Incisional hernia – clinical characteristics, diagnosis and treatment

Przepuklony pooperacyjny – obraz kliniczny, diagnoistyka i leczenie

INTRODUCTION

Postoperative hernias are a frequent and costs generating complication of surgical procedures performed within the abdominal cavity (1). According to the European Hernia Society (EHS) postoperative hernias should be considered as any space in the abdominal wall accompanied by or without a bulge, perceptible or palpable on examination, detected by imaging studies within the postoperative scar (2, 3). This complication applies to both operations performed using classical and laparoscopic techniques.

KEYWORDS

incisional hernia, surgery complications, surgery treatment

Słowa kluczowe

przepukliny pooperacyjne, powikłania chirurgiczne, leczenie chirurgiczne

Conflict of interest

None

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Summary

Postoperative hernias are long-term complications of surgical procedures performed within the abdominal cavity. Their incidence is estimated at around 20%.

Postoperative hernia hold a special place in abdominal surgery due to the high incidence and recurrence. The European Hernia Society (EHS) recommends the classification of postoperative hernia based on: the character of hernia (primary/relapsing), location, size and risk factors for relapse. The available literature indicates many factors leading to the development of hernia, including co-morbidities that impair postoperative wound healing, diseases with elevated intraabdominal pressure or improper surgical techniques. The symptoms of postoperative hernias include pain, cosmetic defect (protruding hernia sac) and discomfort. The only effective way of postoperative hernia treatment is reconstructive surgery, that includes several repair techniques. Scientific studies show a higher efficacy of mesh repair methods over procedures based on tension suture techniques.

The following article contains an overview of data and literature on epidemiology, pathogenesis, clinical characteristics and treatment of incisional hernia.

Streszczenie

Przepukliny pooperacyjne zaliczamy do odległych powikłań zabiegów operacyjnych przeprowadzanych w obrębie jamy brzusznej. Częstość ich występowania szacuje się na około 20%.

Przepukliny w bliznie pooperacyjnej zajmują szczególne miejsce w chirurgii jamy brusznej ze względu na dużą częstość występowania oraz nawrotowość. European Hernia Society (EHS) zaleca klasyfikację przepuklin pooperacyjnych w oparciu o: charakter przepukliny (pierwotna/nawrotowa), lokalizację, wielkość oraz czynniki ryzyka nawrotu schorzenia. W literaturze możemy odnaleźć wiele czynników sprzyjających powstawaniu przepuklin, m.in. choroby współistniejące upośledzające gojenie ran pooperacyjnych, stany przebiegające z podwyższonym ciśnieniem wewnątrzbrzusznym, nieprawidłowa technika chirurgiczna. Objawami, na które zwracają uwagę autorzy publikacji, są: ból, dolegliwości natury kosmetycznej (wystający worek przepuklinowy) i uczucie dyskomfortu. Jedyną skuteczną metodą leczenia jest zabieg naprawczy. Niniejszy artykuł zawiera przegląd danych oraz piśmiennictwa na temat epidemiologii, pathogenesis, clinical characteristic and treatment of incisional hernia.

REVIEW

Epidemiology

The incidence of hernias depends largely on the location of the surgical incision, experience of the surgeon and the type and scope of the operation being performed. Postoperative hernias are most often located...
in place of the scar after a median laparotomy. Studies show a wide discrepancy in the incidence of postoperative hernia. This complication may occur in 9 to 20% of operations performed in the abdominal cavity (4, 5). More than half of hernias in the postoperative scar is diagnosed within the first year after surgery (6).

**Classification**

EHS recommends that the following parameters should be used for the classification of postoperative hernia: location of the defect, size (length and width) and whether it is a primary or recurrent hernia (fig. 1-4) (2).

