

THE FIRST EXPERIENCE OF USING NON-INTUBATED VIDEO-ASSISTED THORACOSCOPIC RESECTIONS FOR LUNG CANCER IN THE REPUBLIC OF KAZAKHSTAN

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ABSTRACT

Relevance: Several studies have shown that non-intubated surgical interventions, especially, have proven themselves well in patients with low reserve of the cardiovascular and respiratory systems, as well as in the diagnosis of interstitial lung diseases.

The study aimed to describe the experience of introducing into clinical practice surgical interventions without intubation on spontaneous breathing for malignant neoplasms of the lungs and mediastinal organs.

Methods: two clinical cases are described of the main points of the anesthesia and technical features of surgical intervention.

Results: A surgery in two patients with peripheral lung cancer was performed. In the first case, the operation included NI-VATS on the right and the resection of the upper (S2) and lower lobe (S6, S9); in the second case – NI-VATS on the right, lower lobectomy, and lymph node dissection. Based on the results of histological examination, both patients were diagnosed with NSCLC in the initial stages. Postoperative chemoradiotherapy is not indicated. The patients were registered at the dispensary in clinical group III.

Conclusion: As the literature data and our preliminary results of NI-VATS show, surgical interventions in the surgical treatment of lung cancer have places to be and should be widely introduced into clinical practice in oncothoracic departments of the Republic of Kazakhstan.

Keywords: lung cancer, non-intubated video-assisted thoracoscopic surgery (NI-VATS), video-assisted thoracoscopic surgery (VATS), video-assisted lung resection, non-intubated thoracoscopic lobectomy, non-intubated thoracic surgery.

Introduction: The first experience of surgical interventions without tracheal intubation was presented in 1865 by Francis Richard Cruise, who used a cystoscope developed by Maximilian Nitze for thoracoscopy in a patient with pleural empyema [1, 2]. At the end of the XX century, thoracoscopic surgery entered clinical practice and became widespread due to the development of anesthesiology. Video-assisted thoracoscopic surgery (VATS) under general anesthesia (GA) with separate ventilation of the lungs have become a standard surgical intervention in oncothoracic surgery [3, 4]. It should be noted that tracheal intubation, especially with a double-lumen tube and positive-pressure pulmonary ventilation, leads to complications such as mechanical injuries of the respiratory tract and pulmonary barotrauma. These complications lead to severe long-term damage to the respiratory tract, lung parenchyma, and increased patient rehabilitation. Using a technique with spontaneous breathing reduces complications associated with tracheal intubation [5, 6]. Over the past 10 years, there has been a clear trend of increasing the number of clinics introducing the technique of non-intubated video-assisted thoracoscopic surgery (NI-VATS) for

lobular, segmental, atypical lung resections and diagnostic surgical interventions [7, 8].

Literature analysis shows that in Europe, 62 of 105 thoracic surgeons (59%) among the members of the European Society of Thoracic Surgeons (ESTS) and 42% of thoracic surgeons of the German Society for Thoracic Surgery (*Deutsche Gesellschaft für Thorax* [DGT]) reported performing NI-VATS in patients with lung pathology. In particular, non-intubated surgical interventions have proven well in patients with low cardiovascular and respiratory systems reserve and in diagnosing interstitial lung diseases [9, 10]. NI-VATS are indicated for patients with COPD and low pulmonary reserve, where general anesthesia with intubation has high risks and is associated with complications [11].

NI-VATS can be performed for various chest pathologies, from the elimination of pneumothorax, empyema treatment, diagnosis of pleurisy, marginal, atypical resections to anatomical segmentectomies and lobar resections with lymph dissection in lung cancer [12, 13].

According to the literature data, the advantages of NI-VATS include less postoperative trauma, early activation of the patient, early recovery of oral nutrition [14], reduction

of postoperative pain, reduction of cardiovascular and respiratory events, reduction of the duration of hospital stay of patients without increasing the duration of surgery [15, 16] absence of a precursor to the development of ventilator-associated pneumonia, reduction of systemic postoperative inflammation, better restoration of cell-mediated and humoral immune functions [17].

The study aimed to describe the experience of introducing into clinical practice surgical interventions without intubation on spontaneous breathing for malignant neoplasms of the lungs and mediastinal organs.

