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IMPACT OF THE TYPE OF ANESTHESIA ON THE FREQUENCY OF POSTOPERATIVE COMPLICATIONS AFTER HERNIOPLASTY AND ON THE DYNAMICS OF THE FRAILTY INDEX IN ELDERLY PATIENTS WITH INGUINAL HERNIA

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Abstract

Purpose of the study. The purpose of the study was to compare the effect of spinal and general anesthesia on the incidence of postoperative complications after hernioplasty and on the dynamics of the frailty index (FI) in elderly patients with inguinal hernia.
Patients and methods. 78 patients diagnosed with inguinal hernia were involved in the study (average age was 70.1 ± 0.8 years). Patients underwent open hernia repair and Lichtenstein plasty of the posterior wall of the inguinal canal. The patients were divided into two groups depending on the type of anesthesia: spinal anesthesia (SA; *N* = 65) and general anesthesia (GA; *N* = 13). At the time of admission, 30 days after the surgery, the FI was calculated using the Edmonton questionnaire.
Results. In the SA group, 39 patients (60 %) had a FI ≥ 7; 9 patients (13.8 %) had a FI ≥ 9; 8 patients (12.3 %) had a FI ≥ 11; and 9 patients (13.8 %) had the highest FI ≥ 12. At 30 days after surgery, 20 patients (30.8 %) showed a decrease in FI values (FI from 7 to 9 decreased almost 2-fold). In the GA group, on the day of admission, 6 patients (46.2 %) had FI ≥ 7, 5 (38.5 %) had FI ≥ 9, and 2 (15.4 %) had FI ≥ 11. At 30 days after surgery, no changes were observed in patients with FI ≥ 7.
Conclusion. In the spinal anesthesia group, urinary retention was predominant among complications, while in patients after general anesthesia, pulmonary atelectasis prevailed among complications. The use of spinal anesthesia for hernioplasty was accompanied by a decrease in the frailty index within 30 days after surgery in individuals with a FI ≥ 7. In the GA group, decrease in the index within 30 days after surgery was observed in patients with FI ≥ 9.

Keywords:
open hernioplasty, frailty index, complication, elderly patients

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Compliance with ethical standards: ethical principles of the World Medical Association Declaration of Helsinki (World Medical Association Declaration of Helsinki, 1964, ed. 2013) were adhered to. The study was approved by the Ethical Committee at the Azerbaijan State Advanced Training Institute for Doctors named after A. Aliyev (extract from the minutes of the meeting № 9 dated 25.09.2020). Informed consent was obtained from all study participants.

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ОБМЕН ОПЫТОМ

ВЛИЯНИЕ ВИДА АНЕСТЕЗИИ НА ЧАСТОТУ ПОСЛЕОПЕРАЦИОННЫХ ОСЛОЖНЕНИЙ ПОСЛЕ ГЕРНИОПЛАСТИКИ И НА ДИНАМИКУ ИНДЕКСА «СТАРЧЕСКОЙ АСТЕНИИ» У ПАЦИЕНТОВ ПОЖИЛОГО ВОЗРАСТА С ПАХОВОЙ ГРЫЖЕЙ

