

EFFICIENCY OF ENDOSCOPIC SEDATED EXAMINATIONS: EXPERIENCE OF THE NATIONAL RESEARCH ONCOLOGY CENTER (ASTANA, KAZAKHSTAN)

K. BATYRBEKOV¹, A. GALIAKBAROVA¹

¹National Research Oncology Center, Astana, the Republic of Kazakhstan

ABSTRACT

Relevance: The purpose of sedation during endoscopic procedures is to reduce patient discomfort, including anxiety and pain, while maintaining a minimum frequency of side effects associated with taking medications.

The study aimed to investigate the effectiveness of sedation in endoscopic examinations at the National Scientific Oncology Center (NSOC, Astana, Kazakhstan) in 2023, determine the effect of sedatives on the quality of colonoscopy, and provide more theoretical evidence for the clinical use of sedatives.

Methods: In 2023, sedation for endoscopic examinations at the outpatient stage was available in 11 clinics in Astana. A retrospective analysis of endoscopic studies under sedation and without sedation conducted in the conditions of the NSOC endoscopic department for 2023 was carried out.

Results: The total number of endoscopic examinations in Astana in 2023 is 56,143, of which 10,651 studies were conducted under sedation with propofol. The average cost of sedation in Astana was KZT 18,600, from a minimum of KZT 13,000 to a maximum of KZT 32,000. The number of sedations during endoscopic examinations in 2023 in Astana varied from a minimum of 312 to a maximum of 4,593 per clinic. In 2023, 2 cases of colon perforation were recorded during colonoscopy under propofol sedation; both cases occurred in private centers, and patients were urgently operated with colostomy removal.

In a single-center study of the results of performed colonoscopies without sedation and with sedation in the conditions of the NROC, the number of detected malignancies during sedated colonoscopy was 3% higher, and the number of identified polyps was 0.3% more than with non-sedative, which, as a result, improves the quality of screening colonoscopy as a whole.

Conclusion: The increased use of sedation at the outpatient level will have a positive impact on the quality of esophagogastroduodenoscopy and screening colonoscopy, which means that it will increase the incidence of early forms of stomach and intestinal cancer. Given the data on sedation during endoscopic examinations in the city's clinics, it is safe to say that there is a good growth potential for the widespread introduction of sedation.

Keywords: endoscopy, sedation, analgesia, polyp, colorectal cancer.

Introduction: The challenge of population aging around the world is gradually worsening, while the incidence of colorectal cancer (CRC) is also increasing with age. CRC is the third most common malignant tumor in the world and the second leading cause of cancer death.

In 2023, the incidence rate in the Republic of Kazakhstan amounted to 208.7 per 100 thousand population, and 41,515 new malignant neoplasms (MNs) have been registered. Gender composition of identified patients with malignant neoplasms made in total: women (56.9% – 23,613 cases) fell ill more often than men (43.1% – 17,902 cases).

CRC rose to second place in cancer incidence structure, compared to fifth in 2022. It now accounts for 9.3% of cancer cases, with 3,939 cases. Of them, 55.6% of patients are people of working age, 18 to 64 years old. In 2023, 1,973 new cases of CRC were reported in men and 1,970 in women. Also, in 2023, the mortality rate was 7.6 per 100,000 men and 6.5 per 100,000 women. Of the newly diagnosed CRC cases in 2023, 501 belonged – to stage 1, 1862 – to stage 2, 912 – to stage 3, and 536 have been attributed – to stage 4.

The elevation of detection of CRC in 2023 was noted across all regions of the country. A colonoscopy allows for detecting and removing potential precancerous lesions and preventing metachronous cancer. A colonoscopy is considered an effective method for lowering the rate of CRC early detection and reducing mortality. However, the effectiveness of colonoscopy depends entirely on the quality of its performance.

Sedatives allow patients to tolerate unpleasant endoscopic procedures, relieving anxiety, discomfort, or pain. It also reduces the risk of physical injury to the patient during endoscopic procedures while providing the endoscopist with adequate conditions for a relevant, comprehensive examination. Therefore, many endoscopists consider sedation an important component of gastrointestinal endoscopy. The goal of sedation in endoscopic procedures is to reduce the patient's discomfort, including anxiety and pain while maintaining a minimal incidence of medication-related side effects. Sedatives allow patients to endure unpleasant procedures, relieving anxiety, discomfort,

or pain, and also reduce the risk of physical injury to the patient during endoscopic procedures by providing the endoscopist with adequate conditions for a detailed examination.

