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Complications During Surgical Treatment of Incarcerated Inguinal Hernia

ABSTRACT

Introduction: An incarceration of inguinal hernia is a life-threatening condition and represents the most frequent complication, particularly in the elderly patients. It may compromise vascularisation of the contents of the hernia. A surgical treatment of the incarcerated inguinal hernia represents one of the most frequent surgical interventions in elderly patients and it grows proportionally with the age.

Aim of the Study: The aim of the study is to investigate some of the factors that may have an impact on the incarcerated inguinal hernias surgical treatment outcome in elderly patients.

Patients and Methods: The study included 149 patients classified in two groups: the study group (> 60 years of age), which included 96 patients, and the control group (\leq 60 years of age), which included 53 patients, treated in the period from January 1st, 2012 to December 31st, 2016 at the Clinic of General and Abdominal Surgery UCC RS Banja Luka.

Results: Most of the patients had right inguinal hernia (51.16% in the study group, 60.37% in the control group). 82 patients (85.41%) of the study group suffered from some of the accompanying chronic diseases, opposite to 20 patients (37.73%) of the control group. Polypropylene mesh was implanted in 105 (70.47%) patients, while the tension technique was performed in 44 (29.53%) patients. The duration of incarceration longer than 24 h ($p=0.015$), previous abdominal surgery ($p=0.001$), the American Society of Anaesthesiologists physical status classification system (ASA classification) ($p=0.033$) and the presence of chronic diseases ($p=0.01$) appeared to be statistically significant risk factors for performing intestinal resection in the study group, while in the control group, they represented risk factors, but not at the level of statistical significance ($p > 0.05$), except for the duration of incarceration ($p=0.007$). A higher ASA stage ($p=0.001$), is the most important risk factor for lethal outcome in both groups of patients.

Conclusion: Incarcerated inguinal hernia is a very serious and demanding surgical problem, particularly in elderly patients. A higher ASA score and the presence of bowel resection are the most important risk factors related to very difficult complications.

Key words: Inguinal hernia, complications, risk factors, comorbidity

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Introduction

Due to abdominal wall weakness and conditions that increase intra-abdominal pressure, external hernia is more frequently seen in elderly patients.¹⁻⁴ The estimated incidence of the inguinal hernia in patients more than 60 years old is 13 per 1000.⁵ Incarcerated external hernia repairs are one of the most common emergency procedures performed in elderly patients.⁶ Males predominate among the patients up to 75 years of age, while females prevail in the older age.^{7,8} The most recent data indicate that incarcerated inguinal hernia account for about 20% of all small bowel obstructions. Due to the fact that up to 30% of bowel incarcerations require intestinal resection, it is also associated with significant morbidity and mortality.⁵ Up to 75 years of age, 10-15 % of men underwent surgical treatment of inguinal hernia.

Aim of the Study

The aim of the study is to examine some of the most important factors that may affect the outcome of incarcerated inguinal hernias surgical treatment in elderly patients.

Patients and Methods

The study included 149 patients that underwent surgery in the period from January 1st, 2012 to December 31st, 2016 at the Clinic of General and Abdominal Surgery UCC RS Banja Luka. The patients were divided into two groups: a study group (> 60 years of age) and a control group (≤ 60 years of age). During the research, the following parameters were followed: age, gender, type of incarceration (direct/indirect), the ratio of right to left incarcerated inguinal hernia, related chronic diseases, the duration of incarceration (0-24 h, > 24 h), The American Society of Anaesthesiologists (ASA) classification^{6,16,20}, type of surgical procedure (tension technique or tension-free technique).

In statistical analysis for comparing values of study and control group, parametrical tests (Student's t-test and ANOVA) were used. Analysis of variables not sorted by the type of normality was made by comparing the non-parametrical tests (Mann-Whitney, U-test, Spearman Correlation, χ^2 test, Fisher exact probability tests the null hypothesis). Analysis of the influence of some factors was made by invariant logistic regression and the analysis of survival was made through Cox Regression models, where the invariant "Enter" method was used to determine hazard rate (HR). By means of this method (Enter), the level of risk factors was defined. The statistical analysis was implemented by software package SPSS (version 19) with a statistical probability of $p < 0.05$.

Results

The study included a total of 149 patients of whom 96 were in the study group and 53 in the control group. The patients in the study group (the average age of 68.23 ± 7.11 years), were significantly older than those in the control group whose average age was 51.47 ± 13.87 years.