In the literature, other classifications of postoperative hernia are available, including morphological classification of postoperative hernias (p / rxM ... S ... x ... RF ...):

- the character of hernia (p / rx) - primary / relapsing (x-number of relapses),

<table>
<thead>
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<th>EHS</th>
<th>Incisional Hernia Classification</th>
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<tbody>
<tr>
<td>Midline</td>
<td>subxiphoidal M1</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>umbilical M3</td>
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<tr>
<td></td>
<td>infraumbilical M4</td>
</tr>
<tr>
<td></td>
<td>suprapubic M5</td>
</tr>
<tr>
<td>Lateral</td>
<td>subcostal L1</td>
</tr>
<tr>
<td></td>
<td>flank L2</td>
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<td></td>
<td>iliac L3</td>
</tr>
<tr>
<td></td>
<td>lumbar L4</td>
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<table>
<thead>
<tr>
<th>Recurrent incisional hernia?</th>
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<th>No O</th>
</tr>
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<tbody>
<tr>
<td>length: cm</td>
<td></td>
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<tr>
<td>width: cm</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Width cm</th>
<th>W1 &lt; 4 cm O</th>
<th>W2 ≥ 4-10 cm O</th>
<th>W3 ≥ 10 cm O</th>
</tr>
</thead>
</table>

**Fig. 1.** European Hernia Society classification for incisional abdominal wall hernias (2)

<table>
<thead>
<tr>
<th>subxiphoidal M1</th>
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<tbody>
<tr>
<td>epigastric M2</td>
<td>3 cm</td>
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<tr>
<td>umbilical M3</td>
<td>3 cm</td>
</tr>
<tr>
<td>infraumbilical M4</td>
<td>3 cm</td>
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<tr>
<td>suprapubic M5</td>
<td>3 cm</td>
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</tbody>
</table>

**Fig. 2.** To classify midline incisional hernias between the two lateral margins of the rectus muscle sheaths, five zones were defined (2)

**Fig. 3.** To classify lateral incisional hernias, four zones lateral of the rectus muscle sheaths were defined (2)

**Fig. 4.** Definition of the width and the length of incisional hernias for single hernia defects and multiple hernia defects (2)

- location (M) - medial (m), perioceptal (u), suprapubic (sp), medial with narrow subcostal angle (m + sc), transcostal (sc), transverse (t), lumbar (l), medial (pm),
• size (S) [cm] - length x width,
• risk factors for relapse + for each factor (RF)
  - obesity (BMI > 25), male gender, nicotinism,
  - operative wound contamination, age > 45 years,
  - basic disease, 2 interventions within a month or >
  - 2 within 1 year, complications during the postop-
  erative period (7).

Clinical characteristics

The most common postoperative symptom is pain-
less bulging of the abdomen in the area of the surgical
incision site (e.g. when coughing), which regresses in
the recumbent position (6) (fig. 5, 6). The first appe-
ance of a hernia is usually associated with dynamic
physical effort (increased intra-abdominal pressure).
Such an incidence occurs when accompanied by a
sudden, intense, short-lasting pain in the area of the
resulting area. Other symptoms of uncomplicated her-
nias may be associated with discomfort in the abdomi-
nal cavity, tension, burning sensation within the hernia.
Pain and symptoms of gastrointestinal obstruction may
indicate hernia complications – obstruction or strangu-
lation. In addition to standard physical examination the
physician’s duty is to carefully examine the hernia: as-
essment of the loss of the abdominal wall (especially
when preparing for IPOM) and hernia sac as well as
careful attempt to drain its contents (8). Hernia exami-
nation should be conducted in a lying position, while
standing and after performing the Valsalva maneuver.

Diagnostics of postoperative hernias may be sup-
plemented with imaging examinations. The best diag-
nostic imaging for hernias is computer tomography,
other useful imagning procedures are: ultrasonogra-
phy (used in the diagnosis of hernia in children) and
magnetic resonance imaging (9). Patients with sus-
pected morbidity should be promptly informed hospi-
talized and subjected to urgent corrective surgery.