Factors affecting the quality of colonoscopy;

1. Specialist-independent factors: a) the quality of bowel preparation; b) sedation.

2. Specialist-dependent factors: practical skills of an endoscopist.

The quality of bowel preparation depends on the drug used for bowel preparation, the volume of the drug solution drunk, and, of course, the patient's conscientious implementation of all recommendations. According to the Boston Bowel Preparation Scale, the large intestine is conventionally divided into 3 sections: right, middle, and left. The quality of bowel preparation is rated from 0 to 3 points, where 3 points means a clean intestinal section. The recommended number of points for a satisfactory quality of bowel preparation is 6-9 points.

In Kazakhstan, sedation is performed only by anesthesiologists; therefore, it does not depend on the competence of the endoscopist performing the colonoscopy. However, the success of cecal intubation depends on the practical skills and experience of the endoscopist in performing endoscopy.

According to recent data from a multicenter study conducted by J.W. Zhou et al., which included the results of a colonoscopy of 216,400 patients, the detection rates of adenomas (32.24% vs. 31.63%, $p < 0.05$) and polyps (20.61% vs. 20.21%, $p < 0.05$) increased in the sedated endoscopy group, especially in flat adenomas (44.80% vs. 43.95%, $p < 0.05$) and adenomas of 0-5 mm size (66.99% vs. 66.24%, $p < 0.05$). In addition, the number of colonoscopy biopsies was significantly higher in the selected group ($0.79 = 0.93$ vs. $0.56 = 0.80$, $p < 0.001$) [1].

Q. Zhang et al. reviewed the results of 63,417 colonoscopies, including 11,417 sedation-free and 52,000 sedated colonoscopies. The share of colonoscopic examinations with the use of sedatives was 82.0%. The detection rate of adenomas was significantly higher in cases with sedation compared to cases without sedation (adenoma detection rate was 22.5% versus 17.0%). In addition, this study considered the effect of the specialist's experience on the rate of adenoma detection and the percentage of cecum intubation [2].

For successful and safe sedation, endoscopists must consider procedural and patient factors. Procedural factors include the duration of the endoscopic examination, the level of discomfort during the examination, and the patient's prolonged static position during the procedure. Factors related to the patient include drug intolerance, sensitivity to pain, medical history, age, and body weight.

Before the procedure, the doctor must discuss with the patient the benefits, risks, and limitations associated with

the use of sedatives, and as a result of the discussion, the patient should sign an informed consent [3].

Medical history and thorough physical examination are needed for all patients before the endoscopic procedures. The anamnesis elements that may affect the quality of sedation include the clinical history and physical examination.

The minimum patient monitoring requirements for gastrointestinal sedation include assessment of blood pressure, heart rate, pulse oximetry, visual assessment of ventilation activity, level of consciousness, and discomfort [4].

The most common benzodiazepines used in sedation are midazolam and diazepam. The efficacy of sedation of these two drugs is the same, but most endoscopists prefer midazolam because of its rapid action onset, short duration of sedation, lower risk of thrombophlebitis, and high amnestic properties. When using midazolam, sleep occurs quickly, after 15 minutes with intramuscular injection and after 1-1.5 minutes with intravenous administration. Besides, it has almost no effect on sleep structure and has almost no aftereffects. Midazolam is not registered in Kazakhstan and, therefore, is not included in the clinical formula, although it is preferable to propofol in terms of quality.

The use of anesthesiologist-monitored propofol sedation for endoscopic procedures is widespread in the United States and Europe. It is also the most common method of choice in Kazakhstan.

The drug has sedative, hypnotic, amnestic, antiemetic, and anticonvulsant effects but is devoid of analgesic effects. The time from injection to the onset of sedation is 30 to 60 seconds, and its action lasts 4 to 8 minutes [5,6].