As expected, there was a statistically significant difference in the age of the study group and control group ($p = 0.008$). Out of 96 patients in the study group, 19 had direct and 75 indirect hernia. Out of 56 patients in the control group, 8 had direct and 45 indirect hernia. In both analyzed groups, no statistically significant differences were noticed in the frequency of occurrence of the hernia (χ^2 : $p > 0.5$). The highest number of patients had a right inguinal hernia (84 or 56.38 % of the total number of patients, from which 52 or 61.9 % in the study and 32 or 38.1% in the control group). 82 patients in the study group (80.39 %) had some chronic diseases, which was significantly more than in the control group – 20 patients (37.73 %). (Table 1.)

Table 1. Characteristics of the Patients with Incarcerated Inuinal Hernia

Parameters	Study group n (%)	Control group n (%)	Total n (%)	p
Age (years), $x \pm SD$	68.23 ± 7.11	51.47 ± 13.87		< 0.001
Men, n (%)	86 (96)	47 (53)	133 (100)	0.001
Women, n (%)	10 (96)	6 (53)	16 (100)	0.014
Direct hernia, n (%)	19 (70.37)	8 (29.63)	27 (100)	
Indirect hernia, n (%)	75 (62.5)	45 (37.5)	122 (100)	
Right hernia, n (%)	52 (61.9)	32 (38.1)	84 (100) (56.38)	
Left hernia, n (%)	30 (61.22)	19 (38.78)	49 (100) (32.89)	

Parameters	Study group n (%)	Control group n (%)	Total n (%)	p
Bilateral hernia, n (%)	14 (87.5)	2 (12.5)	16 (100) (10.74)	
Chronic diseases, n (%)	82 (80.39)		102 (100)	< 0.001

In most cases, the type of surgery in the case of incarcerated inguinal hernia was determined based on the individual assessment of surgeons. Out of 96 patients in the study group, 35 patients were subjected to tension surgical technique (without mesh – the intestinal resection was made), and of 53 patients in the control group, 9 were subjected to tension technique (without

mesh – the intestinal resection was made). Synthetic material (polypropylene mesh) was embedded in 61 patients of the study group and 44 patients of the control group. It can be asserted that much higher percentage of the synthetic material was implemented in the control group in the comparison to the study group with the error level of $p < 0.001$ (Table 2.).

Table 2. Type of Surgical Treatment in the Patients of the study and control group

Type of surgical treatment	Study group n (%)	Control group n (%)	Total n (%)	p
Tension technique	35 (36.45)	9 (16.98)	44 (29.53)	
Synthetic material	61 (63.55)	44 (83.02)	105 (70.47)	0.003
Total	96 (100)	53 (100)	149 (100)	

Table 3. Crude Odds Ratio (OR) of the Analyzed Risk Factors for Performing Intestinal Resection

Parameters	Study group OR (95% CI)	p	Control group OR (95% CI)	p
Type of incarceration				
Direct	1			
Indirect	6.923 (2.37 – 56.42)	0.079	30.859 (9.32 – 53.21)	0.852
Duration of incarceration				
0-24	1			
> 24	14.39 (2.56 – 96.38)	0.037	27.536 (14.82 – 43.59)	0.089
Previous abdominal surgery				
NO	1			
YES	3.341 (0.121 – 6.758)	0.005	2.319 (0.352 – 3.821)	0.796
ASA classification				
1-2	1			
3-4	8.764 (0.98 – 64.91)	0.041	25.389 (10.82 – 54.35)	0.93
Chronic diseases				
NO	1			
YES	3.112 (1.859 – 6.457)	0.007	7.428 (2.574 – 8.396)	0.387

CI – confidence interval

With the usage of inivariant binary logistic regression, in the study group, there were marked statistically significant risk factors for performing intestinal resection: incarceration over 24 h (OR = 14.39 95% CI = 2.56 – 96.38, $p = 0.037$), previous abdominal surgery (OR = 3.341 95% CI = 0.121 – 6.758, $p = 0.005$), ASA classification (OR = 8.764 95% CI = 0.98 – 64.91, $p = 0.041$) and the presence of chronic diseases (OR = 3.112 95% CI = 1.859 – 6.457, $p = 0.007$). Previously analysed factors in the control group represented the risk factors, but not at the level of statistical significance ($p > 0.05$) (Table 3.).

