A Novel Method of Intra-Abdominal Cavity Obliteration: A Case Report of a Colonic Seromuscular Flap

Atsushi Imaizumi, MD

Summary: Obliteration of an organized subphrenic abscess with an enteric fistula is a great challenge, especially after hepatectomy, as most of the conventional flaps used to fill the abscess cavity are not feasible. A seromuscular flap is an innovative option for this purpose because of its proximity to the pathology, flexibility in the size and volume of the flap harvested, antibacterial ability of the muscle flap, and preservation of trunk musculature. We illustrate the use of a colonic seromuscular flap for filling such an abscess and show its long-term change. A 66-year-old man developed a right subphrenic abscess after subsegmentectomy for his hepatocellular carcinoma. Prolonged percutaneous drainage of the abscess was unsuccessful because of the enteric communication with the transverse colon and resulted only in the organization of the abscess cavity. Through the previous laparotomy incision, the involved part of the transverse colon was detached from the abscess. The transverse colon including the fistula was isolated for 16 cm based on the middle colic vessels. Following an enterotomy along the antimesenteric border and mucosal stripping, a colonic seromuscular flap was made. The debrided abscess cavity was properly filled with this flap. The donor colon was repaired. The postoperative course was uneventful without showing any signs of infection for more than 3 years. During this period, the volume of the flap filling the cavity showed significant reduction of 50%. The seromuscular colonic flap is an effective option for filling the intra-abdominal abscess cavity when most of the conventional flaps are not feasible. (Plast Reconstr Surg Glob Open 2022;10:e4516; doi: 10.1097/GOX.0000000000004516; Published online 21 September 2022.)

Obliteration of an organized subphrenic abscess with enteric communication is a great challenge, especially after hepatectomy, as most of the conventional flaps such as the rectus abdominis muscle or omental flaps to fill the abscess cavity are not feasible because of the previous subcostal laparotomy incisions and possible intra-abdominal adhesion. Seromuscular flaps have long been used exclusively as biological patches for closure of fistulae or to reinforce the anastomoses or stumps of various organs.1-5 For the purpose of filling the hepatic abscess, this flap was considered as an innovative option because of its proximity to the abdominal pathology, flexibility in the volume of the flap harvested, potential antibacterial ability of the muscle flap, and preservation of trunk musculature.2,6,7 Here, we illustrate the use of a pedicled colonic seromuscular flap for filling such an abscess cavity and demonstrate its long-term volume change.

CASE PRESENTATION

A 66-year-old man underwent hepatic subsegmentectomy (S7 and S8), preserving the part of the S7 for his hepatocellular carcinoma, which was complicated by the subphrenic abscess developed due to ischemic necrosis of the preserved part of the S7. He also had experienced failed mesh ventral hernia repair. Prolonged (two-and-a-half years) percutaneous drainage was unsuccessful because of communication of the abscess with the transverse colon; this resulted in organization of the abscess cavity.

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cavity and frequent episodes of bacteremia. The abscess cavity occupied a wide area underneath the diaphragm (Fig. 1) (See Video [online], slides 1 and 2, displaying preoperative clinical and computed tomography [CT] findings). The general surgeon requested obliteration of this abscess cavity, but most of conventional flaps to fill the cavity were not feasible because of the subcostal laparotomy scar and possible dense intra-abdominal adhesion. An innovative idea was to use the involved segment of transverse colon in the pathology as a donor for the planned seromuscular flap, and use of this colon should avoid donor morbidity arising from other donor sites.

A multidisciplinary collaboration between plastic and general surgery was used for this case. Through the previous subcostal incision, the part of the transverse colon involved in the abscess was released, and enteric communication was detached. The organized cavity of the abscess was debrided with curettage (See Video [online], slides 3 and 4, showing the abscess with enteric communication). The detached part of the transverse colon of 16 cm including the fistula was isolated on the middle colic vessels. A longitudinal enterotomy along the antimesenteric border of the created colonic flap was made. The fistula was excised. Mucosal stripping was facilitated by submucosal injection of dilute epinephrine (See Video [online], slides 5 and 6, showing the process of the colonic seromuscular flap). Through this tumescent submucosal plane, mucosa was excised piece by piece with sharp scissors. Complete excision of mucosa was necessary to prevent a future mucocele at the transfer site. Minimal cautery was applied to the major bleeding points to maintain adhesive property of the submucosal surface, which would provide a biological seal against blood and bile leakage from the abscess inner surface (Fig. 2). The abscess cavity was filled with the seromuscular flap facing the submucosal surface with the abscess wall. The flap and its pedicle mesentery were fixed to the liver with sutures. A closed suction drainage tube was placed in between the filling flap and the diaphragm. The abdomen was closed after repairing the donor colon.

The postoperative course was uneventful, and there were no signs of infection during the postoperative follow-up period of 3 years and 7 months. During this period, the volume of the transferred seromuscular flap measured on CT scan showed significant reduction from 35.3 to 17.8 mL by 10 months after surgery, despite patient’s weight gain from 61.9 to 77.0 kg (See Video [online], in which slide 7 shows chronological volume change of the seromuscular flap).
The use of the transverse colon as a seromuscular flap for obliteration was an innovative idea as it was in close proximity to the pathology and avoided the need for adhesiolysis for mobilization of the omental flap. Moreover, the length of colon isolated could be tailored to the volume of the soft tissue required for filling. Obviously, a bowel with any disease, neoplasm, inflammatory bowel disease, etc. could not be used for this flap.

The seromuscular flap has exclusively been used as a patch using various kinds of digestive tracts. There is only one report on the seromuscular flap used for filling the cavity, in which an ileal seromuscular flap was used for filling the pelvic cavity but did not show long-term clinical results and flap changes.

The postoperative CT scan showed 50% reduction of the volume of the filling seromuscular flap by 10 months after surgery. The reduced volume was maintained thereafter. Although atrophy of the denervated skeletal muscle flap after transfer is a well-known phenomenon, that of the smooth muscle has not been well discussed. Cervellione et al reported 40% reduction of the ileal seromuscular flap used for clam ileocystoplasty in experimental pigs and suggested reduced microcirculation after mucosectomy was responsible for flap contraction. Despite possible reduction in vascularity, it was proved that the colonic seromuscular flap possessed enough vascularity to eradicate the infection.

**SUMMARY**

The seromuscular colonic flap is a promising option for obliteration of intra-abdominal abscess cavities when most of the conventional flaps are not feasible, providing the advantages of tailored volume of vascularized tissue in proximity to the site of pathology and preservation of trunk musculature.

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