Currently, most outpatient endoscopic examinations in Kazakhstan are carried out without sedation, and sedation is performed only at the patient's request on a paid basis. No order obliges to conduct all endoscopic sedated examinations. The only regulation of the Minister of Health of the Republic of Kazakhstan is the order of April 26, 2023, No.78, "On Approval of the standard for the organization of anesthesia and resuscitation care performance in the Republic of Kazakhstan" [7]. Annex No.4 to this order contains the Classification scale for the patient's physical status from the American Society of Anesthesiologists' Endoscopy Manual on Sedation.

Most importantly, any sedation for all outpatient and inpatient endoscopic interventions in Kazakhstan can only be performed by anesthesiologists. An endoscopist can be admitted to sedation, but only if there is a certificate of completion of certification courses on anesthesiology. However, according to American guidelines, self-sedation of the patient by gastroenterologists or endoscopists is justified and recommended only for routine diagnosis

tic procedures, such as colonoscopy and gastroscopy. In surgical endoscopic interventions, sedation is carried out only by doctors-anesthesiologists since the intraprocedural introduction of the patient requires the attention of a separate specialist and a separate nurse.

Also, Annex No.5 to this order specifies the scope of preoperative examination of patients, considering the urgency of surgical intervention (in case of emergency and planned hospitalization), but does not specify the exact list of tests required for sedation in outpatient cases.

This study aimed to investigate the effectiveness of sedation in endoscopic examinations at the National Scientific Oncology Center (NSOC, Astana, Kazakhstan) in 2023, determine the effect of sedatives on the quality of colonoscopy, and provide more theoretical evidence for the clinical use of sedatives.

Materials and methods: In 2023, sedation for endoscopic examinations at the outpatient stage was available in 11 clinics in Astana. A retrospective analysis of endoscopic studies under sedation and without sedation conducted in the conditions of the endoscopic department of the National Scientific Oncology Center (NSOC, Astana, Kazakhstan) was performed.

In a sedated colonoscopy, patients received intravenous propofol to achieve deep sedation or general anesthesia. At the beginning of the procedure, propofol was administered at a dose of 80-120 µg/kg of body weight. A maintenance dose of 20-50 mcg/kg was repeated depending on the patient's response, operator experience, and technical difficulties encountered, while patients undergoing traditional colonoscopy remained conscious during the procedure. All patients were monitored with

pulse oximetry, continuous ECG, and noninvasive blood pressure assessment every 5 minutes. Supplemental oxygen is supplied to patients under sedatives through a nasal catheter.

Results: In 2023, the total number of endoscopic examinations performed in Astana comprised 56143, of which 10651 were carried out under propofol sedation. The average cost of sedation in Astana amounted to KZT 18,600, from a minimum of KZT 13,000 to a maximum of KZT 32,000. The number of sedations during endoscopic examinations performed in 2023 in Astana ranged from a minimum of 312 to a maximum of 4,593 per clinic. In 2023, 2 cases of perforation of the large intestine during colonoscopy under sedation with propofol were recorded, and both cases occurred in private centers, followed by the patients urgently operated with the colostomy egestion. According to Table 4, sedation during endoscopic examinations at the outpatient stage is available in 11 clinics in Astana. However, in 5 clinics, the tests for sedation are not required at all 5 clinics only a general blood count and ECG are required from the necessary tests, and only in one clinic 5 tests are required (complete blood count, blood test for HIV and hepatitis, ECG and plain X-ray of the lungs). Based on data from Table 1, it can be stated that the list of tests requested by the anesthesiologist before sedation is not regulated by the Order No.78 of the Ministry of Health of the Republic of Kazakhstan and depends on the preferences of the anesthesiologist. The number of sedations depends only on the staffing of intensive care and anesthesiology departments; hence, the potential for growth of sedated endoscopies directly depends on the number of anesthesiologists in the clinic.

