

The lateral incisional hernia: anatomical considerations for a standardized retromuscular sublay repair

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Abstract

Background The management of incisional hernias outside the midline remains a challenging procedure. Evidence-based data and even any kind of guidelines for dealing with this problem are still lacking. The aim of the study was to elucidate this field of hernia surgery and give some guidelines for retromuscular sublay mesh repair outside the midline.

Materials and methods Fresh-frozen corpses were used to perform anatomical studies. During all the investigations the main target was to find the layer which can maintain the maximum overlap of healthy tissue with the implanted mesh material. Afterwards the findings were evaluated during clinical situations, using photo-documentation and drawings.

Results The layer between the external oblique muscle and the internal oblique muscle is the ideal place to position the mesh with adequate overlap. Even for subcostal hernias, this layer offers adequate mesh overlap behind the ribs. For lumbar hernias the same plane of dissection is usually useful. Only if the defect is situated close to the bone might preperitoneal dissection and mesh placement be necessary.

Conclusion The repair of lateral hernias must follow the same principles as median sublay repair. With sufficient knowledge of the anatomical layers of the abdominal wall, adequate mesh overlap can be achieved for any kind of lateral hernia. Therefore the retromuscular sublay repair can be regarded as the standard procedure for all types of hernia outside the midline.

Keywords Lateral incisional hernia · Retromuscular mesh repair · Anatomy

Introduction

Incisional hernia is still a surgical problem of the first magnitude. However, whereas for midline incisional hernias treatment options are somewhat standardized, the management of incisional hernias outside the midline remains a challenging procedure.

The number of publications available dealing with this field of hernia surgery is amazingly small and, therefore, evidence-based data are lacking. Unfortunately most specialized hernia text books do not even mention any treatment options for incisional hernias outside the midline. The health and social expense this generates each year is considerable but, despite this important financial aspect, it is worth noting the little we know about incisional hernias located outside the midline. The relatively low frequency of such defects means, in practice, that no studies of this entity have yet been reported in the literature [1].

Many different techniques are described for repair of incisional hernias [2–4]. However, within open midline incisional hernias mesh placement in the retromuscular sublay position is regarded as a highly standardized and proven method. In many publications the operative technique has been described in detail [5]. The main aim of retromuscular sublay repair is to maintain the principle of adequate overlap of the mesh underneath healthy tissue. The challenge regarding lateral hernias is the question of which anatomical layers have to be used for mesh placement, creating the maximum overlap with minimal side-effects.

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To provide an insight into potential anatomical layers which can be used for open non midline hernia treatment an anatomical study was performed using fresh-frozen corpses. The anatomical knowledge gained was applied in clinical practice and implications for treated patients are presented.

Materials and methods

Five fresh-frozen corpses were used to perform anatomical studies. The corpses were investigated at the Anatomical Institute of the University of Aachen. All studies at the Institute were performed in accordance with local law.

The corpses were cut horizontally at different levels of the abdominal wall, to find the most suitable layer for open mesh placement to maintain maximum overlap with healthy tissue. In addition, the different possible levels of mesh placement within the abdominal wall were dissected using two other corpses to evaluate the technique of adequate mesh placement. During all the investigations the main target was to find the layer which can maintain the maximum overlap of healthy tissue with the implanted mesh material. For anatomical reasons two types of lateral hernia were distinguished—hernias which are situated partly outside the rectus sheath (e.g. subcostal, horizontal incision) and lumbar, flank hernias situated completely outside the rectus sheath (Fig. 1).

Afterwards the findings were evaluated during clinical situations, and experience of treatment of lateral incisional hernias using the retromuscular sublay repair is described.

