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Emergency surgery of incarcerated abdominal wall hernias: a single centre experience

Operacje przepuklin ze wskazań nagłych: doświadczenia jednego ośrodka

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Key words

hernia, incarceration, emergency surgery

Słowa kluczowe

przepuklina, uwięźnięcie, chirurgia stanów nagłych

Summary

Introduction. Emergency repair of incarcerated hernia has increased morbidity and mortality rate comparing to elective procedures. Adequate qualification for the procedure and careful follow-up are highly recommended.

Aim. To present retrospectively patients diagnosed and treated for incarcerated hernia and compare the results with the latest literature.

Material and methods. Patients operated in the Department of General and Gastrointestinal Surgery in Orłowski Hospital Medical Center for Postgraduate Education in Warsaw between January 2010 and December 2013 were analyzed. Following factors were compared: age, sex, hernia type, symptoms at the admission, comorbidities, past medical history, Body Mass Index (BMI), American Society of Anesthesiologists (ASA) class, duration of procedure, contents of the hernial sac, method of hernia repair, duration of hospital stay, complications and mortality.

Results. 26 patients were operated (18 males). Mean age was 58 years. Mean duration of hospital stay was 4 days. Mean BMI was 29 kg/m². 7 patients were operated with ASA class III, in 13 cases ASA was II. In most of the cases the content of the hernia sac was ileum, none of which needed necrotic resection. Mean duration of the procedure was 82 minutes. Complications were observed in 4 cases, 2 of which required reoperation. There was one death, but associated with comorbidities.

Conclusions. Presented material is similar to the results from analyzed literature. Acute abdominal wall hernia is a complex surgical issue. Since methods of emergency treatment of inguinal hernias are widely analyzed, future studies should focus on other types of abdominal wall hernias.

Streszczenie

Wstęp. Nagłe operacje uwięźniętych przepuklin są związane z większą zachorowalnością i śmiertelnością w porównaniu do zabiegów w trybie planowym. Odpowiednia kwalifikacja do operacji i dokładna kontrola pooperacyjna są wysoce zalecane.

Cel pracy. Zaprezentować retrospektywnie wyniki leczenia pacjentów ze zdiagnozowaną uwięźniętą przepukliną i porównać wyniki z najnowszą literaturą.

Materiał i metody. Przenalizowano pacjentów operowanych w Oddziale Klinicznym Chirurgii Ogólnej i Przewodu Pokarmowego w Szpitalu im. Prof. W. Orłowskiego Centrum Medycznego Kształcenia Podyplomowego od stycznia 2010 do grudnia 2013 roku. Porównywano następujące czynniki: wiek, płeć, rodzaj przepukliny, objawy przy przyjęciu, choroby towarzyszące, przebyte operacje, wskaźnik masy ciała (BMI), grupa według American Society of Anesthesiologists (ASA), czas operacji, zawartość worka przepuklinowego, metoda operacji, czas hospitalizacji, komplikacje i śmiertelność.

Wyniki. 26 pacjentów zostało zoperowanych (18 mężczyzn). Średnia wieku wynosiła 58 lat. Średni czas hospitalizacji to 4 dni. Średni wynik BMI – 29 kg/m². 7 pacjentów było operowanych z grupą III według ASA, w 13 przypadkach grupa ASA wynosiła II. W większości przypadków zawartością worka było jelito cienkie, w żadnym przypadku nie wymagało resekcji. Średni czas trwania operacji wyniósł 82 minuty. Komplikacje zaobserwowano w 4 przypadkach, z których 2 wymagały reoperacji. Odnotowano jeden zgon, ale związany z chorobami towarzyszącymi.

Wnioski. Zaprezentowany materiał jest podobny z wynikami z analizowanej literatury. Podczas gdy metody leczenia przepuklin pachwinowych są szeroko opisane, kolejne badania powinny skupić się na pozostałych rodzajach przepuklin ściany brzusznej.