Materials and Methods: This article describes clinical cases of the introduction of NI-VATS for malignant lung tumors. The main technical aspects of the procedure [7, 18] are adapted in the settings of the Almaty Regional Multidisciplinary Clinic.

Clinical cases are described below.

Clinical Case No. 1.

Patient information: Patient T., 67 years old. A periodic health examination at the local polyclinic revealed mass-

es in the right lung. The patient was referred to ARMC for consultation. At the prehospital stage in a polyclinic setting, the patient was further examined and preliminarily diagnosed with peripheral cancer of the upper lobe of the right lung. He was hospitalized in the surgical department for surgical treatment. Specialized specialists consulted him, and no concomitant pathology was detected.

Clinical data: Upon admission, Karnofsky's performance status of the patient was 85%. No clinical signs in vital organs and systems were observed.

Diagnostics: The contrast-enhanced thoracic computed tomography revealed a cloud-shaped shadow with fuzzy lobular margins and a sign of reaction (retraction) of the interlobular pleura, of medium intensity, 1.0 x 1.1 x 0.8 cm in size, in the second segment of the upper lobe of the right lung. The lower lobe in the sixth and ninth segments had subpleural spherical formations with clear margins of average intensity, with a diameter of 0.5 and 0.7 cm, respectively. The intrathoracic lymph nodes are intact (Figure 1, A-D).

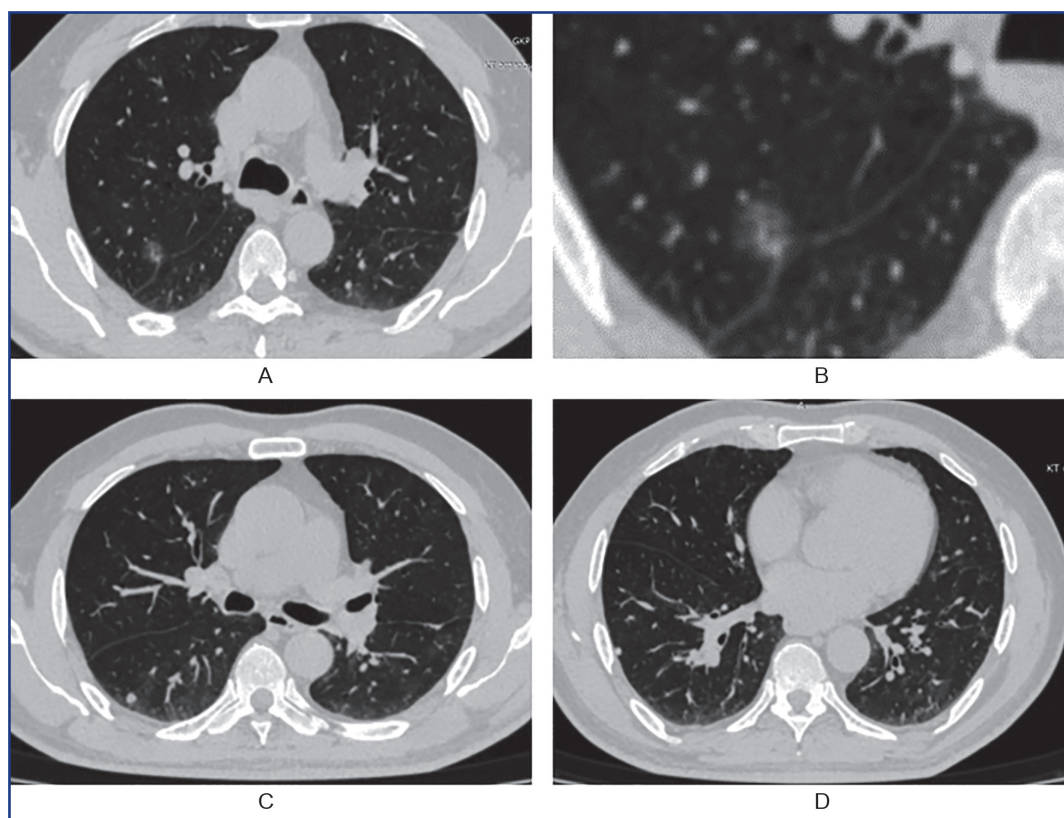


Figure 1 – Thoracic computed tomography of patient T., 67 years old: A, B – cloud-shaped shadow (S2) of the upper lobe of the right lung with visceral pleura reaction; C – cloud-shaped shadow (S2) of the upper lobe of the right lung with visceral pleura reaction (periapical X-ray); D – globular mass (S9) of the lower lobes of the right lung

Treatment: Surgical intervention was performed as planned. Anesthetic support was provided.