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Резюме

Цель исследования. Сравнить влияние спинномозговой и общей анестезии на частоту послеоперационных осложнений и на динамику индекса «старческой астении» после герниопластики у пациентов пожилого возраста с паховой грыжей.
Пациенты и методы. В исследование были включены 78 пациентов с диагнозом «паховая грыжа» (средний возраст 70,1 ± 0,8 года); всем больным была выполнена открытая герниопластика по Лихтенштейну. Больные были разделены на две группы в зависимости от вида анестезии: спинальная анестезия (СА; *N* = 65) и общая анестезия (ОА; *N* = 13 человек). При поступлении, через 30 дней после операции рассчитывали индекс «старческой астении» по Эдмонтонской шкале (далее – индекс EFS – Edmonton Frailty Scale).
Результаты. В группе СА индекс EFS был равен, или превышал 7 баллов в 39 (60 %) случаев; из них соответственно ≥ 9 – в 9 (13,8 %), ≥ 11 – в 8 (12,3 %), и ≥ 12 баллов – также в 9 (13,8 %) случаях. Через 30 дней после операции у 20 (30,8 %) пациентов из этой подгруппы отмечено снижение индекса EFS с 7–9 баллов почти в 2 раза. В группе ОА в день поступления этот индекс у 6 (46,2 %) пациентов был ≥ 7 баллам, у 5 (38,5 %) – ≥ 9, еще у 2 (15,4 %) ≥ 11 баллов соответственно. Через 30 дней после операции ни у одного больного с исходными значениями этого показателя ≥ 7 баллов изменений отмечено не было.
Заключение. В группе спинальной анестезии среди послеоперационных осложнений преобладала задержка мочи, у больных, перенесших общий наркоз – ателектаз легких. Использование спинальной анестезии при герниопластике сопровождалось снижением индекса «старческой астении» через 30 дней после операции у лиц с ESF ≥ 7. В группе ОА снижение показателя в течение 30 дней после операции наблюдалось у пациентов с ESF ≥ 9.

Ключевые слова:
герниопластика открытая, индекс старческой астении, осложнение, пожилые пациенты

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Соблюдение этических стандартов: в работе соблюдались этические принципы, предъявляемые Хельсинкской декларацией Всемирной медицинской ассоциации (World Medical Association Declaration of Helsinki, 1964, ред. 2013). Исследование одобрено Этическим комитетом при Азербайджанском государственном институте усовершенствования врачей им А. Алиева (выписка из протокола заседания №9 от 25.09.2020). Информированное согласие получено от всех участников исследования.

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Конфликт интересов: все авторы заявляют об отсутствии явных и потенциальных конфликтов интересов, связанных с публикацией настоящей статьи.

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INTRODUCTION

Inguinal hernia is one of the most common surgical diseases in elderly patients, and hernioplasty is considered a radical treatment option. Currently, the technical aspects of hernia surgery have been improved very well and are performed daily by most surgeons [1–3]. However, in contrast to young people, the risk of complications and mortality after surgery in the elderly is considered high. This is due to the presence of age-related degenerative changes in the internal oblique and transverse abdominal muscles in the elderly, which leads to local complications (impaired fixation of the mesh endoprosthesis, flotation and folding of the prosthesis in the inguinal canal, and subsequently to a relapse of the disease. Only in clinics specializing in herniology, the recurrence rate did not exceed 2 % in strictly selected groups of patients [4, 5].

Nevertheless, the presence of concomitant diseases in the elderly, as well as a high frailty index (FI), which has been given great importance in recent years, is becoming a problem [6–9].

In surgery of elderly patients, it is necessary to carry out adequate preoperative preparation, choose the most sparing surgical tactics and type of anesthesia. In addition, to improve the immediate and long-term results of surgery, it is important to calculate the FI, reflecting the functional state of the patient [10–12].

The purpose of the study was to compare the effect of spinal and general anesthesia on the incidence of postoperative complications after hernioplasty and on the dynamics of the frailty index (FI) in elderly patients with inguinal hernia.

PATIENTS AND METHODS

The results of examination and treatment of 78 patients diagnosed with inguinal hernia in the central hospital of Yevlakh region were analyzed. 71 of patients were men, and 7 were women. The mean age was 70.1 ± 0.8 years with a range from 62 to 87 years. The sizes of the hernias were as follows: widths 5,3 ± 0,9 cm and lengths 12,4 ± 3,7 cm. The clinical performance of hernias was not complicated Anesthetic risk according to ASA was 3.13 ± 0.08, and the FI was 8.03 ± 0.27. All patients underwent appropriate examination: physical examination, X-ray, ultrasound, electrocardiography, echocardiography. Duration of preoperative preparation was 10.1 ± 1.75 hours. Patients underwent open hernia repair and Lichtenstein plasty of the posterior wall of the inguinal canal.

The patients were divided into two groups depending on the type of anesthesia: spinal anesthesia (SA; *N* = 65) and general anesthesia (GA; *N* = 13 people).