Results

Study of the lateral abdominal wall as a cross-section reveals there are different layers enabling retromuscular positioning of the mesh: between the external and internal oblique muscles, between the internal oblique and transversus muscles, and in-between the preperitoneal space. The anatomical situation of the insertion of the three lateral muscles is shown in Fig. 2. This picture illustrates why the anatomical circumstances normally lead to a preparation between the internal oblique and transversal muscles when leaving the rectus sheath laterally after starting the preparation from a midline incision. This might, in fact, be a useful layer to place the mesh with adequate overlap, if you do not have to extend the preparation into the lumbar region. In contrast, the cadaver investigations also confirmed the well known fact that the segmental nerves and blood vessels are situated in between the internal oblique and transverse muscles. To avoid any nerve irritation, possibly leading to pain or functional impairment of the lateral abdominal wall, this

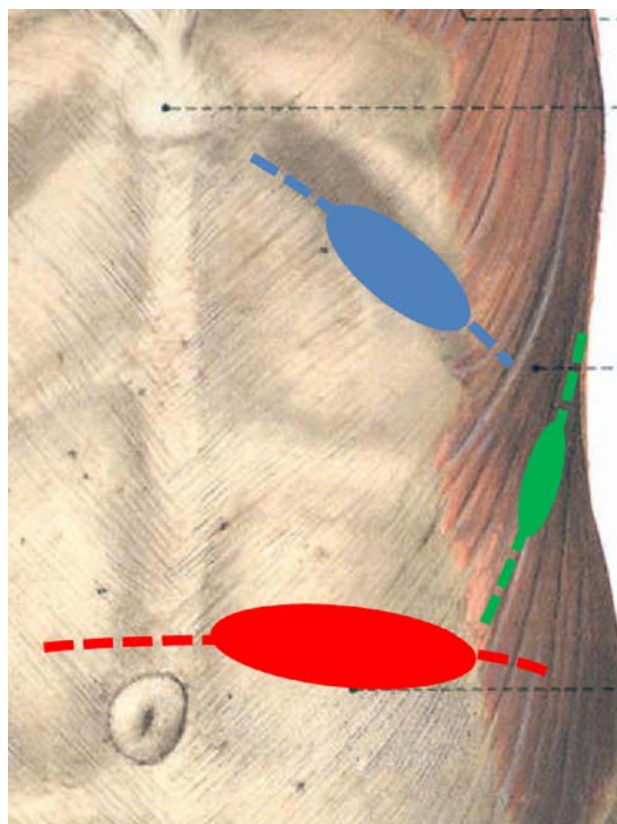


Fig. 1 Typical incisional hernias involving the lateral abdominal wall (blue subcostal, red horizontal, green flank)

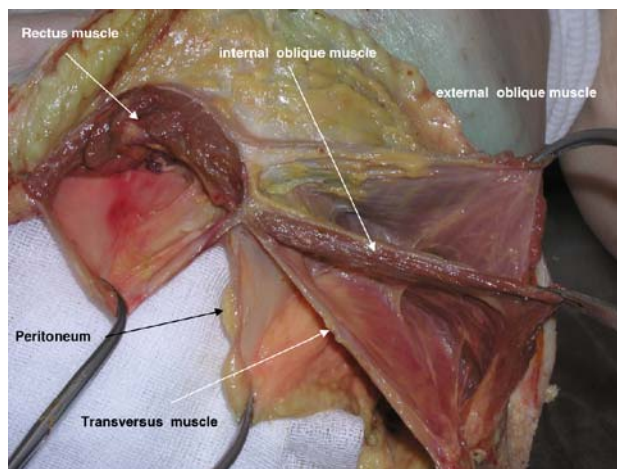


Fig. 2 Dissected layers of the lateral abdominal wall (cross-section above the arcuate line)

layer should not be used. Therefore the layer between the external and the internal oblique muscles should be the first to be considered if an extended preparation is necessary.

