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Can general surgeons evaluate visceral slide with transabdominal ultrasound to predict safe sites for primary laparoscopic port placement? A prospective study of sonographically naïve operators at a tertiary center

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Abstract

BACKGROUND: Port placement injuries are a potentially devastating complication of laparoscopic surgery. Ultrasound assessment for visceral slide has the ability to preoperatively determine adhesion-free areas. The utility of this technique has not been studied when performed by surgeons.

METHODS: Surgeons without expertise in ultrasound were taught the visceral slide technique. Patients with a history of abdominal surgery were then assessed for adhesion-free areas on the abdominal wall. Ultrasound assessments were validated against intraoperative visualization.

RESULTS: Nine surgeons using the visceral slide technique assessed 145 patients for the presence of adhesions immediately before surgery. Surgeon who performed ultrasound demonstrated a sensitivity of 69.6%, specificity of 98.7%, and positive predictive value of 99.5% for detection of areas free from critical adhesions. The median time to perform the examination was 2 minutes.

CONCLUSION: The visceral slide technique was easily learned, was rapid to perform, and reliably identified adhesion-free areas of the abdominal wall.

Port placement injuries pose a persistent hazard during laparoscopic surgery. Despite the development of methods to increase the safety of primary port placement, the incidence of organ and vascular injury has failed to improve.[1] Primary port placement carries a risk of bowel injury of 7/10,000, and mortality from such injuries is reported to be between 2.5% and 5%.[2–4] The risk of visceral injury is increased in the presence of intra-abdominal adhesions, with previous abdominal surgery as the most common etiology.[5] Unfortunately, in the setting of previous surgery, surgeons have little more than the position of surgical incisions as a proxy for the presence of underlying adhesions. Furthermore, patients with extensive surgical

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incisions are often precluded from laparoscopic surgery because of the uncertainty of safe entry into the abdomen.[6,7]

In 1989, Suslavich et al[8] described a technique using transabdominal ultrasound to assess for the free movement of abdominal viscera against the parietal surface of the abdominal wall. Unrestricted movement denoted the absence of adhesions in the area assessed. The technique was suggested as a method to reduce primary port placement complications and was termed "visceral slide."[9] The visceral slide technique has been evaluated in several studies and has been demonstrated to have excellent diagnostic accuracy. These studies evaluating the visceral slide technique have been performed exclusively by expert ultrasonographers. This technique has yet to be adopted into surgical practice.

We hypothesize that surgeons can readily learn the visceral slide technique and use it to identify safe sites for primary laparoscopic port placement.

Methods

This study was approved by the Health Research Ethics Board of Island Health (Victoria, Canada) and the Clinical Research Ethics Board of the University of British Columbia (Vancouver, Canada).

Settings and participants

We conducted a prospective study of patients with a history of prior intra-abdominal surgery undergoing emergency or elective intra-abdominal surgery. Patients were recruited at 2 tertiary, university-affiliated hospitals (Victoria General Hospital and Royal Jubilee Hospital, Victoria, BC, Canada). Inclusion criteria were age greater than or equal to 18 years, previous laparoscopic or open intra-abdominal surgery, and planned laparoscopic or open intra-abdominal surgery. Patients who had a history of intra-abdominal surgery within the preceding 8 weeks were excluded.

Surgeon training

Participating surgeons were provided with on-site standardized training on the visceral slide technique. The training program was developed in collaboration with a radiologist expert in abdominal ultrasound. Each surgeon attended a 30-minute one-on-one training session. The visceral slide technique was demonstrated by the instructor on selected patients with a history of abdominal surgery. Participating surgeons then performed the visceral slide technique with instructor supervision on the same patient.

Visceral slide assessment and intraoperative validation

Data on age, sex, body mass index, diagnosis, procedure, and location of any surgical incisions were obtained from the patient history, physical examination, and the admitting and operative records. Participating surgeons performed the visceral slide test in the immediate preoperative period. The abdomen was interrogated for the presence of visceral slide in 5 predefined zones: right upper quadrant, right lower quadrant, left upper quadrant (LUQ), left lower quadrant, and umbilical. The umbilical zone was defined as an area with a 5-cm radius centered on the umbilicus.

Patients were examined in the supine position. The visceral slide technique was performed in each of the 5 zones using a portable ultrasound machine (SonoSite 180 Plus, Bothell, WA), with a 10-5 MHz, 38-mm broadband linear array transducer with the long axis held in a craniocaudal direction and perpendicular to the skin. The probe was placed in the middle of each zone being assessed. Acoustic coupling was achieved with Aquasonic ultrasound gel between the transducer and the skin. The parietal peritoneum was visualized as a bright white horizontal echogenic line defining the deepest aspect of the abdominal wall above from the viscera below (Fig. 1). For all measurements, the depth of the peritoneal line seen on the monitor was adjusted so that the abdominal wall spanned the upper third of the screen. The remaining two thirds of the screen depicted the viscera. The gain was adjusted so that the viscera could be visualized as echogenic signals that were distinct from the peritoneal line and varied with deep inspiration. If the patient was awake, they were instructed to inspire deeply while the transducer was held in position. If the patient was anesthetized, the anesthesiologist performed manual bag ventilation. A positive visceral slide was defined as craniocaudal movement

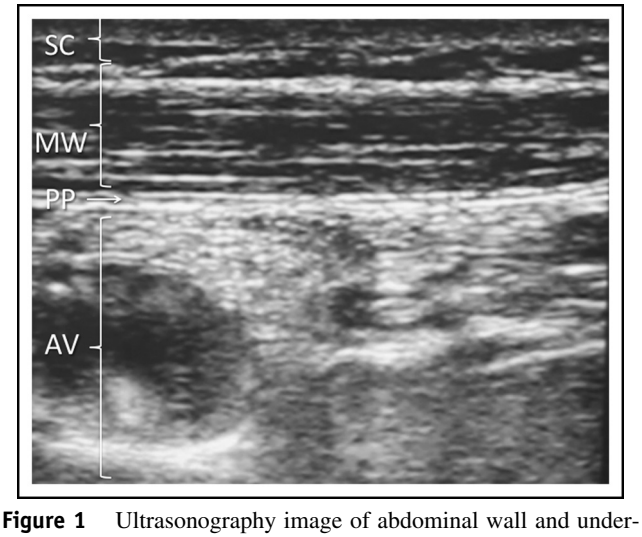

Figure 1 Ultrasonography image of abdominal wall and underlying viscera. AV = abdominal viscera; MW = muscular wall; PP = parietal peritoneum; SC = subcutaneous layer.