The patient preparation was as follows. First, the patient's central vein was catheterized and an intravenous infusion started. Hemodynamic monitoring was carried out: ECG, pulse oximetry, arterial pressure measurement at 5-minute intervals. The patient was sitting on the operating table or lying on his side. For strict observance of sterility, the anesthesiologist must wear a headgear, mask, sterile gown and gloves, and the skin area to be punctured (lumbar vertebral region) was methodically disinfected and isolated with sterile materials.

Spinal anesthesia: puncture was performed with a Pencil-Point spinal needle from the III/IV or IV/V lumbar intervertebral area. If the puncture was done correctly, clear cerebrospinal fluid immediately began to drip through the cannula. After that, 2–2.5 ml of 0.5 % Bupivacaine solution was injected into the spinal canal. The spinal needle was removed and the patient was placed on his back for surgery.

After tracheal intubation and artificial respiration of the patient, general anesthesia was performed using muscle relaxants, followed by analgesics.

In all cases, the surgical operation was performed by one team, and postoperative care was carried out under the same conditions. After the surgery, parameters such as the intensity of pain syndrome, hospital stay duration were compared; postoperative activation time, initiation of per os nutrition after surgery, and stool excretion time were compared.

Postoperative urinary retention was diagnosed when it was impossible to urinate spontaneously in the presence of urge to urinate and a full bladder within 6–10 hours after surgery.

The development of postoperative atelectasis was suspected if the patient had the following symptoms: rapid shallow breathing, cyanosis, increasing hypotension, tachycardia, and mild cough. The diagnosis was confirmed based on physical examination and radiological changes on X-ray.

30 days after the surgery, the FI was calculated using the Edmonton questionnaire. This questionnaire has a good sequence of questions with high constructive validity. The interview explored the following nine domains: cognition, functional performance, general health, functional independence, social support, pharmacological status, nutritional status, mental status, and abstinence.

Depending on the answer to each question, points are awarded to the patient. Depending on the scores, the FI was categorized into the following degrees: ≤ 5 = no frailty; 5–7 = have an inclination; ≥ 7 – frailty is present.

The numerical indicators of the results obtained were systematized in an Excel table. Statistical analysis was performed using IBM SPSS 21 software. Descriptive statistical methods (mean, standard deviation, frequency, percentage, and minimum and maximum) were used

while evaluating the data obtained. The conformity of quantitative data to normal distribution was tested with the Kolmogorov–Smirnov test. The Mann-Whitney U test was used to compare two groups of non-normally distributed quantitative variables. Statistical significance was taken as $p < 0.05$.

RESULTS

The age of patients in the SA group was 69.9 ± 0.85 years, preoperative preparation lasted 8.7 ± 1.51 hours. These parameters were equal to 70.7 ± 2.29 years and 17.5 ± 7.26 hours in the GA group, respectively. Although preoperative preparation took longer in the general anesthesia group, the difference between the scores was not statistically significant. The height and weight of patients did not differ significantly ($p > 0.05$).

According to the ASA, the severity of anesthesia in patients was determined as 3.15 ± 0.09 in the SA group and 3 ± 0.2 in the GA group ($p > 0.05$). On the day of admission, the frailty index values according to the Edmonton scale were calculated as 8.08 ± 0.31 in the SA group and 7.77 ± 0.43 in the GA group ($p > 0.05$).

The duration of surgery was 62.7 ± 3.1 min in the SA group and 75.1 ± 8.48 min in the GA group. The difference between the duration of the surgery in both groups was not statistically significant ($p > 0.05$). The duration of anesthesia did not differ significantly between the groups (SA 74.6 ± 3.25 min; GA 77.7 ± 10.3 min).

The intensity of postoperative pain was compared between the groups on a scale of 0 to 10 (0 = no pain; 10 = worst pain). All patients in the GA group experienced postoperative pain, with an average intensity of 3.33 ± 0.38 points. Intense pain accompanied the need for the use of narcotic analgesics in patients (due to NSAIDs were ineffective). In the SA group, the pain intensity in patients was 2.08 ± 0.09 and was statistically significantly lower compared to the GA group ($p < 0.05$). Most patients in the SA group received NSAIDs for pain relief.

