

An Overview on Umbilical Laparoscopic Entry and Lee–Huang Laparoscopic Entry

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Abstract:

Background: Laparoscopic entry is a critical step in minimally invasive surgery, as improper access may result in serious complications, including vascular injury, bowel perforation, and failed abdominal entry. Umbilical entry remains the conventional approach because of its anatomical accessibility, relatively thin abdominal wall, and favorable cosmetic outcomes. However, its safety may be compromised in patients with previous abdominal surgery, periumbilical adhesions, obesity, or large pelvic masses. The Lee–Huang point, located midway between the xiphoid process and the umbilicus, has been proposed as an alternative entry site that may reduce the risk of encountering periumbilical adhesions while providing improved visualization of the abdominal cavity. Both approaches have distinct anatomical advantages, technical considerations, and potential complications. Nevertheless, direct comparative evidence remains limited, and no single entry technique is universally appropriate for all patients. This review aims to compare umbilical and Lee–Huang laparoscopic entry regarding their anatomical rationale, surgical techniques, safety profiles, clinical indications, and potential complications. It also highlights the importance of individualized patient selection, careful preoperative assessment, and appropriate surgical expertise in minimizing entry-related complications and improving operative outcomes.

Keywords: Umbilical laparoscopic entry; Lee–Huang point; Laparoscopy; Abdominal entry techniques; Intra-abdominal adhesions; Entry-related complications; Gynecological laparoscopy; Patient safety.

Introduction:

Laparoscopic access techniques have evolved to reduce entry-related complications while maintaining efficiency. Despite refinements in instruments and imaging, the “blind” components of entry whether with a Veress needle, trocar, or even an “open” approach continue to carry risk. Major vascular injury, bowel perforation, and failed entry occur infrequently but can be catastrophic. Because these events are concentrated at the beginning of an operation, they shape guideline development, training curricula, and credentialing pathways (1).

The umbilicus has become the default entry site across general surgery and gynecology. It offers a cosmetically concealed scar and typically the shortest distance from skin to peritoneum. Nonetheless, this convenience can mask an important truth: the umbilicus is not universally safe. Adhesions from prior laparotomy, especially periumbilical or midline, may tether bowel to the abdominal wall. Additionally, in the setting of large uteri, adnexal masses, or severe obesity, umbilical entry may provide suboptimal visualization or unsafe insertion angles (2).

The Lee–Huang entry point provides a distinct alternative. It is midline and supraumbilical, often chosen both to avoid periumbilical adhesions and to obtain a higher camera perspective. Its role is especially prominent in advanced gynecological laparoscopy where a high midline optical port improves exposure of the pelvis and upper

abdomen. An academic comparison of these approaches requires attention to anatomy, technique, evidence, and context-specific decision-making rather than a single “best” entry for all patients (3).

Anatomical and Biomechanical Rationale for Primary Laparoscopic Entry

The safety of a laparoscopic entry site is determined by the relationship between the abdominal wall layers, underlying viscera, and major retroperitoneal vessels, as well as by how pneumoperitoneum alters these relationships. At baseline, the peritoneal cavity is a potential space; insufflation increases the distance between the anterior abdominal wall and intraabdominal structures, but this protective effect is absent at the moment of initial needle or trocar insertion (4).

Midline entry sites traverse skin, subcutaneous tissue, linea alba (or umbilical ring), transversalis fascia, and peritoneum. Because the linea alba contains less muscle and fewer segmental vessels than lateral abdominal wall locations, midline sites reduce risk of injury to inferior epigastric vessels. Conversely, midline entry aligns with the aorta, vena cava, and iliac vessels in the retroperitoneum, meaning excessive depth or steep angulation can transmit risk to major vessels. The relationship is dynamic: patient habitus, degree of Trendelenburg, elevation of the abdominal wall, and insufflation pressure influence safety margins (5).

Adhesions shift the dominant risk away from vessels and toward bowel or omentum adherent to the underside of the abdominal wall. This is the primary anatomical reason why alternative entry sites including supraumbilical and subcostal points remain essential in a modern laparoscopic practice (6).