Table 1 – Use of sedation in endoscopy at the outpatient stage in Astana (Kazakhstan), 2023

Aspects	Name of Clinic										
	NRMC	MDMC	NSOC	State hospital №1	State hospital №2	State hospital №3	Hospital of the Department for Presidential Affairs RK	I-clinic	Green Clinic	Alanda	Umit
1. No. of studies in 2023	5880	4734	4833	7788	7922	6553	9674	1600	3559	2100	1500
2. No. of sedated examinations	312	500	478	1040	320	348	4593	1280	316	864	600
3. Cost of sedation?	32000	20000	18000	29500	13000	13000	15000	22000	24000	18000	25000
4. What tests are required?	Not required	Not required	CBC, HIV, hepatitis, ECG, X-ray of lungs	CBC, UA, ECG	Not required	Not required	CBC, ECG	CBC, ECG	CBC, ECG	CBC, ECG	Not required

According to Table 2, the total number of endoscopic examinations performed in the Department of Expert Endoscopy of the NSOC steadily increases yearly, even though the department employs only 3 endoscopists and only 2 colonoscopes are available. Also, ac-

ording to Table 2, it can be seen that the number of recto-colonoscopy examinations and the number of initially diagnosed cases of CRC is also growing, although the clinic does not belong to a primary care medical facility.

Table 2 – Performance indicators of the Department of Expert Endoscopy of the NSOC, 2019-2023

Indicator	Years				
	2019	2020	2021	2022	2023
Total number of endoscopic examinations	1226	2130	2684	2676	4833
Number of biopsies in all endoscopic examinations	294	1577	693	1452	1721
Rectocolonoscopy	78	351	503	555	968
Number of biopsies in rectocolonoscopies	29	301	176	308	353
Number of malignant neoplasms detected during recto-colonoscopies	22	10	32	37	50

According to Table 3, the number of sedated colonoscopy procedures performed at the NSOC Endoscopy Center of Expertise was lower than non-sedated procedures, with an annual increase in the proportion of sedated endoscopy examinations. Besides, Table 3 confidently proves that sedated examinations detected more

cases of terminal ileum and cecal intubation and benign neoplasms, including flat neoplasia. Thus, in 2019-2023, benign tumors were detected 3-11% more often during sedated colonoscopy than during non-sedated examinations. Accordingly, this has improved the quality of screening colonoscopy in general.

Table 3 – Results of colonoscopy examinations conducted at the Center for Expert Endoscopy of the NSOC, 2019-2023

Indicator	Years				
	2019	2020	2021	2022	2023
Number of colonoscopies, abs.	40/38***	202/149	289/214	305/250	490/478
CIR, %*	89.1/93.8	91.2/94.1	91.0/94.7	92.5/94.3	91.7/96.3
ADR, %**	17/22.5	18/22.4	17.9/25.6	19.1/27.2	20.9/32.1

Notes: *CIR is an indicator of cecum intubation; **ADR – adenoma detection rate; The first digit in the results refers to non-sedated colonoscopy, the second to sedated colonoscopy

The statistical analysis of differences in the incidence of cecum intubation and the incidence of adenomas with and without sedation was carried out using the Welch t-test. The two-sample Welch t-test, which compared adenoma detection between the sedated and non-sedated groups, revealed a significant difference between the groups ($t=-3.8431$, $p=0.0075$), with the sedation group having a higher mean adenoma detection rate (23.72), compared to the non-sedation group (18.58). The 95% confidence interval for the mean difference composed $[-8.36, -1.92]$ indicates a significant effect of sedation status.

Sedation during colonoscopy makes it possible to examine the mucous membrane of the large intestine more thoroughly using chromoendoscopy and electron chromoendoscopy, increasing the number of biopsies and ultimately increasing the adenoma detection rate (ADR).

Discussion: Sedated colonoscopy has been carried out in clinics in Astana and Kazakhstan over the past decades. It is widely used in clinical practice in public hospitals and private centers. At NSOC, sedatives are used in 42.4-49.3% of cases, and ADR rate and cecal intubation rate (CIR) increase year to year with more sedatives used. The growth of the proportion of sedated endoscopic examinations in clinics depends on the availability of doctors-anesthesiologists and anesthesiologists in the anesthesiology and resuscitation departments. For example, NSOC has significantly increased the rate of sedated colonoscopies and ADR and CIR rates. However, there is a shortage of anesthesia service staff.

In this study, we did not consider the years of experience and the number of colonoscopies performed by each endoscopist of the Expert Endoscopy Department since

only three doctors worked there, which was not enough to compare the indicators.

The main limitation of this study was the insufficiency of indicators reflecting the quality of colonoscopy. Two important indicators of colonoscopy quality, including ADR and CIR, have been studied. However, other indicators, such as patient comfort and satisfaction, were not considered. This retrospective study lacked data on patient satisfaction, so the relevant indicators could not be examined. In addition, sedation may lead to increased complications and financial burdens on patients not assessed in that study. Further studies are needed to assess sedatives' complications and potential economic impact on colonoscopy.