During the hospital stay, the following significant complications occurred in all patients included in the study: urinary retention – in 7 patients; lung atelectasis – in 4 patients; intestinal paresis – in 3 patients and wound suppuration in 6 patients. The distribution of patients into groups revealed interesting facts. In the SA group, urinary retention was registered in 9.2 % of patients. In the GA group, the complication observed with the highest percentage was lung atelectasis – 23.1 %. From all 4 cases, 3 cases were observed in the GA group and only 1 in the SA group. We thought, that the previous history of chronic obstructive disease in patient in SA group was the main cause for the developing lung atelectasis. The rates of these two complications were statistically significantly different between the groups ($p < 0.05$). Intestinal paresis was registered in 2 patients in the SA group and in 1 person in the GA group. Although wound suppuration was numerically greater in the SA group (5 patients), there were no difference between the groups in percent (table).

A comparative study of changes in the frailty index was performed on the day the patients were admitted to the hospital, 30 days later, and 1 year after surgery. In the 78 patients enrolled in the study, the frailty index on the day of admission was 8.03 ± 0.27. 30 days after surgery, it decreased to 6.86 ± 0.26 ($p < 0.01$). After 1 year it increased again and reached 7.09 ± 0.26.

Detailed analysis revealed a pattern between the change in the FI and the type of anesthesia. Thus, on the day of admission in the SA group, the FI in 39 patients (60 %) was ≥ 7; in 9 – (13.8 %) ≥ 9; in 8 (12.3 %) ≥ 11; and 9 (13.8 %) patients had the highest FI ≥ 12. 30 days after the surgery, a decrease in the FI values was noted. In particular, it should be noted that in 25 patients (38.5 %) the pain index decreased and was in the range of 5–7, which is estimated as a tendency to frailty. The number of elderly people with a FI from 7 to 9 decreased by almost 2 times till in 20 patients (30.8 %). In 6 out of 9 people with severe fragility (≥ 12), a decrease in the FI was observed, although the difference between the indices was not significant. Only in 3 elderly patients who underwent hernioplasty, a high FI was calculated 30 days after surgery.

In the GA group, on the day of admission, 6 patients (46.2 %) had a FI ≥ 7, 5 (38.5 %) had a FI ≥ 9, and 2 (15.4 %) had a FI ≥ 11. Thirty days after surgery, no

Table. The comparison of complications in patients of groups with different types of anesthesia

Complications	GA (*N* = 13)		SA (*N* = 65)		*p*
	Abs. number	%	Abs. number	%	
Urinary retention	1	7.7	6	9.2	< 0.05
Lung atelectasis	3	23.1	1	1.5	< 0.05
Intestinal paresis	1	7.7	2	3.1	< 0.05
Wound suppuration	1	7.7	5	7.7	> 0.05

changes were observed in patients with a FI ≥ 7. In 2 individuals with a FI of 9 and 1 individual with a FI of 11, there was a decrease in the index to a range of 5–7.

When analyzing the variation in the FI values by groups, the following correspondence was established. The use of spinal anesthesia in persons with mild frailty leads to a decrease in the index values in the immediate postoperative period due to earlier rehabilitation of patients. In persons with severe weakness, the values of the FI are not statistically significantly reduced. In patients treated with GA, 30 days after surgery, the general functional activity of persons with severe soreness returned to normal for the better, and the FI decreased. The Fig. 1. shows the dynamic change in FI values between groups.

FI measurements more recently have gained attention as a predictive metric for postoperative outcomes. Preoperative weakness is believed to be a strong predictor of postoperative morbidity among general surgery. Thus, Solano Q., et al. (2022) retrospectively reviewed the Michigan Surgery Quality Collaborative Hernia Registry (MSQC-HR) for adult patients who underwent ventral hernia repair and assessed patient frailty and primary outcome (30-day complication). The authors revealed that frailty was independently associated with increased odds of postoperative complications [7]. Our findings are in line with aforementioned conclusions and highlight the importance of preoperative frailty assessment for risk stratification. However, the study mentioned above, unlike ours, did not evaluate the effect of different methods of anesthesia. At the same time, the results of our work show that the type of anesthesia is important, so we recommend approaching risk assessments based on this factor as well.