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INTRODUCTION

Hernioplasty is a procedure associated with specific types of complications and risk of recurrence. The numbers may vary depending on the used technique and accompanying risk factors (1, 2). Although, all types of hernias have a recommendation for elective procedure, incarceration or strangulation are often causes of admission to the surgical wards. Among all types of abdominal wall hernias, inguinal, femoral, epigastric and umbilical hernias carry the greatest risk of incarceration (3). Strangulated hernias are unable to be reduced manually and need emergency surgery. Emergency status of the operation increases the morbidity and mortality. Incarcerated hernia is one of the main indication for intestinal resection (4, 5). Many studies evaluate the factors affecting outcomes of emergency hernioplasty (6-8). Despite rapid development of methods of elective hernias repair, an emergency hernioplasty can be challenging for the surgeon. This group of patients requires careful attendance and adequate follow-up.

AIM

We would like to present a retrospective analysis of cases of incarcerated hernias treated in our clinic.

MATERIAL AND METHODS

We analyzed retrospectively patients operated in Department of General, Oncological and Gastrointestinal Surgery in Orłowski Hospital Medical Center for Postgraduate Education in Warsaw between January 2010 and December 2013. Patients data was gathered from the medical records and operating room records. Patients follow-up was obtained from outpatient surgical clinic records and by phone survey. The following variables were analyzed: age, sex, hernia type, symptoms at the admission, comorbidities, past medical history, Body Mass Index (BMI), American Society of Anesthesiologists (ASA) class, duration of surgical procedure, contents of the hernial sac, method of hernia repair, duration of hospital stay, complications and mortality.

RESULTS

Inguinal and femoral hernia

Between January 2010 and December 2013, sixteen patients (3%) underwent emergency hernia repair out of 490 admitted and operated for inguinal hernia. Femoral hernia repair had urgent status in two cases out of 13 patients (15%). Mean age was 61 years (range 21 to 88). There were 14 male and 4 female. Two patients were diagnosed with groin hernia. Mean duration of hospital stay was 4 days (range 3 to 6). Dominating symptoms were abdominal pain (18/18), nausea and vomiting (5/18), irreducible manually mass in the inguinal region (3/18) and flatulence (3/18). Comorbidities were noted in 13 patients (hypertension, diabetes, ulcer disease, epilepsy, cardiac dysrhythmia). Two patients had previously elective hernia repair and was admitted with a recurrence. Mean BMI was 25 kg/m² (range from 19 to 30 kg/m²). Blood tests prior to operation evalu-

ated leukocytosis in 7 cases. 8 patients were operated with ASA class II, 5 patients with ASA class III. Lichtenstein hernia repair was performed in 4 cases, Shouldice method in 4 cases, Halstead method in 4 cases, Basini method in 1 case, 3 patients had anatomic hernia repair. Content of the hernia sac was ileum (7/18), omentum (3/18), colon (2/18), urinary bladder (2/18) and preperitoneal tissue (1/18). None of the patients required necrotic bowel resection. Mean duration of the surgery was 92 minutes (range 60 to 180). Major complications were noted in 2 cases. There was one reoperation in the first postoperative day because of bleeding from the wound. One patient, 2 months after hernia repair, required bowel resection secondary to iatrogenic perforation. Postoperative mortality was noted in one patient who had significant coexisting disease (2 years after hernia repair). No deaths related to hernia surgery was recorded. No hernia recurrence was observed.

Epigastric hernia

Between January 2010 and December 2013, 116 patient underwent epigastric hernia repair, out of whom five had emergency operation (4.3%). Mean age was 51 years (range from 28 to 80), two were male. Hospital stay ranged from 3 to 5 days. Dominating symptom at the admission to the hospital was abdominal pain (5/5), 2 patients complained additionally about nausea. Comorbidities were recorded in 4 patients (arterial hypertension, diabetes, Hashimoto disease). One patient, 3 years before admission, underwent elective surgery of epigastric hernia. Mean BMI was 32 kg/m² (range from 25 to 40 kg/m²). Three patients blood tests revealed leukocytosis. Three patients were operated with ASA class II, one case of ASA class III. Hernia sac in 2 cases contained ileum, colon and preperitoneal tissue in one case each. Mean operating time was 85 minutes (range 50 to 140 minutes). Post-dural-puncture headache was the only postoperative complication, observed in one case. No major complication, no deaths, no recurrence were noted in the follow-up.