Table 4. shows the summary statistics of Cox regression model and log rank test of patients survival length. The patients' age in the study group did not represent a

statistically significant risk factor for lethal outcome ($p = 0,657$). The length of survival in both groups did not seem to differ in age ($p = 0,584$). In the study group, gender did not represent a statistically significant risk factor for lethal outcome ($p = 0,542$). Also, there was no difference between the groups in terms of the length of survival by gender ($p = 0,384$). By increasing ASA stage for one, a chance for lethal outcome was increased 8,541 times at the level of significance ($p = 0,016$). The presence of intestinal resection was a statistically significant risk factor for lethal outcome, increasing the chance 7,358 times ($p = 0,002$). The duration of incarceration over 24h was a statistically significant risk factor, increasing the chance by 26 times ($p = 0,04$) and the patients with resection had significantly shorter survival time than the patients without resection ($p = 0,043$).

Tabela 4. Cox regression model for survival analysis

Factors	Hazard rate	95% CI	p	p (Log Rank)
Age (years)				
< 60	1			
> 60	4.935	0.928 – 23.459	0.657	0.584
Gender				
Male	1	0.693 – 3.514	0.542	0.384
Female	0.471			
*ASA				
Continuous	8.541	2.119– 45.874	0.016	0.001
Resections				
YES	1			
NO	7.358	3.628 – 19.987	0.002	0.001
Duration of incarceration				
< 24h	1			
> 24h	26.546	0.357 – 51.437	0.04	0.043

Discussion

Strangulation hernia is a condition in which the hernia cannot be returned to the abdomen. By putting emphasis on the increased risk of intestinal obstruction, strangulation incarceration is of a great importance.⁸ Incarcerated external hernias are the second most important cause of intestinal obstruction.⁹ In elderly people, about 40 % of inguinal hernias are surgically treated due to incarceration or intestinal occlusion. Although some earlier studies have presented data that

only 5 % of all inguinal hernias require urgent surgical care¹⁰, others have suggested that this percentage is slightly higher and amounts up to 13 %.¹¹ Since the anterior abdominal wall hernia incarceration, followed by incarceration of intestinal curves, is associated with high percentage of morbidity and mortality¹⁰⁻¹², urgent surgical intervention is necessary. There is a generally accepted view that hernia should be electively managed in order to avoid later complications.¹³ However, many patients are undiagnosed, or consciously reject the proposed surgery, that resulting in occurrence of many emergency surgeries,

because of "neglected" cases of hernia. The incarceration percentage increases also by the waiting lists for elective surgery¹, as well as the fact that non-surgical medical staff did not provide enough information to the patients regarding the danger of incarceration. There were no significant differences in the occurrence frequency of inguinal hernia between the groups, as reported also by other published studies.^{1,11} The published studies have shown that indirect hernias dominate over the direct ones in the proportion ranging from 7 : 3 : 10 : 1.¹ In our study, out of 96 patients in the study group, 19 patients had direct and 77 had indirect incarcerated inguinal hernia. Of 53 patients in the control group, 8 patients had direct and 45 patients indirect incarcerated inguinal hernia.

Our study has also shown that there was not more frequent occurrence of indirect hernia than direct incarcerated inguinal hernia concerning sex. Another important factor, contributing to the unwanted outcome in the patients with incarcerated inguinal hernia, is related to comorbidity of chronic diseases.^{17,18} The chronic diseases are even more important factor when talking about mortality.¹⁹

Most of the patients in the study group had some chronic diseases, that is, 82 (85.41 %), which was statistically more significant than 20 (37.73 %) patients in the control group. Symptoms duration in the study group was accompanied by incarceration duration and lasted from one to three days. Duration increases with the age, which could be observed in other studies, too.¹ Late hospitalization is generally considered as an important factor for determining the level of intestinal resection and subsequent morbidity and mortality.^{10,20-22} Incarceration and strangulation with or without intestinal obstruction are major complications.²³ Roughly speaking, about 15 % of all patients with incarcerated intestinal curve require resection due to intestinal necrosis caused by strangulation.^{20,24} Manual reposition may be the method of choice without resection in incarcerated inguinal hernia, although there are no strict criteria to clearly differentiate strangulation, except for the obvious peritonitis.²⁴

Higher number of patients studied in both groups who were without intestinal resection and had incarceration that lasted less than 24h ($p = 0.002$) is statistically significant.