The assessment of FI and its importance has been emphasized for other surgical patients. Shikhverdiev N. N., et al. (2019), having conducted an observation of 127 patients over 65 years of age who were treated at the Military Medical Academy named after Kirov S. M. (St. Petersburg), proved that the prognostic value of the FI, in addition to the generally accepted risk stratification scales, allows for a more accurate prediction of treatment outcomes in elderly and elderly cardiac surgical patients [13].

Several studies have evaluated postoperative complications of hernia repair in elderly patients. For instance, Zhuk S. A., Smotrin S. M. (2023), evaluating the effectiveness of different methods of inguinal hernioplasty in elderly patients (336 patients with inguinal hernias aged 60 to 75 years), concluded that the most frequent postoperative complications were inflammatory infiltrate in the area of the postoperative wound, wound suppuration, mesh endoprosthesis rejection, hematoma in the area of surgery, testicular edema, and hernia recurrence, which differs from our results. At the same time, the authors analyzed several methods, including the Lichtenstein method (used by us), but did not study the effect of anesthesia or the dynamics of the FI, which, in our opinion, is some limitation of this study [14].

Huerta S., et al. (2022) in their retrospective analysis of 109 veterans (age ≥ 80 years) who underwent elective hernia repair evaluated complications and their prognostic values. The characteristics of patients who received general (GA) and local (LA) anesthesia were also evaluated. According to the study results, renal disease [odds ratio (95 % confidence intervals) 4.1 (1.2–13.8)] and use of GA [5.0 (2.0–10.0)] were independent predictors of mortality. Cardiac disease and higher ASA remained more common in patients submitting to LA [2]. However, the authors did not use the FI for the analysis, even though the FI is an objective tool to assess multidimensional geriatric syndrome characterized by increased vulnerability to dis-

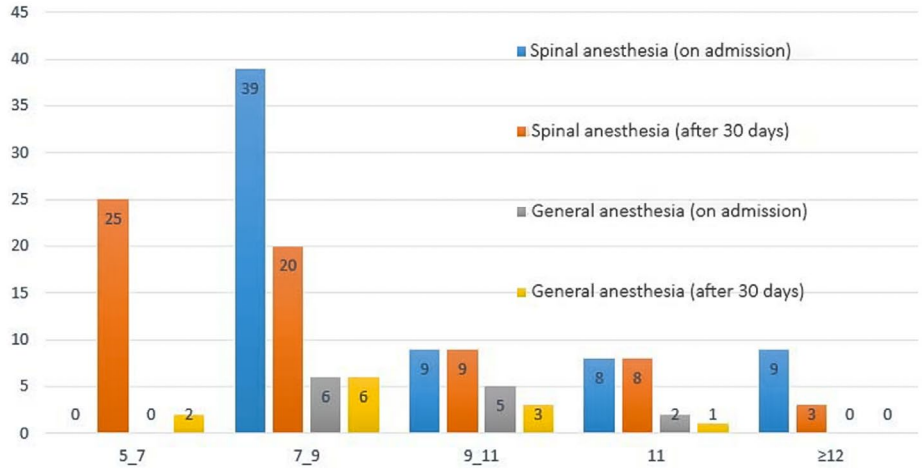

Figure. Dynamic change in FI in SA and GA groups.

ease. Therefore, we believe it is necessary to emphasize that the approach to managing patients should not be unilateral, but should include a comprehensive evaluation of both the FI and the type of anesthesia. In our work we considered both factors, which enabled us to state that they are interrelated and require the development of an approach aimed at reducing the risk of complications.

CONCLUSION

According to the results of our study, it can be noted that the frequency of complications after surgical treatment of inguinal hernia in elderly and senile patients remains high. Among the complications after spinal anesthesia, urinary retention predominates, while in patients with general anesthesia, pulmonary atelectasis comes to the forefront. The influence of the type of anesthesia on intestinal paresis and infection of the wound was not observed.

The use of spinal anesthesia for hernioplasty was accompanied by a decrease in the frailty index within 30 days after surgery in individuals with FI ≥ 7. In the GA group, decrease in the index within 30 days after surgery was observed in patients with FI ≥ 9.

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