Gynecology and Obstetrics Clinical Medicine 3 (2023) 184–187

Contents lists available at ScienceDirect

Gynecology and Obstetrics Clinical Medicine

journal homepage: www.keaipublishing.com/en/journals/gynecology-and-obstetrics-clinical-medicine

Correspondence

Post-cesarean small bowel obstruction caused by unusual adhesions following myomectomy scar rupture repair during lower segment cesarean section

Dear Editor,

Caesarean section (CS) is one of the most performed abdominal surgeries performed worldwide. With a growing number of CS, the rate of short- and long-term problems rises, resulting in an increase in hospital stay duration.[1,2] Intra-abdominal adhesions are fibrous scar tissues that adhere between internal organs or structures that occur throughout the healing process. Post-CS, adhesions occur near the uterus, bladder, and omentum as uterine size precludes contact with the bowel.[1–3] Adhesions involving the intestines are relatively rare post-CS and can cause bowel obstruction with increased morbidity. The incidence of small bowel obstruction (SBO) after CS is low (0.1%) and is more commonly observed after abdominal hysterectomy.[4]

A 44-year-old woman underwent an emergency lower segment caesarean section at 32 weeks 2 days gestation (by last menstrual period) due to complications. She had dichorionic diamniotic twins with discordant growth and pregnancy-induced hypertension. Twin A had a 32 weeks and 5 days maturity, while twin B had a 26 weeks and 2 days maturity. Twin B had severe fetal growth restriction, oligohydramnios, uteroplacental and feto-placental insufficiency. Only one twin survived. There was scar dehiscence at the previous myomectomy site and placenta herniation was found during CS (Fig. 1A). Catgut suture repair and routine closure were performed (Fig. 1B). Post-operative recovery was uneventful. Abdominal distension, pain, nausea, vomiting, and obstipation occurred on the fourth day, requiring conservative treatment. The patient had a well-healing surgical wound, abdominal tenderness, and guarding. She had a tender uterus per vaginal exam and normal laboratory tests, with a mildly elevated C-reactive protein level (13 mg/L). The clinical diagnosis was post-operative paralytic ileus.

Abdominal radiography (Fig. 1C) revealed dilated small bowel loops with multiple air-fluid levels and the absence of pneumoperitoneum. Abdominal sonography showed dilated small bowel loops and sluggish peristalsis. Contrast-enhanced computed tomography (CECT) performed due to worsening symptoms revealed dilated stomach, jejunal, and proximal ileal loops (with a maximum caliber of 4.4cm) (Fig. 1D). An abrupt change in caliber in distal ileal loops near the uterus' fundus indicated a transition point, while the rest appeared collapsed (Fig. 1E). An ill-defined, 38 mm × 37 mm hypodense fluid collection was observed adjacent to the transition point, possibly a post-operative collection. (Fig. 1F and G). CECT findings suggested SBO due to post-operative adhesions with the uterine fundus. The uterus appeared bulky, with heterogeneous enhancement and multiple air foci, representing post-operative and post-partum changes. Emergency laparotomy revealed adhesive intestinal obstruction due to adhesions of the omentum and distal ileal loops at the fundus of the uterus at the site of the previously repaired myomectomy scar (Fig. 1H). Adhesiolysis at the SBO site, milking dilated loops, and routine closure of the uterus, peritoneum, and abdomen were done. (Fig. 1I). Histopathological examination of adhesion bands showed fibrinous, neutrophilic infiltrate, and mucinous material, with no decidua or chorionic villi. Post-operative recovery was favorable, and follow-up was advised after 7 days.

Postoperative fibrous band-containing peritoneal adhesions develop in the lower or upper abdomen after surgery, affecting 67%~93% of lower and 93%~100% of upper laparotomies. Preventing adhesions is a significant unmet medical need, as post-surgical adhesions cause 60% ~80% of SBOs.[2,5]

SBO in the post-operative period is due to adhesions, edema, volvulus, and internal herniation. There are two techniques following a CS: non-closure and peritoneum closure.[6] Practice of non-closure of parietal peritoneum post-CS offers advantages like shorter operation time, reduced analgesic use, and improved maternal satisfaction.[1] Rarely SBO may occur due to small bowel herniation in the rectus sheath and muscle, which can be avoided by peritoneal closure.

