



## Incarcerated inguinal hernias surgical treatment specifics in elderly patients

Specifičnosti hirurškog lečenja uklještenih ingvinalnih kila kod starijih osoba

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### Abstract

**Background/Aim.** Incarcerated inguinal hernias surgical treatment represents one of the most frequent surgical treatments in elderly patients. The percentage of incarcerated inguinal hernias urgent surgical treatments is growing exponentially with the age in patients over 50. The aim of the study was to investigate some of the factors that may have impact on the incarcerated inguinal hernias surgical treatment outcome in elderly patients. **Methods.** The study included 180 patients classified in two groups: the study group ( $> 65$  years of age) and the control group ( $\leq 65$ ), managed in the period from January 2005 till March 2009 at the General Surgery Clinic, Clinical Center Niš. **Results.** Most of the patients had right inguinal hernia (52.6%, the study group; 59.1%, the control group). All the study group patients suffered from some of accompanying chronic diseases (100%), opposite to 39 (59%) patients of the control group. Synthetic material was implanted in 124 (68.9%) patients, while the tension technique was performed in 65 (31.1%) patients. The duration of incarceration more than 24 h ( $p = 0.015$ ), previous abdominal surgery ( $p = 0.001$ ), the American Society of Anesthesiologists 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 ( $p = 0.001$ ) and the presence of bowel resection ( $p < 0.001$ ) are the most important risk factors for lethal outcome in both groups of patients. **Conclusion.** Incarcerated inguinal hernia in elderly patients is a serious problem. A higher ASA score and the presence of bowel resection are the most important factors related to unfavorable outcome.

### Key words:

hernia, abdominal; digestive system surgical procedures; risk factors; aged; comorbidity.

### Apstrakt

**Uvod/Cilj.** Hirurško rešavanje uklještenih ingvinalnih kila predstavlja jednu od najčešćih hirurških intervencija kod starijih osoba. Procenat urgentno hirurški rešenih uklještenih ingvinalnih kila eksponencijalno raste sa godinama starosti kod osoba starijih od 50 godina. Cilj ove studije bio je ispitivanje nekih od faktora koji mogu uticati na ishod hirurškog lečenja uklještenih ingvinalnih kila kod starijih osoba. **Metode.** Studija je obuhvatala 180 bolesnika, razvrstanih u dve grupe: ispitivana ( $> 65$  god) i kontrolna grupa ( $\leq 65$  god), zbrinutih u periodu od januara 2005. do marta 2009. u Klinici za opštu hirurgiju Kliničkog centra Niš. **Rezultati.** Najveći broj bolesnika imao je desnu ingvinalnu kili (52,6% u ispitivanoj, 59,1% u kontrolnoj grupi). Svi bolesnici ispitivane grupe (100%), imali su neko od pratećih hroničnih oboljenja, nasuprot 39 (59%) bolesnika u kontrolnoj grupi. Sintetski materijal bio je ugrađen kod 124 (68,9%) bolesnika, dok je tenzionom tehnikom bilo zbrinuto 65 (31,1%) bolesnika. Dužina uklještenja preko 24h ( $p = 0,015$ ), prethodne abdominalne operacije ( $p = 0,001$ ), The American Society of Anesthesiologists – 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 crevnih resekcija u ispitivanoj grupi, dok su u kontrolnoj grupi predstavljeni faktori rizika bez statističke značajnosti ( $p < 0,05$ ), izuzev dužine uklještenja ( $p = 0,007$ ). Viši ASA stadijum ( $p = 0,001$ ) i prisustvo resekcije creva ( $p < 0,001$ ), bili su najznačajniji faktori rizika od letalnog ishoda bolesnika u obe ispitivane grupe. **Zaključak.** Uklještena ingvinalna kila kod starijih bolesnika ozbiljan je problem. Viši ASA skor, kao i postojanje crevne resekcije predstavljali su najvažnije faktore rizika od neželjenog ishoda.

### Ključne reči:

hernija, ventralna; hirurgija digestivnog sistema, procedure; faktori rizika; stare osobe; komorbiditet.

