ANDIJAN STATE MEDICAL UNIVERSITY

ANESTHESIOLOGY AND RESUSCITATION DEPARTMENT

O.A.Ismailov, B.E.Mo'minov

CRITERIA FOR ASSESSING THE EFFICIENCY OF HIGH SPINAL ANESTHESIA DURING OPERATIONS ON THE UPPER FLOOR OF THE ABDOMINAL CAVITY

Summary. In recent years, the frequency of application of regional anesthesia methods, and especially in economically developed countries, has progressively increased. This paper presents the experience of high spinal anesthesia during operations on the upper part of the abdominal cavity in 112 patients. We have developed and proposed a method of simultaneous high spinal anesthesia, with the development of high neuromuscular block to the level of the first and second thoracic vertebrae. By its simplicity and technique, as well as by maintenance high spinal anesthesia is close to epidural analgesia, but unlike that it provides adequate, long-lasting and high level of pain relief of the abdominal organs. Compared to "traditional" methods of pain relief high spinal anesthesia reduces the risk of thromboembolic complications, decreases the amount of blood loss, reduces risk of developing complications from respiratory and cardiovascular systems, reduces the duration of postoperative paresis of the intestine. The use of high spinal anesthesia during operations on the upper part of the abdominal cavity is the method of choice. This type of anesthesia has advantages over other types of pain relief, and is better tolerated by patients. The proposed technique of regional anesthesia - high spinal anesthesia - has broad prospects for use in clinical practice.

Key words: spinal anesthesia, abdominal cavity, surgery, results

Over the past few decades, high quality neuraxis pain relief with minimal methods of pain relief and associated side effects. In recent years, with progressive methods, various local anesthetics have been increasing in frequency and the frequency of application of the methods has progressed. They currently provide regional anesthesia (RA) and primarily ineconomically developed countries. According to numerous literature data, RA accounts for 15% to 45% in the total volume of anesthetic benefits, of which 20-40% falls on the share of spinal anesthesia [1, 3, 16].

Improving the technique of surgical interventions, introducing new technologies, advancing pharmacology, anesthesiology and resuscitation have significantly expanded the indications for the use of various types of central conductive blockades. The advantages of central conductor blockades are well known due to a number of advantages. Nociceptive impulses falling into the hypothalamus and cerebral cortex cause efferent impulses to various endocrine organs, leading to various endocrine and metabolic effects. Operations performed under general inhalation anesthesia cause an increase in the plasma concentration of cortisol, aldesterone, renin, vasopressin, growth hormone, adrenaline and norepinephrine [4, 15]. In addition, plasma glucose and lactic acid levels increase with the onset of surgery. Stable segmental analgesia providing reliable protection against operational stress, which stimulates the secretion of catabolic hormones, as well as cytokines, the concentration of which in the blood plasma depends on the severity of the surgical trauma and the type of anesthesia.

Under conditions of regional anesthesia, there are no main links in the chain of unfavorable pathophysiological changes observed during operations under general anesthesia. The absence of stressful moments of intubation and extubation, as well as a more complete, in comparison with general anesthesia, blockade of both somatic and visceral afferent impulses allows you to minimize or completely eliminate the response of the hemodynamic and hormonal reactions of the body to operational stress. Numerous works devoted to a comparative analysis of the varieties of general and segmental anesthesia in various fields of surgery indicate that blockade with local anesthetics at the segmented level of nocicential impulses and peripheral blockade significantly suppress the stimulation of the processes of release of cortisol ACTT, serotonin, and glucose under the influence of c-AMP and adrenaline release from the adrenal glands [2, 4, 14].

One of the types of regional anesthesia is spinal anesthesia (SA). This type of pain relief has established itself as an adequate and reliable method for operations on the lower floor of the abdominal cavity, lower extremities, including orthopedic, abdominal, urological and gynecological interventions [3, 12, 18]. In addition, SA can be considered a method of choice for “problem” elderly patients suffering from severe comorbidities [11, 17].