Umbilical hernia

In the analyzed period, 69 patients had umbilical hernia repair, 3 procedures (4%) were performed as an emergency. Mean age was 53 years (range 22 to 83), 2 were male. Hospital stay ranged from 3 to 5 days. All of the patients complained about abdominal pain, one also about nausea and vomiting. Each patient had coexisting diseases (arterial hypertension, alcoholism, Prader-Willi syndrome). Mean BMI was 36 kg/m² (range from 27 to 56 kg/m²). One patient was operated with ASA class III, one case of ASA class II. Ileum was found in hernia sac in 1 patient, in 2 cases it contained omentum, which once had to be resected. Mean duration of the surgery was 63 minutes (range 30 to 100). One patient, with Prader-Willi syndrome and significant high BMI (56 kg/m²), required reoperation 4 months after the primary hernia repair. This patient

was diagnosed with subcutaneous fluid collection, which was drained successfully. No deaths, no recurrence of the hernia were observed in the follow-up.

DISCUSSION

Indications for emergency hernia operation has been widely discussed in the literature, mainly because of a high probability of complications, which increase the mortality rate. A large number of articles published recently gives an impression of rapid development of minimally invasive surgery in the emergency treatment of abdominal wall hernias.

In total, 24 papers were reviewed in our article. Most of the authors (17) focus on emergency surgery of groin hernias. Only 6 articles covered all types of abdominal wall hernias. Only one paper focused on ventral hernias. 16 articles discuss open methods of abdominal wall hernias surgery, 13 of which refer to inguinal hernias and only 3 concern open surgery of acute abdominal and groin hernias. 9 articles focus on minimally invasive methods used in diagnosing acute hernias, out of which 8 refer to groin hernias and one concern abdominal and groin hernias. One paper compares open and minimally invasive surgery of acute groin hernias. Only one article describes minimally invasive treatment of acute abdominal wall hernias.

Since emergency surgery of abdominal hernias is associated with increased morbidity and mortality rate, some authors tried to answer the question, what are the risk factors that contribute to this.

Kulah et al. (9) reported that complications occurred mainly in the cases that required necrotic bowel resection during the emergency surgery. Authors point out that comorbidities (cardiorespiratory system), delayed admission to the hospital, as well as higher ASA class may influence the morbidity and mortality rates. Authors highlight that elderly patients, if possible should undergo elective operations.

Similar conclusions were reached by Alvarez et al. (4). Authors again emphasize that a extended duration of the symptoms, delayed admission, coexisting diseases and high ASA class are statistically proven to be significant risk factors of treatment failure. Therefore, symptomatic hernias should be scheduled to elective surgery as soon as possible.

The next paper from this series by Tiernan et al. (10) proves, that excessive waiting time for elective repair and delays in diagnosis and treatment increase the risk of strangulation, bowel resection and overall mortality. We should do everything to shorten waiting lists for surgery. Then number of emergency groin hernia repair would decrease and those that will have elective operation would have less complications after the surgery.

Nilsson et al. (7) analyze if mortality after groin hernia surgery can be caused by delay in treatment. They find that emergency hernia surgery in contrast to elective hernia surgery is associated with appreciable mortality. Incarcerated hernia is the second most common cause of small bowel obstruction after adhesions and the leading cause of bowel strangulation. That is why

groin examination of patients presenting bowel obstruction is of utmost importance in order to minimize delay to hernia surgery.

The aim of study conducted by Derici et al. (6) was to investigate the factors that affect morbidity and mortality in patients with incarcerated abdominal wall hernias who underwent emergency surgery. He finds that intestinal necrosis which was followed by bowel resection, was the sole factor affecting morbidity and mortality. Emergency surgery is required for incarcerated abdominal wall hernias before intestinal necrosis develops. In our opinion, it is very interesting article because it refers to different types of abdominal hernias not only inguinal. The group of patients is large what makes this research very valuable.