## Introduction

Due to abdominal wall weakness and conditions that increase intra-abdominal pressure, external hernia is more frequently seen in elderly patients<sup>1-4</sup>. The estimated incidence of the anterior abdominal wall hernia in patients more than 65 years old is 13 per 1000<sup>5</sup>. Incarcerated external hernia repairs represent one of the most common emergency procedures performed in elderly patients. Emergency hernia repair rates increase exponentially with the age in patients more than 50 years old<sup>6</sup>. Males predominate among the patients up to 75 years of age, while females prevail in the later age<sup>7,8</sup>. More recent data indicate that incarcerated inguinal hernias account for about 20% of all small bowel obstructions. Due to the fact that up to 30% of bowel incarcerations require intestinal resection, emergency hernia repair is also associated with significant morbidity and mortality<sup>5</sup>. Up to 75 years of age, 10–15% of men underwent surgical treatment of hernias.

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

## Methods

The study included 180 patients divided into two groups: the study group (> 65 years) and the control group ( $\leq 65$  years). All tests were carried out in the period from January 2005 to March 2009 at the Clinic of General Surgery, Clinical Center Niš. During the research, the following parameters were tracked: age, gender, type of incarceration

of normality was made by comparing the non-parametrical tests (Mann-Whitney U test, Spearman Correlation,  $\chi^2$  test, Fisher exact probability test the null hypothesis). Analysis of survival was made through Cox Regression models, where univariate "Enter" method was used to determine hazard rate (HR). By means of univariate logistic regression, "Enter" method use, the crude odds ratio-cross ratio (OR) has been defined, the risk factors analyzed variables. The statistical significance was determined at the level of  $p < 0.05$  and implemented by software package SPSS (version 15).

## Results

The study included a total of 180 patients of whom 114 were in the study group and 66 in the control group. The patients in the study group (the average age of  $71.28 \pm 5.06$  years), were significantly older than those in the control group whose average age was  $49.68 \pm 14.54$  years. As expected, there was a statistically significant difference in the age of the study group and control group at the level of significance  $p < 0.001$ . Out of 114 patients in the study group, 20 (66.7%) had direct and 94 (62.7%) indirect hernia. Of 66 patients in the control group, 10 (33.3%) had direct and 56 (37.3%) indirect hernia. In either of the analyzed groups, no statistically significant differences was observed in the frequency of the occurrence of displayed hernia forms ( $\chi^2$ :  $p > 0.05$ ). (Table 1). The highest number of patients had a right inguinal hernia (52.6% in the study group and 59.1% in the control group). All patients in the study group suffered from some of chronic diseases (100%), which was significantly more than 39 (59%) patients in the control group (Table 1).

**Table 1**

**Characteristics of the patients with incarcerated inguinal hernia**

Parameters	Study group	Control group	Total n (%)	<i>p</i>
Age (years), $\bar{x} \pm SD$	$71.28 \pm 5.06$	$49.68 \pm 14.54$		< 0.001
Men, n (%)	101 (114)	58 (66)		< 0.001
Women, n (%)	13 (114)	8 (66)		< 0.001
Direct hernia, n (%)	20 (66.7)	10 (33.3)	30 (100)	
Indirect hernia, n (%)	94 (62.7)	56 (37.3)	150 (100)	
Right hernia, n (%)	60 (52.6)	39 (59.1)	99 (55)	
Left hernia, n (%)	37 (32.5)	24 (36.4)	61 (33.9)	
Billateral hernia, n (%)	17 (14.9)	3 (4.5)	20 (11.1)	
Chronic diseases, n (%)	114 (100)	39 (59)	153 (85)	< 0.001

(direct/indirect), the ratio of right to left incarcerated inguinal hernia, related chronic diseases (as it is to do with elderly people with degenerative changes in the body organs and systems), the duration of incarceration (0–24 h, > 24 h), The American Society of Anesthesiology (ASA) classification, intestinal resection, type of surgical procedure (autologous tissue-tension technique or repair with prosthetic material-tension-free technique). In statistical analysis for comparing values sorted by the normality type, parametrical tests (Student's *t*-test, ANOVA – variance analysis with post hoc analysis, Bonferroni, Dunnett, Dunnetts T3, Pearson correlation) were used. Analysis of variables not sorted by the type

In most cases, the type of surgery in the case of incarcerated inguinal hernia was determined in individual assessment of the surgeons. Of 114 patients in the study group, 45 (39.5%) patients were subjected to tension surgical technique. Among the control group patients, tension technique was applied in 11 (16.7%) patients. Synthetic material was embedded in 69 (60.5%) patients of the study group, and in 55 (83.3%) patients of the control group. It can be asserted, with the error level of  $p < 0.001$  that much bigger statistically important number of the control group patients had synthetic material implanted compared to patients in the study group (Table 2).