Initial hemodynamics: BP 135/82 mmHg; HR 82 per minute; RR 17 per minute; SO₂ 93%

Preoperative preparation of the patient:

1) A central venous catheter was installed.

2) Antibiotic prophylaxis was given 30 minutes before the skin incision.

3) To prevent the cough reflex, lidocaine solution for inhalation was given.

4) Volemic preload: sterofundin solution.

5) In the patient's sitting position, catheterization of

the epidural space at the level of Th5-Th6 was performed. The clinical picture of the sympathetic block in the form of paresthesia at the level of Th2-Th8 with a moderate decrease in BP to 125/75 mmHg was achieved. There was no disorder or inhibition of vital organ function with sensory blockade (no pain and tactile sensitivity).

6) For sedation, Dexdor solution was intravenously administered using a dispenser. RASS score is 0 to -1.

7) Additionally, in order to enhance analgesia during skin incision, mobilization of the pulmonary ligament, and mediastinotomy, fentanyl solution was administered.

Continuous intraoperative monitoring of vital organ functions (ECG, pulse oximetry, BP) on spontaneous respi-

ration with the supply of moistened oxygen through a nasal cannula.

Surgery: NI-VATS on the right; marginal resection of upper (S2) and lower (S6, S9) lobes with lymph dissection.

The patient's position is lying on the left side. Under local anesthesia with lidocaine solution, a 6-cm-long incision was made at the fifth intercostal space along the midaxillary line. The "surgysleeve" retractor was placed. An additional second port for the video camera was placed in two intercostal spaces below. During the revision of the pleural cavity, a tumor node in the second segment of the upper lobe was reported (Figure 2).



Figure 2 – Intraoperative view of the tumor of the upper (S2) lobe with a sign of visceral pleura retraction

Marginal resection of masses in S2, S6, and S9 was performed using crosslinking devices. Further inspection found no macroscopically altered lymph nodes. Lymphodissection of the bifurcation and paratracheal regions, lung root, and pulmonary ligament area was performed. Intraoperative blood loss was 30 mL. The surgery lasted for 2 hours 05 minutes.

The early postoperative period proceeded smoothly; the patient was activated 1 hour after transfer to the intensive care unit. Having stable hemodynamic and laboratory parameters, he was transferred to the specialized department 16 hours after the end of the surgery.

Results: Chest X-ray conclusion: shadow of the drainage tube in the pleural cavity; lung straightened; no hypoventilation zones and atelectasis. Sines are free.

The drainage tube was removed on the third day. On the fourth day, the patient was discharged with recommendations.

Histological conclusion: adenocarcinoma G-2 of micropapillary type with moderate lymphocytic infiltration. No tumor cells in the removed lymph nodes.

Final diagnosis: peripheral cancer of the right lung's upper (S2) lobe T1bN0M0 St-IA2.

Clinical case No. 2.

Patient information: Female patient Zh., 59 years old. Fluorography at the periodic health examination at the local polyclinic revealed a shadow in the lower lobe of the right lung. The patient was referred to ARMC for consultation. In a polyclinic setting, the patient was further examined and preliminarily diagnosed with peripheral cancer of the upper lobe of the right lung. Specialized specialists consulted her, and no concomitant pathology was detected. She was hospitalized in the surgical department for surgical treatment.

Clinical data: Upon admission, Karnofsky's performance status of the patient was 85%. No clinical signs in vital organs and systems were observed.

Diagnostics: The contrast-enhanced thoracic computed tomography revealed a medium-intensity shadow with fuzzy lobular margins in the tenth segment of the

lower lobe of the right lung, not associated with a visceral pleura, 1.5x2.5x1.2 cm in size, with a bronchovascular

path to the root. The intrathoracic lymph nodes are intact (Figure 3).

