Introduction

Endoscopic submucosal dissection (ESD) in colorectum is an invasive technique which can endoscopically resect large colorectal neoplasia by en bloc fashion. The en bloc resection rate of colorectal ESD for large colorectal neoplasia over 2 cm in diameter ranges from 73% to 99%.\(^1\)\(^-\)\(^8\) Therefore, the main indication of colorectal ESD is large colorectal neoplasia over 2 cm suspected as early cancer which would not be resected en bloc by conventional snare resection techniques because early cancers should be resected en bloc to minimize the risk of remnant lesions and to enable thorough histopathological evaluations.\(^9\) Despite its theoretically definite usefulness in cases of large, suspected early cancers, colorectal ESD is not yet performed worldwide because of high incidence of complications. Colorectal ESD-related perforation rate has been reported 1.4\(^-\)\(^10.0\)% and bleeding incidence is 1.2\(^-\)\(^2\)%.\(^1\)\(^-\)\(^8\) Therefore, proper measures to avoid and prevent complications and optimized management for complications are very important for colorectal ESD to be accepted more widely. In this paper, how to avoid and manage colorectal ESD-related complications will be reviewed.

Colorectal ESD-Related Perforation

1. Types of Perforation

Colorectal ESD-related perforations may be divided into endoscopically proven and radiologically proven perforation.\(^10\) An endoscopically proven perforation is colonic mural defect which is detected during ESD. A radiologically proven perforation is diagnosed when a pneumoperitoneum or a pneumoretroperitoneum is shown on a simple abdominal X-ray. It can be also diagnosed when extraluminal air density or abscess is found at the site of ESD on CT.

2. Risk Factors of Perforation

Large tumor size, tumors at cecum, procedures by ESD beginners, and fibrosis are known to be risk factors for colorectal ESD-related perforations.\(^11\) Use of long-lasting submucosal cushion fluid such as hyaluronic acid is a protective factor against colorectal ESD-related perforations.\(^12\)
3. Measures to Avoid Perforation

Unintentional muscle tear by ESD knives is one of the most common mechanisms of colorectal ESD-related perforation. This occurs especially when the knives are approached vertical to the colonic wall. The approach of knives at cecum is usually vertical, which is the reason that cecum is a risk factor for perforation. Thus, pull-type knives such as hook knife is useful to decrease the risk of perforation at cecum.

Rectum is wide and fixed. Therefore ESD procedure may be relatively easier than other parts of colon. In addition, generalized peritonitis rarely develops even if perforation occurs in case of mid to distal rectal lesions. Thus, colorectal ESD beginners are recommended to start the training of colorectal ESD from rectal lesions.13

Hyaluronic acid can be recommended as submucosal cushion fluid because its use was reported to be protective against colorectal ESD-related perforations.

4. Management of Perforation

Surgery was the mainstay of treatment of colonic perforation. Surgery is still indicated in large perforations, generalized peritonitis, ongoing sepsis, aggravating peritonitis, and concomitant pathology such as advanced neoplasm which is difficult to resect endoscopically.14

Endoscopic treatment of colonic perforation has significantly progressed since the first report of clipping.15 Endoscopic clips have been used with satisfactory success rate for the management of colonoscopy-related perforation.10 Endoscopic clipping is especially useful in the closure of small perforations which are common with colorectal ESD-related perforations. In case of large perforations, combination of clips and detachable snare can be used in the endoscopic closure.16 Over-the-scope clips were reported for the management of large gastrointestinal perforations.17

Proper supportive measures are essential for medical treatment of colorectal ESD-related perforations. They include nil per os, antibiotics, and needle decompression of tension pneumoperitoneum.14 In addition, to avoid severe peritonitis, endoscopists should remove all the residual feces before the trial of colorectal ESD.

Colorectal ESD-Related Bleeding

1. Types of Bleeding

Colorectal ESD-related bleeding may be divided into immediate and delayed bleeding. Immediate bleeding refers to bleeding during the endoscopic procedure. Delayed bleeding is defined as bleeding which develops after the completion of ESD procedure.

2. Measures to Avoid Bleeding

Immediate bleeding occurs when submucosal vessels are cut without sufficient coagulation. Thus, to avoid immediate bleeding, submucosal vessels should be visualized and identified during submucosal dissection and adequately coagulated. Hemostatic forceps can be used to grasp the vessels and coagulate them adequately. Some suggest the level of dissection should be just above the muscle layer because fewer vessels are present at this level so that those may be easily coagulated before bleeding develops.18

Delayed bleeding occurs by rupture of exposed vessels after the completion of ESD procedure. Therefore, the
post-ESD ulcer should be observed cautiously to see if there are large exposed vessels. If vessels are suspected, they can be coagulated by hemostatic forceps or argon plasma coagulation. If the vessels are large, clipping the vessels is a useful measure to prevent delayed bleeding.

3. Management of Bleeding

When bleeding develops during the ESD procedure, it can be controlled by various hemostatic techniques such as argon plasma coagulation, hemostatic forceps and clipping. Most delayed bleeding can also be stopped by endoscopic hemostasis. Rarely angiographic embolization is needed to control bleeding.

Conclusions

Colorectal ESD-related complications such as perforation and bleeding are not uncommon. Perforation is especially important because the frequency is above 5% and there is a potential needs for surgery. Measures to avoid and prevent perforation and bleeding should be performed, which include proper use of various knives, adequate training, use of long-lasting submucosal cushion fluid, and timely use of hemostatic forceps to coagulate visible submucosal vessels. Even after perforation or bleeding develops, most cases can be managed conservatively by endoscopic closure or hemostasis. Clipping is a key element for medical management of both perforation and bleeding.

References