In another similar study Gul et al. (11) examines factors affecting morbidity and mortality in patients who underwent emergency operation for incarcerated abdominal wall hernia. The morbidity was observed in 21.4% patients and mortality rate was 2.3%. Intestinal resection, presence of concomitant disease and general anesthesia were the independent variants that affected morbidity of patients with incarcerated abdominal wall hernias. This is another interesting study because covers all different cases of abdominal wall hernias.

Study by Hoffman et al. (12) presents interesting results. It refers to combined laparoscopic approach in the treatment of incarcerated inguinal hernia. This study aimed to evaluate an approach that combines intraperitoneal laparoscopic exploration with hernia reduction and total extraperitoneal repair of the hernia. A combined laparoscopic approach offers a solution to incarceration of inguinal hernias while taking advantage of each separate approach. The first part of the procedure enables an easy reduction of the incarcerated content and assessment of its viability. The second part enables a simple and standard repair, similar to that for an elective case. If bowel necrosis is suspected preoperatively, an open anterior approach should be performed to avoid possible intraabdominal contamination.

Özkan et al. (13) studies if there is a relationship between risk factors and morbidity and mortality rates in incarcerated abdominal wall hernia surgery. He finds that incarcerated abdominal wall hernia is surgical problem with high morbidity and mortality rates. Therefore, surgery should be planned under elective conditions when hernia is detected.

Wysocki et al. (14) presents an analysis of Lichtenstein repair method of 27 patients diagnosed with incarcerated inguinal hernia. In this study authors states that monofilament polypropylene mesh can be successfully applied also in cases of emergency inguinal hernia repair with very good results. In our material, this method was associated with complications in only 22% of patients. Authors prove that it is a safe method and should be used more frequently in cases of incarcerated groin hernias.

Lohsiriwat et al. (8) presents very similar study. He checked surgical outcomes of Lichtenstein tension-free hernioplasty for acutely incarcerated inguinal hernia. He finds that Lichtenstein hernioplasty can be

used effectively as an emergency operation for incarcerated inguinal hernia with good outcome and an acceptably low rate of postoperative complications.

Another similar study presents Elsebae et al. (15). He compares tension-free repair versus Bassini technique for strangulated inguinal hernia in a controlled randomized study. He claims that use of Lichtenstein "tension-free" technique in emergency treatment of strangulated inguinal hernia is safe, effective with an acceptably low rate of postoperative complications and without any recurrence.

Karatepe et al. (16) reveals a very interesting study in which he compares preperitoneal and Lichtenstein repair for incarcerated groin hernias in a randomized controlled trial. Author recommend preperitoneal repair in strangulated hernia instead of Lichtenstein repair. The use of preperitoneal hernia repair for strangulated inguinal hernia is safe. In our opinion this article should be postponed because of its extraordinary content. Nowadays we could describe preperitoneal groin hernia repair as classical TEP. In our opinion this definition of this surgical technique is easier to understand especially for the less experienced surgeons.

Guidelines of the European Society hernia with commentary by Polish working group under the chairmanship of Śmietański (5) say that incarcerated inguinal hernia in adults should be treated urgently and surgery without mesh in case of infection risk may be considered.

Following paper by Atila et al. (17) explores prospectively in a clinical observational cohort study of prosthetic repair of acutely incarcerated groin hernias. Mesh usage in repair of acute incarcerated hernia is still a controversial matter because of infectious complications. Results suggest that the use of non-absorbable mesh for acute incarcerated groin hernia repair is effective and may be used with an acceptable incidence of wound infection and recurrence even when intestinal necrosis was present.

In study of Lohsiriwat et al. (18), authors explore what are the long-term outcomes of emergency Lichtenstein hernioplasty for incarcerated inguinal hernia. The paper states that Lichtenstein hernioplasty is a safe and effective operation for non-strangulated incarcerated inguinal hernia with a recurrence rate of 10%.

A very interesting article was written by Ferzli et al. (19). It describes authors experience in the treatment of incarcerated hernia using total extraperitoneal approach (TEP). In our center none of the patients with incarcerated hernia underwent this repair method, it is implemented only in elective inguinal hernia surgery. Results presented in the above study are encouraging to implement this method in incarcerated inguinal hernia. Authors reported as well, that the use of this technique requires some modification comparing to a standard TEP method.