Of major interest in the repair of any subcostal situated incisional hernias is the anatomical situation below the costal arch. The external oblique and internal oblique insert in front of the ribs, whereas the transverse muscle inserts

Fig. 3 Mesh position behind the ribs. Dissection of internal oblique muscle to achieve adequate overlap behind the ribs (subcostal incision)

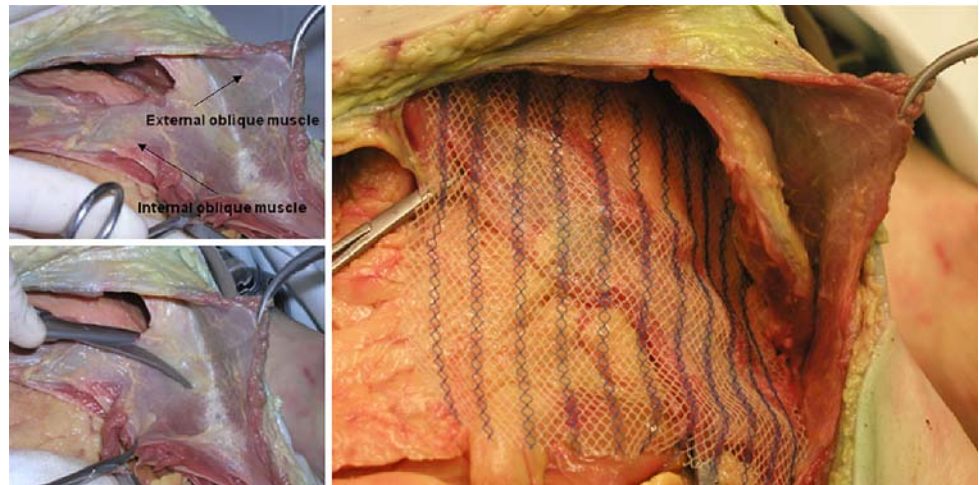


Fig. 4 Dissection of the lateral border of the rectus sheath to create a layer between the rectus sheath and lateral abdominal wall. (horizontal incision)

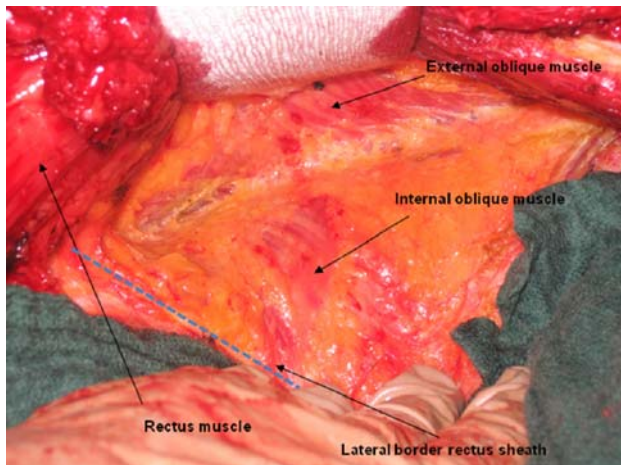
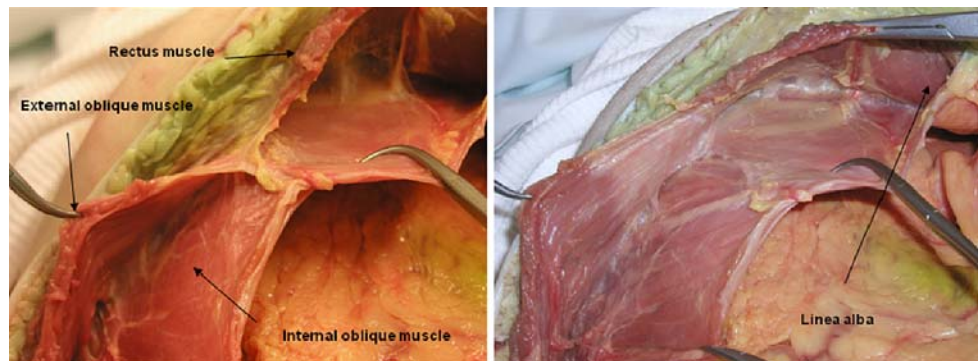