Pathology after CS may differ due to factors like sub-sterile area, blood loss, altered anatomical and physiological condition of pregnancy, and incision type.[3,7] Amniotic fluid's fibrinolytic properties prevent adhesions.[5] Postoperative adhesions can be entero-enteric, entero-parietal, and entero-visceral.[8] Adhesions are usually asymptomatic. Some patients experience chronic pain in entero-parietal type adhesions and obstructive symptoms in entero-enteric type adhesions. The efficacy of CS-specific adhesion prevention methods is unknown. Absorbable anti-adhesion barriers can reduce adhesion formation. Use of less invasive procedures; delicate tissue handling; use of nonreactive sutures; adequate hemostasis; less use of glove powder, abdominal swabs, and electrocauterization; adequate irrigation to reduce tissue drying help in reducing tissue trauma and ischemia. Absorbable barriers like oxidized regenerated cellulose (ORC) and sodium hyaluronate/carboxymethylcellulose (HA/CMC) reduce adhesion development during healing by acting as mechanical barriers between adjoining tissues.[2] Modifications in surgical methods reduce the incidence but are not adequate. Both closure or non-closure of the peritoneum following CS can influence adhesion formation.[9] Studies show contradictory results on adhesion rate following peritoneum closure and non-closure. Malvasi A et al. in their study showed decreased adhesion rate following non--closure.[10] Kapustin V et al. found no difference in the occurrence of adhesion with closure or non-closure technique.[11] Lyell's DJ study shows reduced adhesions after rectus muscle closure and increased adhesions after visceral peritoneum closure.[12] Barrier placement and parietal peritoneum closure have the lowest adhesion rate, with no significant difference in suture type (chromic vs vicryl) as seen in the study by Poole JH et al.[2]

Surgery causes post-operative adhesions due to inflammatory response and fibrin deposits caused by peritoneal injury. Peritoneal

https://doi.org/10.1016/j.gocm.2023.07.007
Received 28 February 2023; Received in revised form 29 July 2023; Accepted 30 July 2023
Available online 14 August 2023