Our study showed that, according to Cox's regression model and log-rank test on the patients with and without intestinal resection, the presence of intestinal resection was a statistically significant risk factor for lethal outcome, increasing the chance 7.4 times and the patients with resection had a significantly shorter survival time than

those without resection. Open tension-free technique was the most common surgical technique type as in all previous studies,²⁵⁻²⁷ and in both tested groups of our study.

This technique contributed to managing a total of 105 (70.47 %) patients. Considering a general attitude that synthetic material should not be implanted in patients younger than 30 years of age, because of the netting deformation during a young organism development, as well as because of the surgeons' fear to implant synthetic material in intestinal resection cases due to possible complications, we can argue with the level of error ($p = 0.003$), that much higher number of patients in the control group - 44 (83.02 %) had a built-in synthetic material, while the number of patients in the study group was 61 (63.55 %). In previous studies on patients with incarcerated inguinal hernias, it has been observed that a high ASA score is an independent predicting factor for small bowel gangrene.²⁸ Alvarez et al.¹⁹ not only confirmed the higher rate of complications, but also showed a higher rate of mortality in patients with higher ASA grade. In our study, ASA grade was a risk factor for performing intestinal resection, but not at the level of statistical significance.

Conclusion

Our study showed that the incarcerated inguinal hernia is a very serious problem. If the inguinal hernia is not operated and managed at the right time, there is a risk that easy surgical problems may lead to various serious complications with a lethal outcome. The risk is higher in elderly patients because of the presence of associated chronic diseases. Statistically significant risk factors for performing intestinal resection in the study group patients were duration of incarceration longer than 24 h, previous abdominal surgery, higher ASA classification, whereas in the control group, the only risk factor was duration of incarceration more than 24h.

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Komplikacije hirurškog liječenja uklještenih preponskih kila

SAŽETAK

Uvod: Uklještenje je stanje kile opasno po život i predstavlja najčešću komplikaciju, posebno kod starijih osoba. Karakteriše je kompromitacija vaskularizacije sadržaja kilne kese. Hirurško liječenje uklještenih preponskih kila predstavlja jednu od najčešćih hirurških intervencija kod starijih osoba i procentualno raste sa godinama starosti.

Cilj rada: Cilj ove studije je ispitivanje faktora koji mogu uticati na ishod hirurškog liječenja uklještenih preponskih kila u odnosu na starosnu dob bolesnika.

Ispitanici i metode: Studija je obuhvatila 149 bolesnika, razvrstanih u 2 grupe: ispitivana (više od 60 godina), u kojoj je bilo 96 bolesnika i kontrolna grupa (manje od 60 godina), u kojoj je bilo 53 bolesnika, liječenih u periodu od 01.01.2012. do 31.12.2016. u Klinici za opštu i abdominalnu hirurgiju UKC RS Banja Luka.

Rezultati: Češće je bila zastupljena desna preponska kila (54,16% u ispitivanoj, 60,37% u kontrolnoj grupi). 82 bolesnika (85,41%) u ispitivanoj grupi su imala neko od pratećih hroničnih oboljenja, nasuprot 20 bolesnika (37,73%) u kontrolnoj grupi. Polipropilenska mrežica bila je ugrađena kod 105 (70,47%) bolesnika, a tenzionom tehnikom je zbrinuto 44 (29,53%) bolesnika. Dužina uklještenja preko 24h ($p=0,015$), prethodne abdominalne operacije ($p=0,001$), klasifikacioni sistem fizičkog stanja (ASA klasifikacija) ($p=0,033$) i prisustvo hroničnih oboljenja ($p=0,01$) izdvojili su se kao statistički značajni faktori rizika od izvođenja resekcije crijeva u ispitivanoj grupi, dok su u kontrolnoj grupi predstavljali faktore rizika bez statističke značajnosti (p veće od 0.05), izuzev dužine uklještenja ($p=0.007$). Viši ASA stadijum ($p=0.001$) bio je najznačajniji faktor rizika od letalnog ishoda bolesnika u obe ispitivane grupe.

Conclusion: Uklještena preponska kila veoma je ozbiljan i zahtjevan hirurški problem, posebno kod starijih osoba. Viši ASA skor i resekcija crijeva predstavljali su najvažnije faktore rizika za teške komplikacije.

Ključne riječi: Preponske kile, komplikacije, faktori rizika, komorbiditet