Fig. 5 Dissection lateral of the rectus sheath between the external and internal oblique muscles

mainly at the posterior side of the thoracic wall. To create an adequate retromuscular overlap of the mesh, a position behind the ribs should be created. While doing the preparation in the rectus sheath this is a well known technique, using the incision of the posterior rectus sheath, as already described [5]. To achieve this approach lateral of the rectus sheath the layer between the transverse and the internal

oblique must be used or the internal oblique has to be dissected from the costal margin at this position (Figs. 3, 4). This offers the opportunity to achieve adequate overlap underneath healthy tissue, placing the mesh behind the ribs. Because the segmental nerves and vessels insert from the lateral side, this preparation does not usually involve the risk of damaging these structures. These anatomical considerations make it possible to repair even subcostal incisional hernias close to the ribs with an adequate retromuscular sublay repair.

Discussion and clinical implications

Because the number of publications about the repair of lateral incisional hernias outside the midline is amazingly small, evidence-based data are lacking. It is also impossible to find any guidelines helping to perform such an operation. The relatively low frequency of such defects means, in practice, that no studies of this entity have been published in the literature [1].

The anatomical studies described above, dealing with the correct positioning of the mesh when repairing a hernia outside the rectus sheath, lead to the definition of some recommendations for the surgical procedure.

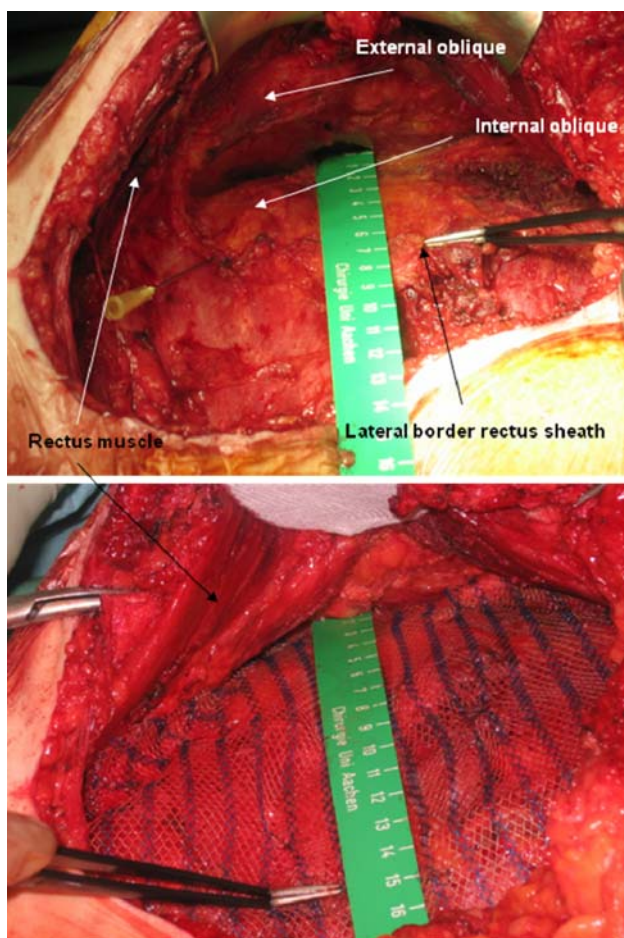


Fig. 6 Dissection lateral of the rectus sheath. Layer of mesh placement between the external and internal oblique muscles (hernias partly outside the rectus sheath)

The anatomical situation of the insertion of the three lateral muscles at the rectus sheath (Fig. 2), makes clear why an extension of the preparation leads to a dissection between the internal oblique and transversal muscles when leaving the rectus sheath laterally, starting preparation from a midline incision. This might, in fact, be a useful layer to place the mesh with adequate overlap, if you do not have to extend the preparation into the lateral region (Fig. 5).