Conclusion: Further development of effective and safe sedation in endoscopy requires further high-quality multicenter randomized trials in cooperation with professional societies of anesthesiologists and resuscitators, modifying the legislative framework, and the research of the pharmacoeconomic efficacy of specified changes. Expanded use of sedation at the outpatient level could improve the quality of endoscopic examinations and, therefore, increase the detection of early forms of bowel cancer. Data on the use of sedation during endoscopic examinations in Astana clinics evidences a good growth potential for a wider introduction of sedation and improving the quality of colonoscopies (ADR, CIR). The increase in ADR and timely curing of identified adenomas will have a positive delayed cumulative effect on the CRC incidence and mortality due to this disease among the population of Kazakhstan. This study's results suggest sedatives can help inexperienced and experienced endoscopists achieve better colonoscopy quality.

Also, in our opinion, it is necessary to work out the issue of proper and adequate reimbursement of the cost of sedation under the CSHI package at the outpatient stage.

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АНДАТПА

СЕДАЦИЯ КЕЗІНДЕГІ ЭНДОСКОПИЯЛЫҚ ЗЕРТТЕУЛЕРДІҢ ТИІМДІЛІГІ: ҰЛТТЫҚ ҒЫЛЫМИ ОНКОЛОГИЯЛЫҚ ОРТАЛЫҚТЫҢ ТӘЖІРИБЕСІ (АСТАНА, ҚАЗАҚСТАН)

К. Батырбеков¹, А. Галияқбарова¹

¹ЖШС «Ұлттық онкологиялық зерттеу орталығы», Астана, Қазақстан Республикасы

Өзектілігі: Эндоскопиялық процедураларды жүргізу кезінде седацияның мақсаты пациенттің ыңғайсыздығын, соның ішінде мазасыздық пен ауырсынуды азайту, дәрі-дәрмекпен байланысты жанама әсерлердің минималды жиілігін сақтау бо- табылады.

Зерттеудің мақсаты – Ұлттық ғылыми онкологиялық орталық (ҰФО, Астана, Қазақстан) жағдайында эндоскопиялық тексерулер кезінде седативтерді қолданудың тиімділігін зерттеу 2023 ж., седативтердің колоноскопия сапасына әсерін анықтау және седативтердің клиникалық қолданылуына көбірек теориялық дәлелдер келтіру.

Әдістері: 2023 жылы амбулаториялық кезеңде эндоскопиялық зерттеулер кезінде седация Астана қаласындағы 11 клиникада қолжетімді болды. 2023 жылы Ұлттық ғылыми онкологиялық орталықтың (Астана, Қазақстан) эндоскопиялық бөлімшесі жағдайында жүргізілген седациямен және седациясыз эндоскопиялық зерттеулерге ретроспективті талдау жүргізілді.

Нәтижелері: 2023 жылы Астана қаласы бойынша эндоскопиялық зерттеулердің жалпы саны 56143-ке тең, оның ішінде пропофол седациясымен 10651 зерттеу жүргізілді. Астана қаласы бойынша седацияның орташа құны 18600 теңгеге тең, ең төменгі құны – 13 мың теңге және ең көбі 32 мың теңгеге дейін жетеді. 2023 жылы Астана қаласы бойынша эндоскопиялық зерттеулер кезінде седациялардың ең аз саны 312, ең көп саны – 4593 құрады.

2023 жылы пропофол седациясының астында колоноскопия кезінде тоқ ішектің перфорациясының 2 жағдайы тіркелді; екі жағдай да жеке орталықтарда болды, науқастарға колостомияны жою үшін шұғыл операция жасалды. Седациясыз және седациямен жүргізілген колоноскопиялардың нәтижелерін бір орталықты зерттеуде седативті колоноскопияда анықталған қатерлі ісіктердің саны седативті емес колоноскопияға қарағанда 3%-ға, ал анықталған полиптердің саны 0,3%-ға көп болды, нәтижесінде жалпы скринингтік колоноскопияның сапасы артады.