Saggar and Sarangi (20) claims that with some modifications in operating technique endoscopic totally extraperitoneal repair is feasible and effective in patients with incarcerated inguinal hernias and encompasses the advantages of endoscopic procedures.

Another paper from this series is made by Deeba et al. (21). It is a metaanalysis of laparoscopic approach to incarcerated and strangulated inguinal hernias. Study reveals that the laparoscopic repair is a feasible procedure with acceptable results, however its efficacy needs to be studied further, ideally with larger multicenter randomized controlled trials.

Wu et al. (22) presents a case study in which laparoscopic transabdominal preperitoneal hernioplasty for reduction en masse of an incarcerated inguinal hernia is described. That is an interesting case underlining the safety, effectiveness and minimal invasiveness conferred by the laparoscopic approach justified its application under such conditions.

Sauerland et al. (23) points that in the emergency surgery, laparoscopy is of unclear or limited value if hernia incarceration is suspected. Although the open approach remains standard treatment for incarcerated hernia, laparoscopic surgery may be considered in carefully selected patients.

In another paper, Shah et al. (24) also present results of laparoscopic repair of incarcerated ventral abdominal wall hernias. Authors claim that laparoscopic repair can be safely performed with a low complication rate even in incarcerated hernias. Careful vowel reduction with adhesiolysis and mesh repair in an uncontaminated abdomen with a 5 cm mesh overlap remains key factors for a successful outcome.

The last two articles expose some problems that may occur during diagnosis of anterior abdominal wall hernias.

The first one by Gonenc et al. (25) checks if patients who are diagnosed preoperatively to have acutely incarcerated abdominal wall hernia should undergo further diagnostic workup, if any level of clinical suspicion for differential diagnosis is present. Moreover, the surgeon should consider general abdominal exploration if contradictory findings are encountered during the exploration of the hernia sac, even if preoperative diagnostic studies reveal no gross pathology or non-specific findings. In our opinion it is very important to find a problem in this expanded way because sometimes incarcerated hernia can be the consequence of another abdominal emergency disease.

Piccolo et al. (26) proposes to perform in cases of acute inguinal hernias a hernioscopy. Hernia sac laparoscopy (hernioscopy) is the introduction of the laparoscope through an open inguinal hernia sac and can be useful to evaluate the viability of the incarcerated hernia content, to avoid unnecessary laparotomy.

CONCLUSIONS

Presented literature confirms importance of emergency surgery of anterior abdominal wall hernia. Summing up the discussion, we have to underline that a significant number of publications focus on acute inguinal hernia repair. We suggest that more researches should be conducted concerning other types of anterior abdominal wall hernias also from the perspective of minimally invasive surgery.