But if an extended preparation to the lateral side is necessary a dissection between the two oblique muscles is recommended, because the segmental nerves and blood vessels are lying on the transversal muscle laterally. To reach the layer between external and internal oblique muscles, e.g. repairing a hernia after subcostal incision, the dissection should begin at the lateral side and then go further to the lateral border of the rectus sheath. Afterwards, dissection of the retromuscular space in the rectus sheath should be carried out. After this dissection, the two plains of dissection, medially and laterally, are then only separated by the lateral margin of the rectus sheath (Figs. 4, 5). After dissection of this margin, a plain layer is created to place the mesh in the retromuscular space

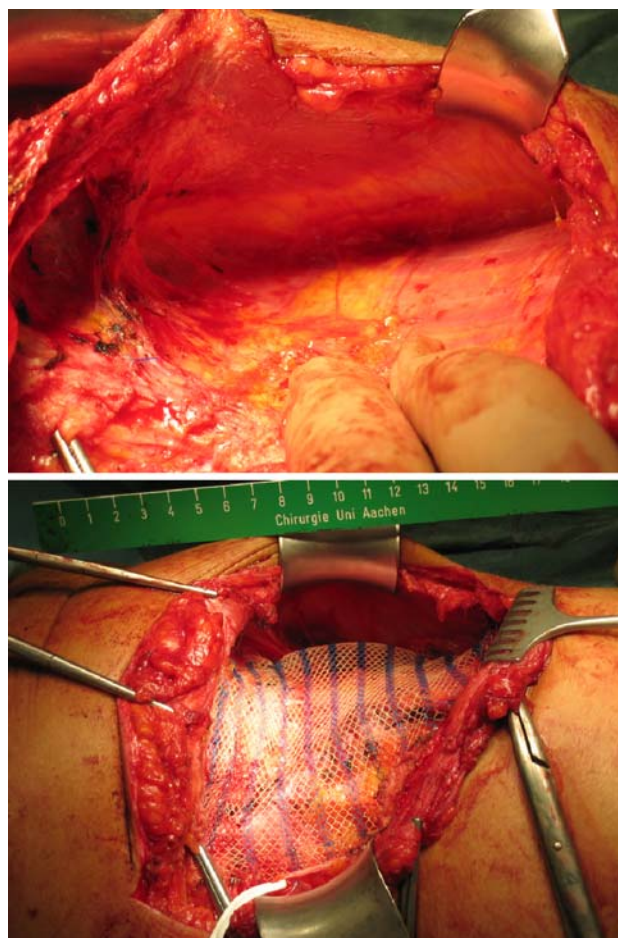


Fig. 7 Repair of lateral incisional hernia with Ultrapro-Mesh placed in the retromuscular position between the external and internal oblique muscles and posterior rectus sheath

with an adequate overlap of 5–6 cm. This kind of action enables the surgeon to find the layers properly and is, therefore, an improvement on dissection that just leaves the rectus sheath laterally (Fig. 6).

If the preparation has to be performed below the arcuate line, the lateral extension of the preparation can be done easily on the layer of the preperitoneal space. A mainly blunt dissection is able to achieve adequate overlap with both lateral sides. Repair of a lumbar incisional hernia has to respect the same principles as described above. Because of the segmental nerves positioned on the transversus abdominis muscle laterally, this layer of dissection is not recommended for this type of hernia. If there is enough lateral abdominal wall left, a dissection between the external and internal oblique muscles can easily be achieved. After this preparation it is possible to create an adequate medial overlap with incision of the lateral rectus sheath and preparation of the posterior layer to place the mesh (Fig. 7). If the hernia has a relevant lateral defect, without adequate muscle and fascia inserting at the crista iliaca, the preperitoneal space must be used for dissection, to achieve adequate

lateral overlap underneath healthy tissue. If an extended lateral preparation is done in the preperitoneal space, it must be ensured that correct positioning of the mesh, without folding, is guaranteed.

In summary, repair of lateral hernias must follow the same principles as median retromuscular sublay repair. Mesh overlap must be adequate. With sufficient knowledge of the anatomical layers of the abdominal wall this can be achieved for any kind of lateral hernia.

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