23 Open Access in Laparoscopic Surgery to Prevent Entry Complications

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23.1 Introduction

To reduce complication rates in surgery, refining of techniques is a mainstay and starts as early as preoperative preparation and pre-habilitation of the patient. Concerning laparoscopic surgery, the first complication may arise when access to the abdominal cavity is performed and pneumoperitoneum is established. While adverse events must be reduced by any means in all kinds of surgery, this especially holds true in preventive surgery. Imagining the sequelae that could arise from a laparoscopic access injury, e.g., to a major vessel such as the pelvic vessels in a case of elective or opportunistic appendectomy, must be one of the worst nightmares for every surgeon.

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More than 50% of accidental bowel and (major) vascular injuries in laparoscopy are associated with entry techniques. Major entry-related complications occur in up to 0.6% of patients, with about 70% related to the first trocar placement [1–6].

The intestines with up to 37.6% of all injuries are the most affected organs, followed by vascular injuries to major vessels such as the iliac vein/artery, aorta, and visceral vessels [2]. Depending on the degree of injury and time of recognition, substantial morbidity and mortality can arise [7, 8]. Apart from surgeon skill and experience, risk factors for visceral injury include pre-existing adhesion due to operations or infection. While only scarcely present in not operated individuals, umbilical adhesions have been described in up to 15% of women with previous laparoscopies and rise up to 60% after previous median laparotomy [9–12]. In vascular injuries, an underestimation of the proximity of vascular structures, forceful thrust, and inadequate pneumoperitoneum (among other factors) may be fatal [13]. In other than obese individuals, the distance between the umbilicus and the retroperitoneal vasculature may only measure 2 cm and thus is easily reached with either trocar or Veress needle [14, 15].

To address this problem, multiple techniques have been described over time and can be divided into closed and open access techniques. Closed access can be achieved with or without previous establishment of pneumoperitoneum after puncture with a Veress needle. While the umbilicus is

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the usual site for Veress needle insufflation, the so-called *Palmers* point in the left upper quadrant can be used in case of expected umbilical adhesions [16]. Alternatively, transvaginal or intercostal approaches have been described [5].

Trocars for closed access can be bladeless or cutting (with or without shielded blades), blunt or conically tipped. Optical trocars can provide certain visualization while penetrating the abdominal wall. While several open access techniques exist, the most known, which requires a special trocar, has been published by Hasson [17].

Especially in previously operated patients, blind puncture of the abdomen (either by Veress needle or gasless introduction of the first trocar) carries a higher risk of serious entry injuries, especially when adhesion of bowel loops cannot be safely ruled out.

A recently updated Cochrane review [18] compared 25 entry techniques including results from 57 RCTs with a total of 9865 patients. The authors found no evidence of differences in major complications and generally described the quality of evidence as low or very low with too small sample sizes to identify differences. Only a reduced rate of failed entry was observed in open access techniques. Of note, the majority of studies selected low risk, non-obese patients without previous abdominal surgery and thus may not reflect real-life clinical data. Consequently, there is no consensus favoring one access technique over another, and the methods used vary with surgeons' preferences being affected by training, experience, and regional and interdisciplinary considerations [19].

23.2 A Safe Technique

We advocate a simple, reproducible technique for open access that can be employed in all types of patients. While this technique can be used at any site of the abdomen, it is preferably done at the upper edge of the umbilicus, because here the subcutaneous fat is at its thinnest and the fascia is easily reached, even in obese patients [14].

Operative steps:

1. An approximately 1.5 cm vertical incision is performed from the bottom to the upper edge of the umbilicus (Fig. 23.1).
2. The subcutaneous fatty tissue is dissected, and the fascia exposed.
3. The fascia is then grasped vertically on both sides with Kocher clamps creating a fascial fold (Fig. 23.2). This way the risk of accidental injury to the peritoneum and intra-abdominal organs can be avoided.
4. The fascia is then carefully incised, thus opening the preperitoneal space (Fig. 23.3).
5. When the preperitoneal space is reached, the Kocher clamps will be turned 90° and will grasp the fascial edges: this way the fascia unfolds, and the incision is lengthened (Fig. 23.4).