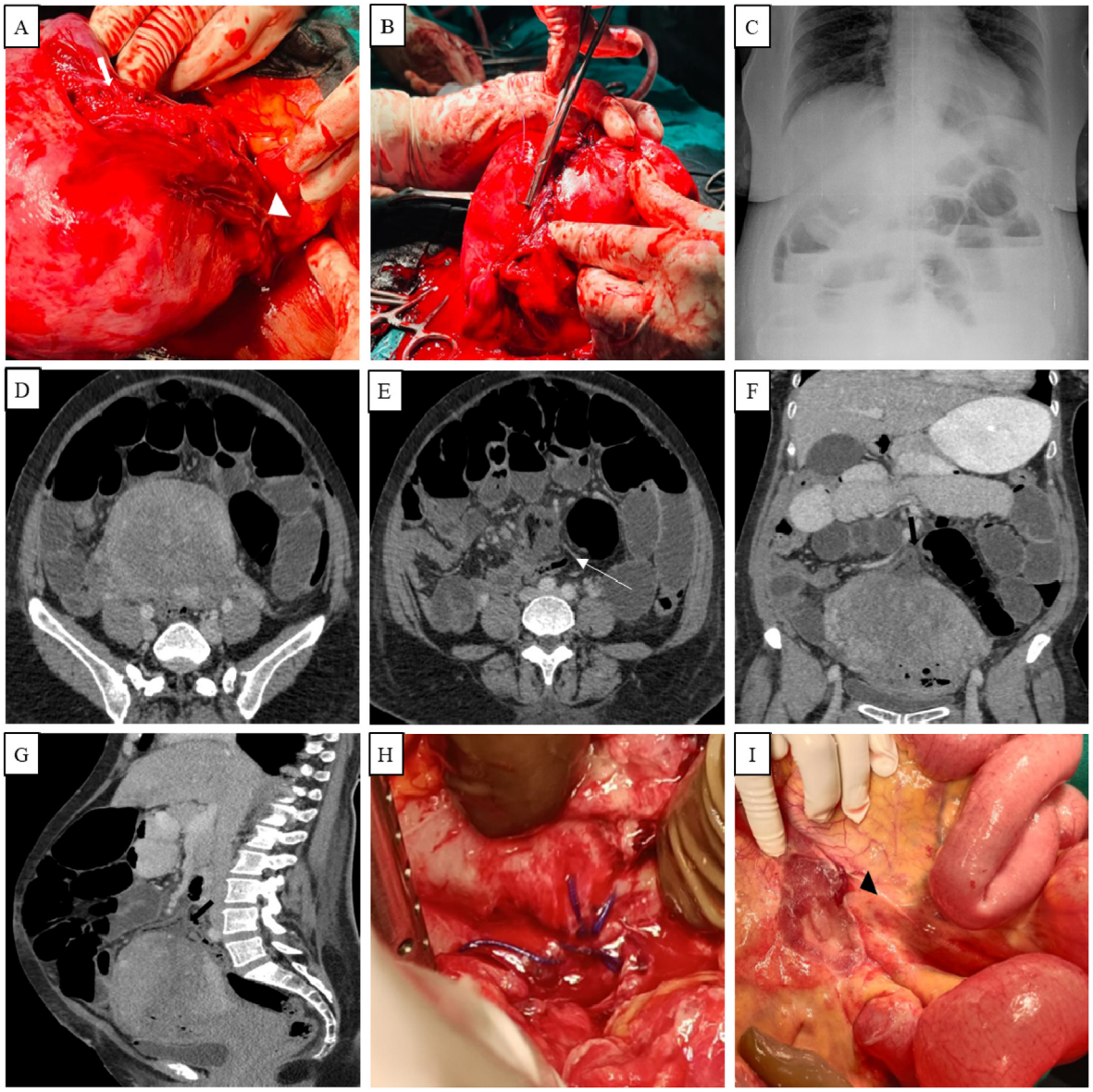

Fig. 1. Intra-operative findings, related radiography and contrast-enhanced computed tomography (CECT)
A, B. Intra-operative images during LSCS operation: A shows normal LSCS incision site (white solid arrowhead) and site of myomectomy scar dehiscence through which placenta is herniating (white solid arrow; B shows the repair of the myomectomy scar dehiscence. **C. X-ray of the erect abdomen-**shows dilated small bowel loops with multiple gas-fluid levels, suggestive of small bowel obstruction, **D, E, F, G. Venous phase axial, coronal, and sagittal CECT images of Abdomen and Pelvis.** D shows dilated small bowel loops in the abdomen; E shows a transition zone (represented by a white line arrow) just proximal to the uterine fundus–suggestive of small bowel obstruction; F and G show dilated small bowel loops and small collection (represented by black solid arrow) at the uterine fundus-likely causing adhesive small bowel obstruction, **H, I. Intra-operative images during exploratory laparotomy operation.** H revealed adhesive intestinal obstruction due to adhesions of the omentum and distal ileal loops at the fundus of the uterus at the site of the previously repaired myomectomy scar; I shows adhesiolysis performed at the site of small bowel obstruction at the site of the previously repaired myomectomy scar dehiscence on the fundus of the uterus.

adhesions develop from infection, foreign materials, poor fibrinolysis, and fibroblast proliferation, causing complications and post-operative symptoms like SBO, and infertility.[8]Adhesive SBO has high morbidity and mortality rates. Understanding adhesion types improves clinical and surgical management, ranging from conservative treatment to emergency surgery. SBO with strangulation requires emergency surgery.

CECT and multidetector computed tomography (MDCT) of the abdomen is crucial for conservative versus surgical management of adhesive SBO, detecting small bowel ischemia with high accuracy (73% ~80%) and sensitivity (85%~100%).[13] Diagnosis of SBO, obstruction, transition point, small bowel feces sign, causes and complications (bowel ischemia, necrosis, and perforation) on MDCT helps in treatment selection (laparoscopic adhesion versus exploratory laparotomy). CT predicts adhesions by detecting distortion in bowel loops, adjoining mesentery, and overlying peritoneum.[8] Bowel findings include angulation, kinking, asymmetric wall thickening, clustering, adhesions, or torsion with luminal narrowing and fixed loop position. Mesenteric findings include vascular crowding and congestion. Peritoneal findings include peritoneal thickening, enhancement, loss of fat planes beneath the rectus sheath and anterior peritoneum, and sclerosing peritonitis with peritoneal calcifications. Special signs are - the "Fat notch" sign (insinuation of mesenteric fat at the location of a focal alteration in bowel caliber), "Beak" sign (abrupt bowel caliber change), "Small bowel feces" sign (presence of colon-like fecal matter along with the air in dilated small bowel loops due to stasis).[8] MDCT improves resolution, provides isotropic imaging, and multiplanar reconstructions, aiding in the diagnosis of SBO, adhesions,