Umbilical Laparoscopic Entry: Techniques and Rationale

Umbilical entry is favored because the umbilical scar often represents the thinnest region of the anterior abdominal wall. In many patients, the distance from skin to peritoneum is minimal, facilitating reliable access. Cosmetic outcomes are typically excellent because the incision can be concealed in the umbilical fold (7).

Several technical pathways exist for umbilical entry. The closed technique uses a Veress needle to create pneumoperitoneum before trocar insertion. This method relies on correct needle placement, commonly assessed by a combination of tactile feedback and insufflation pressure parameters. The open (Hasson) technique creates a small incision and direct fascial opening under vision, then places a blunt trocar secured with sutures. Optical trocar entry uses a trocar with an integrated scope to visualize tissue layers during advancement; while not truly eliminating risk, it aims to reduce “blind” penetration by providing real-time cues (8).

Each technique has distinct failure modes. Veress needle entry may result in preperitoneal insufflation, failed pneumoperitoneum, or unrecognized injury. Open entry can reduce some blind elements but may be slower, leak gas, or be challenging in obesity. Optical entry demands experience in interpreting tissue planes and can still injure bowel or vessels if adhesions or anomalous anatomy are present (9).

Safety Profile and Complications of Umbilical Entry

Entry-related major vascular injuries are rare but life-threatening. Reported rates vary across specialties and study designs, but major vascular injury is generally described in the range of a few per ten thousand laparoscopic cases, while bowel injury is typically reported more frequently, often a few per thousand. Importantly, bowel injury at entry is also more likely to be missed initially, especially if caused by a Veress needle or small trocar puncture, leading to delayed diagnosis and increased morbidity (10).

Umbilical entry carries particular risk in patients with previous midline laparotomy. Adhesions are not guaranteed, but the probability of periumbilical adhesions increases with prior surgery, infection, peritonitis, or endometriosis. Even after laparoscopy, adhesions can occur near the umbilicus, especially when prior umbilical ports have been used. In such patients, a routine umbilical approach may convert a low-risk step into the most dangerous moment of the procedure (11).

Obesity complicates umbilical entry in a different way. The umbilicus can migrate caudally relative to the aortic bifurcation, and the abdominal wall thickness increases, which can encourage steep instrument angulation and uncontrolled depth. Techniques to mitigate this include careful elevation of the abdominal wall,

controlled insertion angles, longer instruments, and consideration of supraumbilical or alternative entry points to optimize geometry (12).

Patient Selection and Modifications for Umbilical Entry

In low-risk patients without previous abdominal surgery and with normal anatomy, umbilical entry remains efficient and safe. Modifications become relevant when anatomy is altered. Pregnancy, for example, shifts the uterus upward, reducing the safety of infraumbilical entry as gestation advances; supraumbilical midline entry is often recommended, with the height tailored to fundal level. Large pelvic masses similarly narrow the workspace and may benefit from higher camera placement. When umbilical hernias exist, entry at or through the umbilicus may be avoided to prevent bowel injury or mesh disruption, although some surgeons incorporate hernia repair into the surgical plan (13).

A key concept in modern practice is individualized entry selection. Rather than treating the umbilicus as the default in every case, entry planning should incorporate prior surgical history, expected adhesions, body habitus, uterine size, and the need for upper abdominal visualization. This planning context is where the Lee–Huang entry point becomes particularly relevant (14).

The Lee–Huang Laparoscopic Entry Point: Definition and Surgical Rationale

The Lee–Huang entry point is a midline supraumbilical site commonly described at the midpoint between the umbilicus and the xiphoid process. In practice, surgeons may adjust this location slightly based on patient height, body habitus, and the anticipated operative field. Conceptually, it functions as a high midline optical port, providing a panoramic view down into the pelvis and across the abdomen (15).

The rationale for this location is geometric and anatomical. By elevating the camera position, the visual axis to deep pelvic structures improves, especially when the pelvis is crowded by a large uterus, fibroids, adnexal masses, or extensive adhesions. The higher vantage also reduces instrument collision and can facilitate ergonomic triangulation when combined with appropriately positioned lateral ports (16).

From a safety standpoint, supraumbilical midline entry may reduce the likelihood of encountering periumbilical adhesions in patients with prior umbilical incisions. However, it does not inherently eliminate adhesion risk, because adhesions may extend cranially depending on prior operations. Therefore, the Lee–Huang point is best understood as an alternative midline entry that may be safer than the umbilicus in selected patients and more useful for visualization in complex pelvic surgery (17).