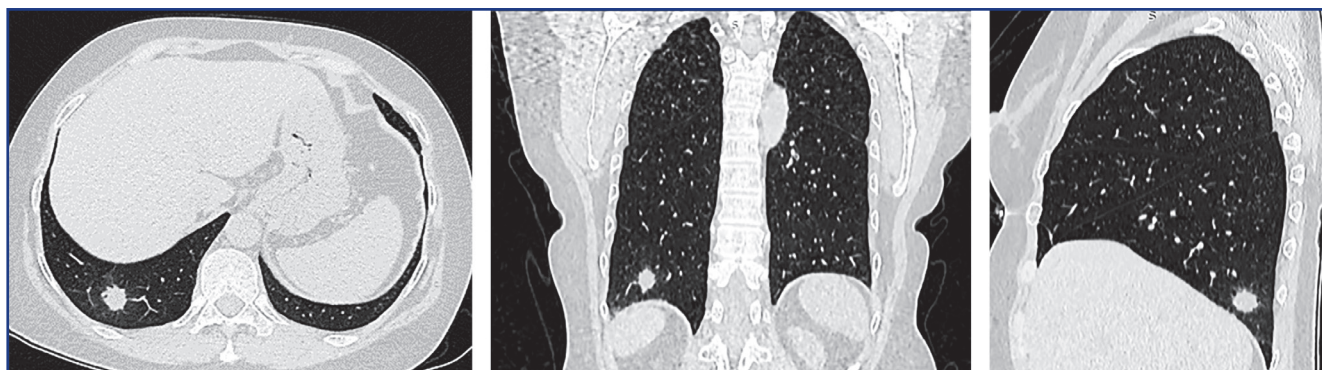


Figure 3 – Thoracic computed tomography of patient Zh., 59 years old: Peripheral cancer of the lower (S10) lobe of the right lung

Treatment: Surgical intervention was performed as planned. Anesthetic support was provided.

Initial hemodynamics: BP 130/75 mmHg; HR 75 per minute; RR 17 per minute; SO₂ 94%

Preoperative preparation of the patient.

- 1) A central venous catheter was installed.
- 2) Antibiotic prophylaxis was given 30 minutes before the skin incision.

3) To prevent the cough reflex, lidocaine solution for inhalation was given.

4) Volemic preload: sterofundin solution.

5) In the patient's sitting position, catheterization of the epidural space at the level of Th6-Th7 was performed. The clinical picture of the sympathetic block in the form of paresthesia at the level of Th2-Th9 with a moderate decrease in BP to 110/65 mmHg was achieved. There was no disorder or inhibition of vital organ function with sensory blockade (no pain and tactile sensitivity).

6) A Dexdor solution was intravenously administered using a dispenser for sedation. RASS score is -1 – -2.

7) Additionally, in order to enhance analgesia during skin incision, mobilization of the pulmonary ligament, and mediastinotomy, a Fentanyl solution was administered.

Continuous monitoring of vital organ functions (ECG, pulse oximetry, BP) on spontaneous respiration with the supply of moistened oxygen through a nasal cannula.

Surgery: NI-VATS on the right; lower lobectomy; lymph dissection.

The patient's position is lying on the left side. Under local anesthesia with lidocaine solution, a 5 cm-long incision was made at the 5th intercostal space along the midaxillary line. The "surgysleeve" retractor was placed. Similarly, a second "surgysleeve" retractor was placed in the 7th intercostal space along the midaxillary line (Figure 4).

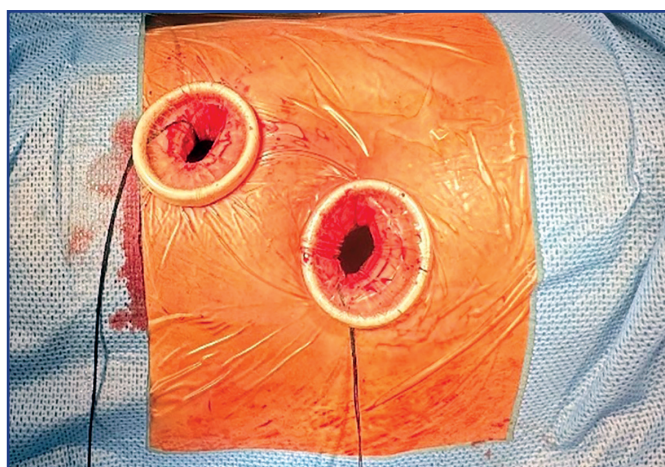


Figure 4 – General view of the port's location

Intraoperatively. Tumor in the lower (S10) lobe. A blockade of the diaphragmatic and vagus nerve was performed with a ropivacaine solution. The lower pulmonary ligament was mobilized. The interlobular fur-

