



# A review of sigmoid volvulus and natural orifice specimen extraction surgery

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**Abstract:** Colon resections are performed successfully with the laparoscopic method and small incisions, but an extra incision is needed for specimen extraction. There is no need for extra incisions in specimen extraction surgery from the natural orifice, and the popularity of this surgery is gradually increasing. The feasibility of natural orifice specimen extraction surgery (NOSES) is related to two factors: the first factor is the patient, and the second is the specimen too. The weakness of the patient and the small size of the specimen are the factors that facilitate natural orifice surgery. In patients with sigmoid volvulus, sigmoid colon resection is performed successfully with the laparoscopic method but specimen extraction from the natural orifice is still rare in the literature. We aimed to review natural orifice surgery in sigmoid volvulus in the light of literature. For this purpose, both the publications in the literature and our own experience were assessed. A total of twenty-eight cases of sigmoid volvulus in seven publications have been reported to date. We experienced eight patients that are not yet reported. Sigmoid volvulus patients are perhaps one of the most appropriate patient groups for NOSES, as they have a large rectum diameter and do not contain a mass.

**Keywords:** Sigmoid; volvulus; natural orifice; transanal; transrectal

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## History and feasibility

Minimally invasive methods to treat sigmoid volvulus were initially laparoscopy-assisted colon resections (1-3). Minimally invasive methods are preferred in sigmoid volvulus patients, most of whom are elderly, because of their advantages, such as fewer wound complications, less pain, and a shorter hospital stay (4). Since it was first published, laparoscopic resection has gained increasing acceptance for the treatment of benign and malignant diseases of the sigmoid colon (5).

The aim of minimally invasive surgery is to perform the surgery with the least possible incision; however, an extra incision is still needed to remove the specimen. Fewer incisions in colon resection surgeries and the use of natural orifices for specimen extraction, such as in transanal and transvaginal approaches, have been described, and their popularity is increasing (6,7). In the literature, specimen extraction from the natural orifice after laparoscopic surgery for sigmoid volvulus is rare, and a total of 28 cases of sigmoid volvulus in 7 publications have been reported to

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**Table 1** Previous reports in literature

First author	Year	n	Age, years, median (range)	Site of specimen extraction	Complication	Discharge day, median (range)
Devane (8)	2022	1	69	Transanal	None	n/a
Seow-En (9)	2021	6	68 [16–84]	Transanal	None	4 [2–9]
Chen (10)	2021	16	n/a	Transanal	n/a	n/a
Sia (11)	2019	1	22	Transanal	None	n/a
Hsieh (12)	2019	2	n/a <sup>a</sup>	Transanal	None	4
Wolthuis (13)	2015	1	n/a	Transanal	n/a	n/a
D'Hondt (15)	2014	1	85	Transvaginal <sup>¶</sup>	None	8*
Christoforidis (14)	2013	1	n/a	Transanal	n/a	n/a
Hamada (16)	2010	1	10	Transanal <sup>¶</sup>	None	n/a

<sup>a</sup>, one of the two patients was 45 years old; <sup>¶</sup>, notes (natural orifice transluminal endoscopic surgery); <sup>¶</sup>, specimen was removed by everting the colon; \*, the patient met discharge criteria on postoperative day 5, but because she had to be placed in a nursing home, discharge was delayed until day 8. n/a, not applicable.

date (8-14) (*Table 1*). We recorded eight patient experiences [Gaziantep University Ethics Committee (2020/178) and registered in an international database (ClinicalTrials.gov NCT04740619)] that are not yet reported. In addition, there are cases of sigmoid volvulus in which the colon is everted and resection from the anal region is completed after intraabdominal proximal transection (16). One case of sigmoid volvulus was reported in which the specimen was removed transanally after resection with robotic surgery, which is widely used (8).

### Potential benefits

The greatest advantage of natural orifice surgery is that no additional incision is needed for specimen extraction. This technique, which improves the aesthetic results and/or increases the comfort of the patients, has been widely accepted by surgeons. Improved postoperative pain control, shorter time to first bowel movement, fewer incisional complications, shorter hospital stays, and more favorable cosmetic results have been demonstrated with natural orifice surgery (17). It has been shown that natural orifice surgery can be safely applied to both benign diseases and malignant diseases (18). In sigmoid volvulus, because the colon does not contain a mass and has a long and narrow mesentery, the specimen diameter is small, which presents an advantage for natural orifice surgery.

In patients with sigmoid volvulus, the dilated colon lumen facilitates specimen extraction by the transanal

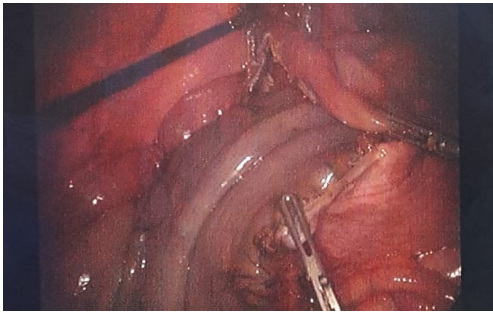
route; the transvaginal route is less often preferred. In the literature, only one case has been reported in which natural orifice transluminal endoscopic surgery (NOTES) was performed transvaginally with a single port (15).