**Type of surgical treatment in the patients of the study and control groups**

Type of surgical treatment	Study group		Control group		Total	<i>p</i>
	n	%	n	%		
Tension technique	45	39.5	11	16.7	65	31.1
Synthetic material	69	60.5	55	83.3	124	68.9
Total	114	100	66	100	180	100

Owing to univariate binary logistic regression, as a statistically significant risk factor for performing intestinal resection in the study group, there were singled out the duration of incarceration over 24 h ( $OR = 12.688$ , 95% CI = 1.64–98.37,  $p = 0.001$ ), previous abdominal surgery ( $OR = 2119$ , 95% CI = 0569–5321,  $p = 0.001$ ), ASA classification ( $OR = 9344$ , 95% CI = 1.12–72.82,  $p = 0.033$ ) and the presence of chronic diseases ( $OR = 3985$ , 95% CI = 1236–5695;  $p = 0.01$ ). Previous analyzed factors in the control group represented the risk factors, but not at the level of statistical significance ( $p < 0.05$ ), except the duration of incarceration ( $p = 0.007$ ) (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 ( $p = 0.381$ ). The length in survival in both study and control group seems not to differ by age ( $p = 0.356$ ). Gender in the study group did not represent a statistically significant risk factor for lethal outcome ( $p = 0.327$ ). Also, there was no difference between the groups in terms of the length of survival by gender ( $p = 0.276$ ). By increasing ASA stage for one, a chance for lethal outcome is increased 10.6 times at the level of significance ( $p = 0.001$ ). The presence of intestinal resection was a

**Crude Odds Ratio (OR) of the analyzed risk factors for performing intestinal resection**

Parameters	Study group		<i>p</i>	Control group		<i>p</i>
	OR	(95% CI)		OR	(95% CI)	
<b>Type of incarceration</b>						
direct	1					
indirect	6.145	(0.78–48.39)	0.085	26.721	(13.52–47.63)	0.879
<b>Duration of incarceration</b>						
0–24	1					
>24	12.688	(1.64–98.37)	0.015	27.352	(13.54–40.11)	0.007
<b>Previous abdominal surgery</b>						
no	1					
yes	2.119	(0.569–5.321)	0.001	1.965	(0.211–3.569)	0.325
<b>ASA classification</b>						
1–2	1					
3–4	9.344	(1.12–72.82)	0.033	27.654	(11.35–49.52)	0.876
<b>Chronic diseases</b>						
no	1					
yes	3.985	(1.236–5.695)	0.01	6.396	(2.369–9.574)	0.154

CI – confidence interval

**Cox regression model for the survival analysis**

Factors	Hazard rate	95% CI.	<i>p</i>	<i>p</i> (Log Rank)
Age (year)				
< 65	1	/	/	
> 65	2.538	0.316–20.416	0.381	0.356
Gender				
male	1	/	/	
female	0.363	0.048–2.760	0.327	0.276
*ASA				
continuous	10.610	2.582–43.590	0.001	
resections				
no	1	/	/	
yes	6.440	2.375–17.461	< 0.001	< 0.001
Duration of incarceration				
< 24 <sup>h</sup>	1	/	/	
> 24 <sup>h</sup>	32.035	0.192–55.535	0.01	0.024

Continuous – parameter ASA was analyzed as a continuous variable

statistically significant risk factor for lethal outcome, increasing the chance 6.4 times ( $p < 0.001$ ) and the patients with resection had a significantly shorter survival time than those without resection ( $p < 0.001$ ). The duration of incarceration over 24 h was a statistically significant risk factor for lethal outcome, increasing the chances by 32 times ( $p = 0.01$ ) and the patients with resection had significantly shorter survival time than the patients without resection ( $p = 0.024$ ).

