10,11</sup> Prophylactic closure of defects with clips was not performed. After WF-EMR, patients remained in recovery for 4 to 6 hours until medically cleared for discharge by the endoscopist.

On discharge, dietary instructions were for clear fluids overnight and to resume a normal diet the following day. Written postprocedural instructions were provided including information on potential problems and contact details for advice.

## Data

Information was collected prospectively at the time of patient admission, during, and then immediately after the procedure. Data included patient demographics and comorbidities, American Society of Anesthesiologists (ASA) grade, and antiplatelet or anticoagulation use. Lesion features including Paris classification, surface morphology, size, and location were recorded. Technical aspects were noted, including the subjective level of difficulty in accessing or positioning for resection of the lesion, adrenaline use in the submucosal injectate, en bloc or piecemeal resection, and whether complete snare excision was achieved. If patients had 2 or more lesions resected in 1 procedure, 1 lesion was selected at random for analysis. If a patient developed bleeding and 2 or more lesions had been resected, the nonbleeding lesion was removed from analysis if it was identified at colonoscopy. If the patient had not had a procedure to localize the bleeding, a lesion was chosen at random.

All patients in the study underwent a structured telephone interview at 14 days. Any patient reporting delayed bleeding was asked about the timing of bleeding in relation to the index procedure and whether a colonoscopy was performed. Hospital records were retrieved at this time to corroborate the history and to record data prospectively on any endoscopic intervention, angiographic embolization or surgery, admission to hospital, and any mortality. At the time of the study analysis, all patients with CSPEB had a standardized chart review with a structured interview of the clinician responsible for the WF-EMR procedure. Data collected included the timing of bleeding in relation to the index procedure, frequency of hematochezia, abdominal pain,

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