Back in the last century B.A. Petrov gave such a high assessment of spinal anesthesia: “There is not a single type of local or conductive anesthesia that would give such a complete anesthesia as spinal anesthesia. There is not a single method that is simpler in technique, which to such an extent provided the surgeon with the best conditions for performing the most complex operations in the abdominal cavity ... ”(1954) [2]. The positive side of spinal anesthesia includes flaccid muscle paralysis - myoplegia and muscle relaxation. The use of modern local anesthetics, the use of disposable needles of small diameter (respectively, low-traumatic due to a significant reduction in traumatization of paravertebral tissues), simple intraoperative monitoring allow the use of spinal anesthesia for various diseases of the abdominal organs that require surgical intervention, both in planned and and on an emergency basis [7, 8, 13].

However, it must be remembered that spinal anesthesia also has negative aspects - a decrease in the total peripheral vascular resistance with a subsequent drop in blood pressure and redistribution of the intravascular volume of fluid with a sharp decrease in the tone of capacitive and resistive vessels [5, 6, 10], and with high spinal anesthesia, paresis of the respiratory muscles can also develop. In this regard, it is urgent to search for new methods of regional anesthesia during operations on the upper floor of the abdominal cavity, which are highly effective and do not bring side and undesirable effects for the patient.

The aim of the work was to develop criteria for evaluating the effectiveness and safety of high spinal anesthesia when performing operations on the upper floor of the abdominal organs.

MATERIALS AND METHODS

For the period from 2016 to 2018 112 operations were performed on the upper floor of the abdominal cavity: 77 men, 35 women. The average age of the patients was 54.6 ± 11.2 years.

All patients were randomized into three groups depending on the type of anesthesia performed: the first group (n = 55) —operative interventions were performed under high spinal anesthesia (ICA) (according to the technique we developed); the second group (n = 31) - surgical interventions were performed under conditions of endotracheal anesthesia (ETN); the third group (n = 26) - surgical interventions were performed under conditions of epidural anesthesia (EA).

Inclusion criteria were: performing planned or emergency surgery on the upper floor of the abdominal cavity; personal consent of the patient to participate in the study.

Postoperative pain relief was assessed using a visual analogue scale for the effectiveness of pain relief (VAS). The development and prevalence of the sensory block was recorded using the Pin Prick test (loss of skin pain sensitivity in response to irritation with a needle). A modified Bromage scale was used to assess motor blockade.

All patients, 2-3 days before the operation, underwent the whole complex of clinical, laboratory and instrumental studies, including non-invasive assessment of the parameters of central hemodynamics.

The state of the circulatory system and respiration was recorded using the device "Nihon" (Japan), carrying out automatic non-invasive measurement of blood pressure with an interval of 5 minutes, heart rate (HR), pulse finger oximetry. Changes in hemodynamic parameters were recorded at stages: I - initial;

II - induction (after the administration of the spinal dose, the main hemodynamic parameters were analyzed and the maximally reduced hemodynamic parameters were selected); III - skin incision; IV - during the operation; V - the end of the operation; VI - in the postoperative period, every 2 hours.

The following indicators were analyzed: systolic blood pressure (BP syst.); diastolic blood pressure (blood pressure diast.); Heart rate; saturation of hemoglobin with oxygen (pO2). We considered a decrease in BPsyst to be severe hypotension. by 30% or more from the initial values or below 100 mm Hg. Art.

Cardiac output was calculated using Starr's formula (T.S. Vinogradova, Yu.M. Levinson, 1969):

SV (cardiac output) = SW (shock output) x heart rate, where SW = 100 + 0.5 x (syst. BP - diast. BP) - 0.6 x xdiast. - 0.6 x age.

The structure of surgical pathology is presented in Table 1.