row was divided. The basal artery was sequentially mobilized, and A6 was stitched with the device. The inferior pulmonary vein is isolated and stitched with the device. The lower lobe bronchus was mobilized, stitched with

a device, and crossed. The lobe was removed. Lympho-dissection of the bifurcation and paratracheal regions, lung root, and pulmonary ligament area was performed. Drainage of the pleural cavity was carried out through

the lower thoracoport; a drainage tube was placed from the diaphragm to the dome of the pleural cavity (Figure 5). Intraoperative blood loss was 70 mL. The surgery lasted for 2 hours 35 minutes.



Figure 5 – Final view of the postoperative wound

The early postoperative period proceeded smoothly; the patient was activated 1.5 hours after transfer to the intensive care unit. Having stable hemodynamic and laboratory parameters, she was transferred to the specialized department 14 hours after the end of the surgery.

Results: Chest X-ray conclusion: shadow of the drainage tube in the pleural cavity; the remaining lobes occupy the entire pleural cavity; no regions of hypoventilation and atelectasis. Sines are free.

The drainage tube was removed on the 3rd day. On the 5th day, the patient was discharged with recommendations.

Histological conclusion: adenocarcinoma G-2. No tumor cells in the removed lymph nodes.

Final diagnosis: peripheral cancer of the lower (S10) lobe of the right lung T1cN0M0 St-IA3

Discussion: NI-VATS combines the advantages of non-intubated surgery with minimally invasive access. NI-VATS is performed in weakened patients when general anesthesia and orotracheal intubation are associated with a high risk of pulmonary complications [12, 13, 19]. This method of surgical intervention proved to be more effective than VATS under general anesthesia. It reduces hospitalization time and accelerates patient rehabilitation [20]. In addition, NI-VATS is associated with fewer pulmonary complications, the absence of respiratory distress syndrome, and a weakly expressed systemic inflammatory reaction [11].

The results of 28 NI-VATS lobectomies are shown by Furák J. et al. The surgery lasted for 91.04 ± 23.88 minutes; drainage was in the pleural cavity for 2.12 ± 1.16 days; there were no postoperative complications [21].

According to Starke H. et al., the duration of surgery for lobar resections was 124.05 ± 74.49 min. The drainage tube was in place for 3.58 days; the median postoperative hospital stay was 6.40 ± 4.51 days [7].

According to Al Ghamdi Z. M. et al. (2018), postoperative hospital stay in the NI-VATS group was 6.9 ± 3.8 days, and the drainage tube was in place for 5.6 days [8].

Conclusion: As the literature data and our preliminary results of NI-VATS show, surgical interventions in the surgical treatment of lung cancer have such advantages over open and VATS surgical interventions as minor postoperative trauma, rapid recovery of the patient, shorter stay of patients in the hospital, and, therefore, should be widely introduced into clinical practice in oncothoracic departments of the Republic of Kazakhstan.

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АНДАТПА

ҚАЗАҚСТАН РЕСПУБЛИКАСЫНДА ӨКПЕ ОБЫРЫ КЕЗІНДЕ ИНТУБАЦИЯЛЫҚ БЕЙНЕ-АССИСТЕНТТЕЛГЕН ТОРАКОСКОПИЯЛЫҚ РЕЗЕКЦИЯЛАРСЫЗ ҚОЛДАНУДЫҢ АЛҒАШҚЫ ТӘЖІРИБЕСІ

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Өзектілігі: Бірқатар зерттеулер көрсеткендей, интубациясыз хирургиялық араласулар, әсіресе жүрек-қан тамырлары мен тыныс алу жүйесінің резерві төмен науқастарда, сондай-ақ өкпенің интерстициальды ауруларын диагностикалауда жақсы нәтиже көрсетті.

Зерттеудің мақсаты: Өкпе мен медиастинальды органдардың қатерлі ісіктері кезінде өздігінен тыныс алуда интубациясыз хирургиялық араласуды клиникалық тәжірибеге енгізу.

Әдістері: анестезиологиялық көмек пен хирургиялық емнің техникалық ерекшеліктерінің негізгі сәттері көрсетілген екі клиникалық жағдай сипатталды.