## 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 gets a great importance<sup>8</sup>. Incarcerated external hernias are the second most important cause of intestinal obstruction<sup>9</sup>. 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 care<sup>10</sup>, others have suggested that this percentage is slightly higher and amounts up to 13%<sup>11</sup>. Since the anterior abdominal wall hernia incarceration, followed by incarceration of intestinal curves, is associated with high percentage of morbidity and mortality<sup>10, 12</sup>, urgent surgical intervention is necessary. There is a generally accepted view that hernia should be electively managed in order to avoid later complications<sup>13</sup>. 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. Due to the increased risk of postoperative complications in elderly people, surgeons sometimes reluctantly access the management of elective inguinal hernias<sup>1</sup>. Despite the universal acceptance of the importance of hernias elective management, inguinal hernia is still a common cause of acute abdomen<sup>14</sup>. This is not only attributed to the fact that many patients, especially elderly, experience incarceration while on the waiting list for elective surgery<sup>15</sup>, but to the primary factors responsible, such as a large hernia proportion, incarceration (long before a doctor learn about that), the low level of public awareness about the danger of incarceration or just to non-surgical medical staff refusal to speak to the patient about the known risk factors<sup>16</sup>. There were no significant differences in the occurrence frequency of inguinal hernia displayed forms between the groups, as reported by studies done in other healthcare institutions<sup>1, 11</sup>. Comparing the prevalence of hernia types in a number of scientific papers, it seems that indirect hernias dominate over the direct ones in the proportion ranging from 7 : 3 to 10 : 1 in favor of indirect hernias<sup>1</sup>. Of 114 patients in this study group, 20 (66.7%) patients had direct and 94 (62.7%) patients had indirect incarcerated hernia. Of 66 patients of the control group, 10 (33.3%) patients had direct and 56 (37.3%) patients indirect incarcerated hernia. There was not more frequent occurrence of indirect than direct incarcerated inguinal hernia, thus no statistically significant difference existed in the displayed hernia forms occurrence frequency ( $\chi^2: p > 0.05$ ) in neither of the groups, concerning sex, also.

Another important factor, contributing to the unwanted outcome in the patients with incarcerated inguinal hernia, is related to comorbid chronic diseases<sup>17, 18</sup>. Moreover, this factor gets a statistical significance when talking about mortality<sup>19</sup>. All the patients in the study group had some chronic diseases (100%) which was statistically more significant than 39 (59%) patients in the control group. Symptoms duration in the study group was accompanied by incarceration duration and lasted from one to three days. Duration increased with the age increase, which could be observed in other studies, too<sup>1</sup>. Late hospitalization is generally considered as an important factor for determining the level of intestinal resection and subsequent morbidity and mortality<sup>10, 20-22</sup>. Incarceration and strangulation with or without intestinal obstruction are major complications<sup>23</sup>. Roughly speaking, about 15% of all the patients with incarcerated intestinal curve required resection because of intestinal necrosis caused by strangulation<sup>20, 24</sup>. Manual repossession may be the method of choice without resection in incarcerated inguinal hernia, although there are no strict criteria to clearly differentiate strangulation, except the obvious peritonitis<sup>24</sup>. Statistically significantly a higher number of patients studied in both groups without intestinal resection, had incarceration that lasted less than 24 h (50.3% vs 3.4%,  $p < 0.001$ ). Our observations showed that, according to Cox's regression model and logrank 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 6.4 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<sup>25-27</sup>, and in both tested groups of our study. This technique contributed in managing a total of 124 (68.9%) patients. Taking into account 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 ( $p < 0.001$ ), that much higher number of patients in the control group, 55 (83.3%), had a built-in synthetic material, than it was the case in the study group, 69 (60.5%). 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<sup>28</sup>. Alvarez et al.<sup>19</sup> 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

Thus, incarcerated inguinal hernia in elderly patients is a serious problem, showing how simple surgical problems may have lethal outcome. It carries a high risk of disease developing in the unwanted direction with the pres-

ence of associated chronic diseases. All the patients in the study group had some of 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 statistically significant risk factor was duration of incarceration for more than 24 h.

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Received on October 21, 2010.

Revised on March 9, 2011.

Accepted on April 5, 2011.