Pathomechanism of formation

Incisional hernias are the result of the separation of
the muscle and fascia. Risk factors contributing to her-
nia formation:

• incorrect technique of supplying the surgical
  wound – for example, too long distances between
  sutures, extensive tension within the cavity being
  worked on using rapidly absorbable sutures (10),
• local complications of wound healing – post-ope-
  rative wound infection (11), hematomas, serovars,
• type of surgical incision – laparotomy performed
  by mid-cut gives the highest percentage of her-
nias among all surgical approaches within the ca-
vity abdominal,
• general condition of the patient unfavorable to
  normal wound healing – poor-controlled diabe-
tes, malnutrition, obesity, advanced age (4), neo-
plastic diseases,
• abnormalities in the structure of connective tissue,
• drugs – glucocorticoids and stimulants – smoking (12),
• states associated with elevated intra-abdominal pres-
sure: chronic cough (patients suffering from COPD,
asthma, bronchiectasis, GERD), chronic constipa-
tion, vomiting, ascites, excessive physical exertion,
postoperative intestinal obstruction, obesity.

The elimination or optimization of the above-mentioned
factors contributes significantly to reduction of postop-
erative hernia incidence. Scientific research proves a re-
duction in the incidence of postoperative hernias using
a mesh as a reinforcement for suture line (13-15).

Methods of treatment

The only form of postoperative hernia treatment is
reconstructive surgery. Observational attempts result in
a frequent risk of urgent surgery – obstruction, strangulation. Such a procedure creates a much higher risk of complications due to corrective surgery, i.e. perforation, fistula, perioperative death (16). The procedure itself requires precise knowledge of the anatomy of the abdominal wall and the surgeon’s experience. There are several techniques of postoperative hernia repair. The first is by simple stitching caused by a hernia. This is the method with the greatest risk of hernia recurrence. The relapse rate is estimated at approximately 63% (17).

Other methods use different types of meshes to strengthen the seam line. Research proved that the use of a mesh in hernia operations reduces the risk of recurrence to 32% (17, 18).

The following types of meshes are used in surgery:

- **synthetic meshes:**
  - polypropylene meshes – are characterized by fast ingrowth of connective tissue elements in, which in a very short time integrate with the surrounding tissues, placement of the mesh in contact with, for example, the small intestine may cause adhesions to develop further and may contribute to the development of e.g. intestinal obstruction,
  - polyester meshes,
  - polates made of polytetrafluoroethylene (PTFE) – their advantage is the possibility of using the mesh within the intraabdominal cavity – they do not cause adhesions, similar properties have composites meshes (combination of synthetic material and anti-adhesion substitutes) (19),
  - biodegradable meshes – for example polyglycolic or polyglactin,

- **biological meshes** – made of cell-free collagen, using biological meshes is associated with a lower incidence of complications due to infection, they are best used in patients at high risk of surgical wound infection (20), the greatest disadvantage of meshes from this material is their price (21, 22).

Contemporary surgery has several techniques for hernia repair surgery. The main differences are dictated by the location of the mesh. Types of mesh placement:

- onlay (overlay) – a mesh is located anterior to the muscular layer of the abdominal wall (fig. 7),
- sublay – the mesh is located anterior to the transverse fascia or anterior to the posterior wall of the rectus abdominis muscle sheath (fig. 8),
- underlay, IPOM (intraperitoneal onlay mesh) – a mesh is located intraperitoneally (fig. 9).

Comparison of onlay and sublay techniques has shown a greater frequency of recurrence and greater chance of infection in the case of placing the mesh anterior to the straight abdominal muscles (24, 25). Sublay operations and IPOM are possible to perform with both classic and laparoscopic techniques. Comparison of both techniques show similar efficacy in terms of hernia recurrence and similar time of hospitalization. The minimally invasive technique is characterized by a lower frequency of local infection, but longer duration of surgery (26-28). In the case of large hernia treatment, the component separation technique may be used (29, 30).

**CONCLUSIONS**

Treatment of postoperative hernia is huge challenge for surgeons. If risk factors are reduced to a minimum the chance of hernia formation decreases. However, modern surgical techniques allow the possibility of repairing the defect. Nevertheless, further research should be conducted with the aim to find answers to the following questions: how to reduce the incidence of postoperative hernias and how to reduce the frequency of hernia recurrence after corrective surgery.