BIBLIOGRAPHY

1. Paajanen H, Scheinin T, Vironen J et al.: Commentary: Nationwide analysis of complications related to inguinal hernia surgery in Finland: a 5 year register study of 55 000 operations. *Am J Surg* 2010; 199: 746-751.
2. Bay-Nielsen M, Kehlet H, Strand L et al.: Quality assessment of 26 304 herniorrhaphies in Denmark: a prospective nationwide study. *Lancet* 2001; 358: 1124-1128.
3. Szmjdt J, Gruca Z: Podstawy chirurgii. [W:] Mackiewicz Z (red.): Przewodnik brzusznego. Medycyna praktyczna, Kraków 2009: 1047-1064.
4. Alvarez JA, Baldonado RF, Bear IG et al.: Incarcerated groin hernias in adults: Presentation and outcome. *Hernia* 2004; 8: 121-126.
5. Simons MP, Aufenacker T, Bay-Nielsen M et al.: European Hernia Society guidelines on the treatment of inguinal hernia in adult patients. *Hernia* 2009; 13: 343-403.
6. Derici H, Unalp HR, Bozdogan AD et al.: Factors affecting morbidity and mortality in incarcerated abdominal wall hernias. *Hernia* 2007; 11: 341-346.
7. Nilsson H, Nilsson E, Angerås U et al.: Mortality after groin hernia surgery: delay of treatment and cause of death. *Hernia* 2011; 15: 301-307.
8. Lohsiriwat V, Sridermma W, Akaraviputh T et al.: Surgical Outcomes of Lichtenstein Tension-Free Hernioplasty for Acutely Incarcerated Inguinal Hernia. *Surg Today* 2007; 37: 212-214.
9. Kulah B, Duzgun AP, Moran M et al.: Emergency hernia repairs in elderly patients. *Am J Surg* 2001; 182: 455-459.
10. Tiernan JP, Katsarelis H, Garner JP et al.: Excellent outcomes after emergency groin hernia repair. *Hernia* 2010; 14: 485-488.
11. Gul M, Aliosmanoglu I, Kapan M et al.: Factors Affecting Morbidity and Mortality in Patients Who Underwent Emergency Operation for Incarcerated Abdominal Wall Hernia. *Int Surg* 2012; 97: 305-309.
12. Hoffman A, Leshem E, Zmora O et al.: The combined laparoscopic approach for the treatment of incarcerated inguinal hernia. *Surg Endosc* 2010; 24: 1815-1818.
13. Özkan E, Yildiz MK, Cakir T et al.: Incarcerated abdominal wall hernia surgery: relationship between risk factors and morbidity and mortality rates (a single center emergency surgery experience). *Ulus Travma Acil Cerrahi Derg* 2012; 18: 389-396.
14. Wysocki A, Poźniczek M, Krzywoń J et al.: Lichtenstein Repair for Incarcerated Groin Hernias. *Eur J Surg* 2002; 168: 452-454.
15. Elsebae MMA, Nasr M, Said M: Tension-free repair versus Bassini technique for strangulated inguinal hernia: A controlled randomized study. *Int J Surg* 2008; 6: 302-305.
16. Karatepe O, Adas G, Battal M et al.: The comparison of preperitoneal and Lichtenstein repair for incarcerated groin hernias: A randomised controlled trial. *Int J Surg* 2008; 6: 189-192.
17. Atila K, Guler S, Inal A et al.: Prosthetic repair of acutely incarcerated groin hernias: a prospective clinical observational cohort study. *Langenbecks Arch Surg* 2010; 395: 563-568.
18. Lohsiriwat D, Lohsiriwat V: Long-term outcomes of emergency Lichtenstein hernioplasty for incarcerated inguinal hernia. *Surg Today* 2013; 43: 990-994.
19. Ferzli G, Shapiro K, Chaudry G, Patel S: Laparoscopic extraperitoneal approach to acutely incarcerated inguinal hernia. *Surg Endosc* 2004; 18: 228-231.
20. Saggarr VR, Sarangi R: Endoscopic totally extraperitoneal repair of incarcerated inguinal hernia. *Hernia* 2005; 9: 120-124.
21. Deeba S, Purkayastha S, Paraskevas P et al.: Laparoscopic Approach to Incarcerated and Strangulated Inguinal Hernias. *JLS* 2009; 13: 327-331.
22. Wu CC, Kang JC, Huang YM: Laparoscopic Transabdominal Preperitoneal Hernioplasty for Reduction En Masse of an Incarcerated Inguinal Hernia: A Case Report. *J Gastrointest Surg* 2012; 16: 1433-1435.
23. Sauerland S, Agresta F, Bergamaschi R et al.: Laparoscopy for abdominal emergencies. *Surg Endosc* 2006; 20: 14-29.
24. Shah RH, Sharma A, Khullar R et al.: Laparoscopic repair of incarcerated ventral abdominal wall hernias. *Hernia* 2008; 12: 457-463.
25. Gonenc M, Bozkurt MA, Kapan S et al.: Acutely incarcerated abdominal wall hernia: what if it is a consequence? *Hernia* 2013 Oct 12 [Epub ahead of print].
26. Piccolo G, Cavallaro A, Lo Menzo E et al.: Hernioscopy: A Simple Application of Single-port Endoscopic Surgery in Acute Inguinal Hernias. *Surg Laparosc Endosc Percutan Tech* 2014; 24: 5-9.

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