Қорытынды: Амбулаториялық деңгейде седацияны қолдануды кеңейту эзофагогастроуденоскопия мен скринингтік колоноскопияның сапасына оң әсер етеді, яғни асқазан мен ішек қатерлі ісігінің ерте түрлерінің пайда болуын арттырады. Қала клиникаларында эндоскопиялық зерттеулерде седация деректерін ескере отырып, седацияны кеңінен енгізу үшін жақсы осу әлеуеті бар деп айтуға болады.

Түйінді сөздер: эндоскопия, седация, анальгезия, полип, колоректальды қатерлі ісік.

АННОТАЦИЯ

ЭФФЕКТИВНОСТЬ ЭНДОСКОПИЧЕСКИХ ИССЛЕДОВАНИЙ ПОД СЕДАЦИЕЙ: ОПЫТ НАЦИОНАЛЬНОГО НАУЧНОГО ОНКОЛОГИЧЕСКОГО ЦЕНТРА (АСТАНА, КАЗАХСТАН)

К.У. Батырбеков¹, А.А. Галияқбарова¹

¹ТОО «Национальный научный онкологический центр», Астана, Республика Казахстан

Актуальность: Целью седации при проведении эндоскопических процедур является уменьшение дискомфорта пациента, включая беспокойство и боль, при сохранении минимальной частоты побочных эффектов, связанных с приемом лекарств.

Цель исследования – изучить эффективность применения седации при эндоскопических исследованиях в условиях Национального научного онкологического центра (ННОЦ, Астана, Казахстан) в 2023 году, определить влияние седативных препаратов на качество колоноскопии и предоставить больше теоретических доказательств для клинического применения седативных препаратов.

Методы: В 2023 г. седация при эндоскопических исследованиях на амбулаторном этапе была доступна в 11 клиниках г. Астана. Проведен ретроспективный анализ эндоскопических исследований под седацией и без седации, проведенных в условиях эндоскопического отделения Национального научного онкологического центра (Астана, Казахстан).

Результаты: Общее количество эндоскопических исследований по г. Астана за 2023 год равно 56143, из них под седацией пропофолом проведено 10651 исследование. Средняя стоимость седации по г. Астана равна 18600 тенге, минимальная стоимость – 13 тысяч тенге и максимально доходит до 32 тысяч тенге. Минимальное количество седаций при эндоскопических исследованиях в 2023 г. по г. Астана составило 312, максимальное количество – 4593.

За 2023 год зафиксировано 2 случая перфорации толстого кишечника во время колоноскопии под седацией пропофолом; оба случая произошли в частных центрах, пациенты были экстренно прооперированы с выведением колостомы.

В одноцентровом исследовании результатов проведенных колоноскопий без седации и с седацией в условиях ННОЦ количество выявленных злокачественных образований при седативной колоноскопии было больше на 3%, а количество выявленных полипов – больше на 0,3 %, чем при неседативной, что, в итоге, повышает качество скрининговой колоноскопии в целом.

Заключение: Расширение использования седации на амбулаторном уровне окажет положительное влияние на качество эндоскопических исследований, а значит, повысит выявляемость ранних форм рака кишечника. Учитывая данные по проведению седации при эндоскопических исследованиях в клиниках г. Астаны, можно с уверенностью сказать, что есть хороший потенциал роста для повсеместного внедрения седации и роста качества проводимых колоноскопий.

Ключевые слова: эндоскопия, седация, анальгезия, полип, колоректальный рак (КРР).

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Authors' data:

K.U. Batyrbekov (corresponding author) – PhD, Head of the Center for Expert Endoscopy and Interventional Radiology, Center for Expert Endoscopy and Interventional Radiology, National Research Oncology Center, Astana, Kazakhstan; tel: +77074744980, e-mail: dr.kanat77@gmail.com, ORCID: 0000-0003-4837-0775;

A.A. Galiakbarova – Endoscopist of the Center for Expert Endoscopy and Interventional Radiology, National Research Oncology Center, Astana, Kazakhstan; tel: +77072676316, e-mail: ainura-endo@mail.ru, ORCID: 0000-0002-9588-0025.

Address for correspondence: K.U. Batyrbekov, National Research Oncology Center, Kerey Zhanibek Khandar St. 3, Astana 020000, the Republic of Kazakhstan.