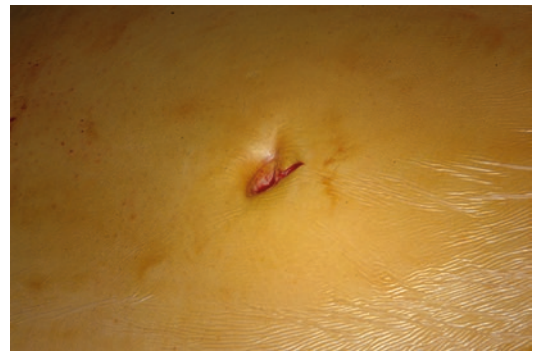

Fig. 23.1 Umbilical skin incision

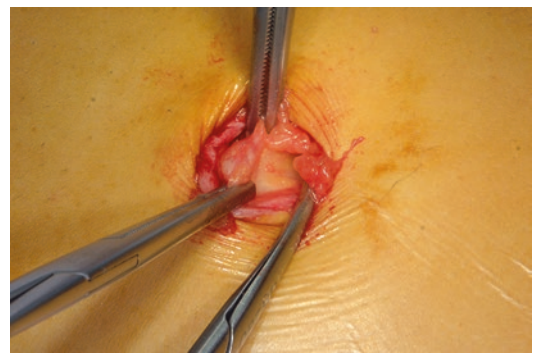

Fig. 23.2 Grasping the fascia with Kocher clamps

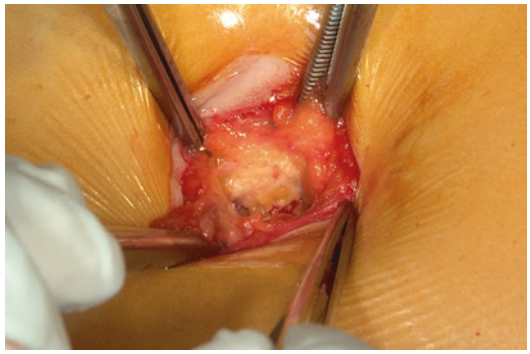

Fig. 23.3 Fascial incision

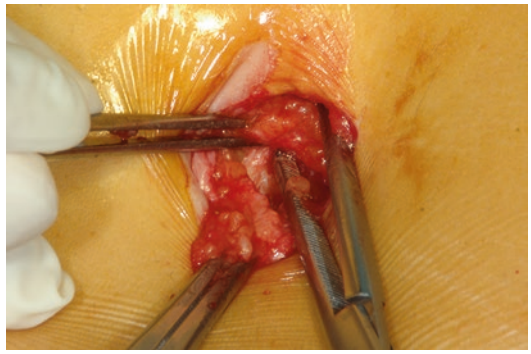

Fig. 23.4 90° rotation and thus change of the grasper from longitudinal position to transverse position

Fig. 23.5 Peritoneal incision with peritoneal access

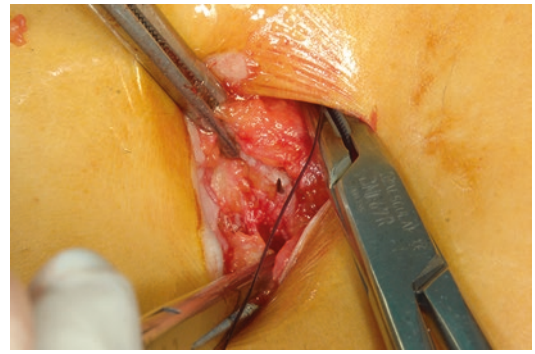

Fig. 23.6 Placement of fascial suture

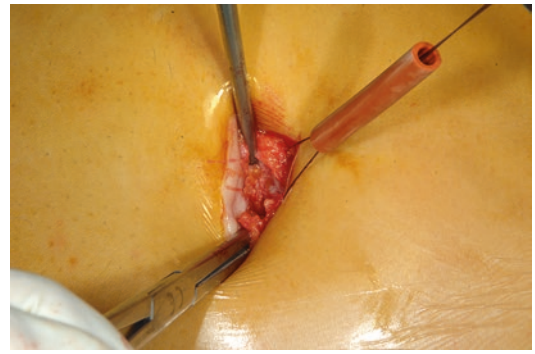

Fig. 23.7 Placement of a tourniquet

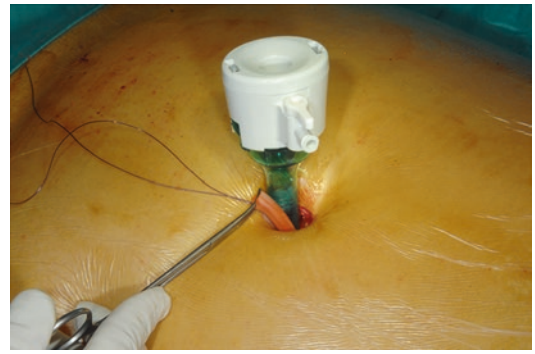

Fig. 23.8 The fascia is tightened around the trocar to prevent gas leakage

6. The parietal peritoneum now is carefully grasped and incised (Fig. 23.5). The incision can be digitally enlarged and the intra-abdominal area around the incision can be palpated for potential adhesions. Now the peritoneal cavity can be seen through the incision.

7. Before the first trocar is introduced, a fascial suture (#0 or #2-0 usually slowly absorbable such as Biosyn™) is placed (Fig. 23.6). It is then fed through a tourniquet that is tightened at the entry site, thus avoiding gas loss (Figs. 23.7 and 23.8). This way there is no need for a specially designed, eventually

expensive trocar, and full mobility of the trocar as well as minimal gas loss is procured. Furthermore, any necessary material (mesh, etc.) can be easily introduced and specimens quickly retrieved by opening of the tourniquet. At the end of the surgery, the previously laid sutures speed up fascial closure.

8. After establishment of pneumoperitoneum and introduction of the optic, the abdominal cavity, beginning with the area below the entry site, is evaluated for any potential access-related injuries.

This technique has been published previously [19] with a 0.09% complication rate (2/2258 patients) as compared to 0.9% (3/321) at a single institution. Both complications were handled via the established access without need for conversion. The mean time needed for establishment of pneumoperitoneum did not differ whether by open access or Veress needle. With this technique, possible complications associated with blind puncture may be prevented without additional time consumption or cost. Access-related complications may be detected early at the time of the peritoneal access and directly managed. Disadvantages of open trocar placement, such as carbon dioxide leakage, are prevented by the tourniquet. Specimen retrieval is facilitated, and fascial closure is accelerated.

Ultimately, irrespective of the method used for first trocar placement, all following trocars should be placed under direct visualization.

23.3 Conclusions

While selection of access modality depends on the surgeon's preference and experience, open access techniques are advisable in order to prevent access complications. The presented technique is safe, reproducible, and easy to apply without additional cost or time consumption.

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