Нәтижелері: өкпенің перифериялық қатерлі ісігі бар 2 науқасқа оперативті ем көрсетілді. Бірінші науқас: оң жақтық NI-VATS, жоғарғы (S2), төменгі (S6, S9) бөліктердің резекция, лимфодиссекция, екінші науқас: оң жақтық NI-VATS, төменгі бөліктің лобэктомия, лимфодиссекция. Гистологиялық зерттеудің нәтижесі бойынша өкпенің қатерлі ісігі ерте сатыда анықталды. Операциядан соңғы химиясәулелі терапия көрсеткіш жоқ. Науқастар III клиникалық топ бойынша диспансерлік бақылауға алынды.

Қорытынды: Әдеби деректер мен алдын ала нәтижелеріне арналған деректер көрсеткендей, NI-VATS өкпенің қатерлі ісігін хирургиялық емдеуде хирургиялық араласулар орын алады және ҚР онкоторакальды бөлімшелерінде клиникалық практикаға кеңінен енгізілуі тиіс.

Түйінді сөздер: өкпенің қатерлі ісігі, NI-VATS, VATS, видео-ассистентті өкпе резекциясы, интубациясыз видеоторакокопиялық лобэктомия, интубациясыз торакалды хирургия.

АННОТАЦИЯ

ПЕРВЫЙ ОПЫТ ПРИМЕНЕНИЯ БЕЗИНТУБАЦИОННЫХ ВИДЕОАССИСТИРОВАННЫХ ТОРАКОСКОПИЧЕСКИХ РЕЗЕКЦИЙ ПРИ РАКЕ ЛЕГКОГО В РЕСПУБЛИКЕ КАЗАХСТАН

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Актуальность: В ряде исследований было показано, что безинтубационные оперативные вмешательства, особенно хорошо себя зарекомендовали у больных с низким резервом сердечно-сосудистой и дыхательной систем, а также в диагностике интерстициальных заболеваний легких.

Цель публикации – описать опыт внедрения в клиническую практику оперативных вмешательств без интубации на спонтанном дыхании при злокачественных новообразованиях легких и органов средостения.

Методы: Описаны два клинических случая с освещением основных моментов анестезиологического пособия и технических особенностей проведения оперативного вмешательства.

Результаты: Двум больным с периферическим раком легких произведено оперативное лечение в объёме: в первом случае – NI-VATS справа, краевая резекция (S2) верхней, (S6, S9) нижней долей с лимфодиссекцией, во втором – NI-VATS справа, нижняя лобэктомия, лимфодиссекция. По результатам гистологического исследования у обоих больных диагностирован НМРЛ на начальных стадиях. Послеоперационная химиолучевая терапия не показана. Больные взяты на диспансерный учет по III клинической группе.

Заключение: Как показывают литературные данные и полученные нами предварительные результаты, оперативные вмешательства NI-VATS при хирургическом лечении рака легких имеют такие преимущества перед открытыми и VATS оперативными вмешательствами, как малая послеоперационная травма, быстрое восстановление больного, более короткое нахождение больных в стационаре, и поэтому должны широко внедряться в клиническую практику онкоторакальных отделений РК.

Ключевые слова: рак легких, видеоассистированная торакальная хирургия без интубации (NI-VATS), видеоассистированная торакальная хирургия (VATS), видеоассистированная резекция легких, безинтубационная видеоторакоскопическая лобэктомия, безинтубационная торакальная хирургия.

Transparency of the study: The authors shall take full responsibility for the content of this article.

Conflict of interest: The authors declare no conflict of interest. Patients' consent to the transmission of personal data has been received.

Financing: Authors declare no financing of the study.

Authors' input: contribution to the study concept – Makarov V.A., Baymukhambetov E.T., Olzhayev S.T., Kadyrbayeva R.E.; study design – Makarov V.A., Baymukhambetov E.T., Olzhayev S.T.; execution of the study – Makarov V.A., Baymukhambetov E.T., Musanov E.T., Novikov I.I., Bekbotayev B.Zh., Adzhibayev B.Zh., Makhanbetov B.A., Ospanov S.S., Ozharova A.S.; interpretation of the study – Makarov V.A., Baymukhambetov E.T.; preparation of the manuscript – Makarov V.A., Kadyrbayeva R.E.

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