### Patient factors and selection

The feasibility of natural orifice specimen extraction surgery (NOSES) is related to two factors: one factor is the patient, and the other is the specimen. A patient factor is associated with body mass index (BMI) and gender, while the specimen factor is associated with maximum tumor diameter and size. BMI <30 kg/m<sup>2</sup> and low comorbidity can be considered necessary conditions for elective surgery (19). If the patient is a woman, the transvaginal route can be employed. While the transvaginal route is recommended for larger masses, the transanal route is recommended for smaller masses, as the colon lumen is small (20). It may be hypothesized that the wider pelvis diameter in women could increase the success of natural orifice surgery; however, similar results have been reported in both men and women when comparing laparoscopic colorectal resections (21).

### Surgical technique

In the literature, transanal specimen extraction by eversion was first described in a 10-year-old boy with sigmoid volvulus in 2010 (16). Single-port laparoscopy and pure transvaginal surgery were described in an 84-year-old female



**Figure 1** Extraction of the specimen from the rectal lumen.



**Figure 2** Extraction of the specimen from the anal canal.

patient with sigmoid volvulus in 2014. Transanal specimen removal was described 5 years later, in a 22-year-old female patient with sigmoid volvulus (11,15). In this patient, Sia *et al.* resection was performed after tying the distal part of the specimen with nylon tape, and the specimen was removed through the colon (11). In contrast, in definitive surgery for patients with sigmoid volvulus caused by Hirschsprung's disease, both resection and specimen extraction can be achieved with transanal pull-through (22). In our clinical experience, after performing the resection in the abdomen with the help of a stapler, the stapler line in the proximal rectum is opened and the specimen is removed in this way. The circular stapler anvil is taken into the

abdomen transanally. After the anvil is placed at the distal end, the proximal opening is closed with a linear stapler, and anastomosis is made with a circular stapler.

### *Step by step surgical technique*

Informed consent was obtained from patients and elective operations were scheduled after successful derotation. Because the patients were operated on after endoscopic derotation, only a rectal enema was performed before the surgery. Subcutaneous low molecular weight heparin (0.1 mg/kg) was administered preoperatively. A single dose of third-generation cephalosporin [1 g, intravenous injection (IV)] and metronidazole (500 mg, IV) was administered one hour before the operation for antibiotic prophylaxis. The patient was taken to the operating table in the lithotomy position and fixed to the table to prevent falling. General anesthesia was then administered. An incision was made under the umbilicus to place a 12 mm trocar. A pneumoperitoneum was created using a Veress needle. A total of four trocars were used. The 30-degree camera trocar was inserted when intra-abdominal pressure reached 12–15 mmHg. Then, two main 5 and 12 mm trocars were placed in the right paracolic area. An assistant trocar was placed in the left paracolic area. The sigmoid colon was resected, preserving the mesentery, toward the distal of the colon, descending to 5 cm above the peritoneal reflection. The staple line on the distal rectal stump was opened, and the stump walls were held open with a grasper (*Figure 1*). Resection of the sigmoid colon was aided by a clamp inserted through the anal canal and into the lumen. The specimen was retrieved through a transanal approach (*Figure 2*). A 31–33 mm circular stapler was placed via the anus, then the anvil was taken into the abdomen and the shaft removed. The open rectal stump was closed again with a stapler. The anvil was inserted at the end of the proximal colon through the stapler line, and the open area was closed with a stapler. The resected stapler lines were removed through the trocar using an endo bag. Following an air leakage test, the operation was terminated by placing a drain.

### **Potential pitfalls**

Successful endoscopic derotation is required for laparoscopic surgery in patients with sigmoid volvulus. Even after successful derotation, exploration difficulties may occur due to the dilated colon. In some patients, a loose abdominal wall secondary to chronic dilatation may

facilitate exploration (23). Because colotomy is required in patients who are planning to have the specimen removed by transanal route, colon cleansing before surgery is important. The risk of stool contamination is very low in colon specimen removal by the transvaginal route, as both ends of the colon are closed. However, stool contamination may occur because the colon is opened for transanal specimen extraction. Patience and caution are required in this regard. Natural orifice laparoscopic surgery is sometimes not possible, not just in debilitated, elderly patients with neuromuscular deficits, in whom sigmoid volvulus is common. Furthermore, laparotomy is inevitable in the presence of gangrene and in patients with unsuccessful endoscopic derotation.

## Conclusions

In sigmoid volvulus patients, the absence of a mass and having a wider rectum compared with other patients may represent characteristics of the most appropriate patient group for NOSE.

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