and complications. It can predict bowel resection in bowel ischemia and differentiate open-loop adhesive SBO and closed-loop adhesive SBO which influences patient management.[14] CT signs of bowel ischemia complicating adhesive SBO include bowel wall thickening, decreased enhancement, increased attenuation, mesenteric haziness, engorged veins, peritoneal fluid, closed-loop obstruction, pneumatosis, and gas presence in the portal or mesenteric veins.[14]Adhesive SBO can be open loop or closed loop, with single transition zone indicating open loop obstruction and two adjacent transition zones indicating closed loop obstruction. MDCT shows two adjacent beak signs, a C-shaped bowel loop, and radial distribution in the transition zone. Adhesive band causing SBO can be single or matted which can be predicted on MDCT. Strangulation and vascular compromise commonly occur in the single adhesive band. Surgical treatment is needed for a single adhesive band (longer -more than 1cm in length, with less width less than 1cm), while conservative management is needed for matted adhesions (wider-more than 1cm width and shorter-less than 1cm length). Zins M et al. found that adhesive SBO recurrence rates are higher with matted adhesions than solitary bands, highlighting imaging's role in management.[14]Detecting adhesions on CT is challenging due to sparse vascularity and sheet-like nature. MDCT detects serosal bowel surfaces surrounded by mesenteric fat or adjacent loops. Soft tissue strands between bowel loops or from the bowel to the peritoneal surface suggest adhesions on MDCT. Adhesions can be avascular or vascular. Vascular adhesions enhance on CECT.[15] Angulation and kinking involve a sharp turn of the bowel's long axis, causing acute-angled, U, or J-shaped configurations with proximal dilated and distal collapsed loops. Torsion involves rotation of the bowel loop. Single adhesive band SBO shows a beak sign, fat notch sign, single transition point, and small bowel feces sign.[16]

Clinical evaluation, laboratory tests, and CT imaging determine conservative versus surgical management in SBO. Conservative treatment for SBO is initial, followed by surgical management if unsuccessful. Surgical intervention with resection is recommended for high suspicion of bowel strangulation; evaluated based on risks, patient's co-morbidities, and strangulation presence. Non-surgical treatment for adhesive SBO involves a nasogastric tube, fluids, analgesics, evaluations, and electrolyte balance correction. Conservative therapy can resolve 70% of adhesive SBO.[17] Surgical management can be laparoscopic adhesiolysis or open laparotomy. Laparoscopic adhesiolysis benefits are reduced adhesion formation, shorter hospital stay, fewer complications like infection and incisional hernia, pain relief, and early bowel function return. Laparoscopic adhesiolysis is preferred for chronic or recurrent partial obstruction, bowel dilatation under 4cm, and single-band adhesions. Laparoscopic adhesiolysis limitations are limited visualization and increased risk of iatrogenic injuries. Open laparotomy is preferred for SBO due to dense adhesions, matted small bowel loops, inability to visualize obstruction, strangulation, perforation, ischemia, and technical difficulties.[18]

Post-CS SBO is rare due to post-operative adhesions at the myomectomy scar dehiscence site, affecting the uterus, omentum, and distal ileal loops, with the need for high suspicion for diagnosis. MDCT detects adhesions in patients with bowel obstruction, aiding in management, treatment, and pre-operative planning, and reducing morbidity and mortality.

Authors' contributions

SK and RK analyzed and interpreted the patient clinical details and interpreted the imaging modality. SK, RK and DK were major contributors in writing the manuscript. AP helped in data collection. AM and SY helped with the intra-operative details. All authors read and approved the final manuscript.

Declaration of competing interest

The author(s) declare(s) that there is no conflict of interest.

Consent for publication

Our institution does not require ethics approval for reporting individual case reports. However, written informed consent was obtained from the patient for the procedure, publication of this case report, and accompanying images. Patient identity is not disclosed. Any required information is available upon reasonable request from the corresponding author.

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Sanjay Khaladkar, Reetika Kapoor*, Divyajat Kumar, Ankita Pandey
Department of Radiodiagnosis, Dr. D.Y. Patil Medical College and Research Centre, Dr.D.Y.Patil Vidyapeeth, Pimpri, Pune, 411018, Maharashtra, India

Avisha Malu, Suneha Yalla
Department of Obstetrics and Gynaecology, Dr. D.Y. Patil Medical College and Research Centre, Dr.D.Y.Patil Vidyapeeth, Pimpri, Pune, 411018, Maharashtra, India

* Corresponding author.
E-mail address: reetika.kapoor8@gmail.com (R. Kapoor).