Technique Considerations for the Lee–Huang Entry Point

Entry at the Lee–Huang point can be performed using a Veress needle followed by trocar insertion, using an open technique, or via optical trocar entry. Many surgeons favor optical entry at this site to directly visualize passage through the abdominal wall layers, particularly because the abdominal wall may be thicker than at the umbilicus and because controlled advancement can help avoid sudden peritoneal “give.”(18).

A distinctive technical consideration is the proximity to upper abdominal structures. While the site is midline and generally away from the liver and spleen compared with subcostal entry points, it lies closer to the stomach and transverse colon than the umbilicus. Gastric decompression with an orogastric or nasogastric tube is often used to reduce stomach distension and theoretical risk of injury. Patient positioning can also matter: a neutral position may be used during entry, with Trendelenburg applied after safe access and initial survey (16).

As with any midline entry, careful control of insertion depth is critical to protect retroperitoneal vessels. The higher the entry point, the relationship to the great vessels changes; the aorta lies retroperitoneally along the midline, and excessive force or steep insertion angle can be dangerous. Thus, the Lee–Huang point should not be interpreted as “safer because it is higher,” but as “useful and potentially safer in selected contexts when executed with appropriate technique.”(19).

Indications and Clinical Scenarios Favoring the Lee–Huang Entry Point

The Lee–Huang entry point is often chosen for advanced gynecologic laparoscopy and complex pelvic surgery. When the uterus is enlarged or when a pelvic mass fills the lower abdomen, an umbilical camera port can sit too low, forcing the scope to look “up” at the pathology and reducing working space. A higher camera position improves visualization, reduces the need for extreme Trendelenburg, and can facilitate safer dissection (6).

Another scenario involves previous umbilical surgery, including prior laparotomy with a midline scar, repeated umbilical port use, or umbilical hernia repair. In such cases, a supraumbilical midline entry can bypass the most adhesiogenic region. Nevertheless, if there is a history of extensive upper abdominal surgery, the assumption that the supraumbilical midline is adhesion-free may be incorrect, and other alternatives (including lateral or subcostal entry) may be more prudent (17).

Comparative Evidence and Outcomes: Umbilical Versus Lee–Huang Entry

Direct high-quality comparative trials between umbilical entry and the Lee–Huang point are limited, in part because entry choice is highly individualized and ethically difficult to randomize in high-risk anatomy. Most of the available evidence is derived from observational series, technique reports, and broader systematic reviews comparing entry methods (closed, open, optical) rather than specific named points (16).

Within this evidence landscape, two conclusions are broadly consistent. First, serious entry injuries are uncommon, but no single technique or site abolishes risk. Second, patient selection and surgeon experience are major determinants of outcomes. For low-risk patients, umbilical entry whether closed, open, or optical tends to be efficient with low complication rates. For patients with suspected periumbilical adhesions or with large pelvic pathology requiring a higher viewing angle, supraumbilical midline entry points, including the Lee–Huang point, are frequently reported to facilitate safer and more effective surgery, with acceptable rates of access success (15).

The most defensible academic stance is therefore not that the Lee–Huang point is categorically superior, but that it expands the surgeon’s access repertoire and can reduce operative difficulty and potentially entry risk in specific anatomic circumstances (18).

Risk Reduction Strategies Shared by Both Approaches

Regardless of entry site, safe laparoscopic access depends on disciplined technique and preparedness for immediate recognition and management of injury. Preoperative risk stratification based on prior operative history and imaging can inform entry choice. Intraoperatively, consistent steps such as adequate muscle relaxation, controlled insertion, attention to insufflation pressures, and early laparoscopic survey help identify problems promptly (14).

When difficulty is encountered, repeated blind attempts at the same site should be avoided. A low threshold to change the entry site, convert the technique (for example from closed to open), or convert to laparotomy in unsafe conditions reflects sound surgical judgment rather than failure. The overarching theme in contemporary guidelines is adaptability: safe entry is less about loyalty to a single port site and more about selecting a rational route given the patient’s anatomy and the planned operation (12).

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