Table 1

Nosological structure of operated patients

Nosology	Quantity	% from total
Cholelithiasis	36	32,1
Giantincisionalventralhernia	46	41
Peritonitis	5	4,4
Thrombosisofmesentericvessels	1	0,89
Giantuterinefibroids	12	10,7
Adhesivedisease	3	2,6
Colonicobstruction	3	2,6
Paraumbilicalandumbilicalhernia	6	5,3

Most of the patients were operated on for cholelithiasis (32%) and postoperative ventral hernias (41%).

We have developed and proposed a method for one-stage high spinal anesthesia with the development of a high neuromuscular block to the level of the first and second thoracic vertebrae (Th1 2), which allows performing surgery on the upper floor of the abdominal cavity [9]. The method is carried out as follows: before the operation, the patient is premedicated using narcotic or non-narcotic analgesics according to the generally accepted method (depending on the expected volume of surgery). High spinal single-stage anesthesia is performed with a median or paramedial approach, taking into account age-related changes (paramedial access is preferred). The greatest advantage is the position of the patient lying on his side ("in the embryo position"). After local anesthesia, a puncture is performed with a small-diameter needle (25 G or less) in a typical place (at the L level) and a solution of lidocaine 2% - 2.0 (40 mg) is injected into the subarachnoid space. In order to reduce trauma to the dural membrane of the spinal cord, the needle cut during the puncture of the dura mater is directed sagittally (to the right or to the left). During the introduction of an isobaric solution of marcaine (in a total dose of 15-20 mg), the needle section is located as cranially as possible (upward) in order to spread the anesthetic solution to the upper sections of the spinal column. The time of one-stage injection of the anesthetic with bubbling of cerebrospinal fluid in a volume of up to 5-10 ml is on average 1-2 minutes, which makes it possible to create a high degree of turbulence in the injected solution, and also contributes to the distribution of vortex flows in the cranial direction of the cerebrospinal fluid in order to dissolve the distribution of the anesthetic further from the injection site and the formation of adequate and prolonged sympathicolysis.

Further regulation of the development of the block and control of the blockade are carried out by changing the position of the operating table: by tilting the head end of the table to 45-60 ° and controlled by non-invasive measurement of blood pressure, by monitoring the heart rate by pulse oximetry up to 65 per minute. The result is the development of the neuroaxial block as much as possible up to the level of the first and second thoracic vertebrae (Th12). Sedation of the patient is carried out with a solution of phenazepam - 1 mg (1.0 ml) simultaneously or fractionally during the entire time of the surgical intervention.

All patients undergo oxygen inhalation through a face mask or nasal catheters-4.0 l / min, as well as an assessment of the sensory and motor blocks of neuraxial blockade. After reaching the level of the first or second thoracic vertebra (Th1 2), surgery is performed under balanced high spinal anesthesia: with adequate infusion-corrective therapy, the volume of which depends on intraoperative losses, but not less than 1500-2000 ml, as a rule, crystalloid solutions are used.

In the postoperative period, non-narcotic analgesics are used for anesthesia: 4-6 hours after high spinal anesthesia is performed, when the first signs of recovery of pain, motor and sensory innervation appear.

RESULTS

As the results of our study showed, hemodynamics at the stages of surgery changed in all groups of patients. Indicators of the number of patients with altered hemodynamics are presented in Figure 1.

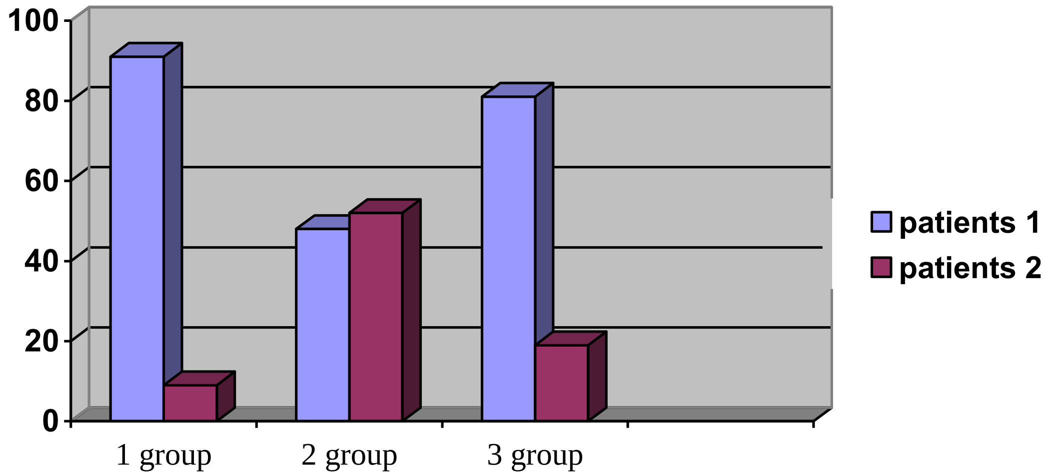

Fig. 1. The number of patients with hemodynamic changes in groups. Differences between the ICA - ETN groups are statistically significant at p = 0.002; BCA - EA - at p = 0.03; ETN - EA - at p = 0.004.

The diagrams show that in all the studied groups there was a decrease in hemodynamic parameters, however, it was most pronounced in patients of the second group (ETH), less pronounced in patients of the third group (EA) and even less pronounced in the first group (ICA). The dynamics of hemodynamic parameters at the main stages of operations is shown in Figure 2.

The greatest decrease in blood pressure was observed in the group of patients who were operated on under the ETN, which had statistically significant differences in comparison with the group of patients operated on under the ICA (p = 0.009). There were also statistically significant differences in blood pressure between the group of patients operated on under the ICA and the group of patients operated on under EA (p = 0.0022).

The indicators of diastolic blood pressure changed in a similar way. So, there was a statistically significant difference between the diastolic pressure indicators in the first and second (p = 0.03), first and third (p = 0.02), second and third groups of patients (p = 0.03).

Evaluating the dynamics of heart rate, we noted that there was some tendency to decrease the heart rate from the baseline values, but the differences were statistically insignificant (p = 0.08). The most pronounced bradycardia was noted at the stages of induction - skin incision - the main stage in the group of patients who underwent ETN. In the group of patients who underwent EA, the heart rate did not statistically significantly change in relation to the baseline values (p = 0.8).

Hemodynamic differences in the groups were also manifested by changes in the shock ejection. In the main group of patients, the shock ejection slightly decreased in a number of patients, however, in general, its decrease from the initial values did not have statistically significant differences ($p = 0.1$). In the third group of patients, there was also no decrease in this indicator, however, in patients of the second group, a decrease in SW

at the time of induction and skin incision had a statistically significant difference ($p = 0.0007$).

In the early postoperative period, patients of the first and third groups did not require anesthesia with narcotic analgesics; there was a rapid recovery of intestinal motility and early activation on the 1st and 2nd day (including the drinking regimen). Complications in the form of headaches, nausea, vomiting, temperature were not noted. Also, there were no complications from surgery and anesthetic benefits.

In terms of simplicity and technique of execution, as well as in terms of material support, high spinal anesthesia is close to epidural anesthesia, but, in contrast to it, it provides a sufficient, long-term and high level of anesthesia of the abdominal organs (both on the lower and middle and upper floors). In comparison with "traditional" methods of anesthesia, with high spinal anesthesia, the risk of thromboembolic complications decreases, the volume of blood loss decreases, the risk of complications from the respiratory and cardiovascular systems decreases, the duration of postoperative intestinal paresis is reduced, compared with systemic administration of promedol and other opioids.

As an illustration of the effectiveness of high ¬ spinal anesthesia, we will give a clinical example.

Patient S., 73 years old, was admitted routinely to the surgical department of the hospital with a diagnosis of giant incisional ventral hernia. For this disease, the patient considers herself sick since 1983, when she first noticed a hernial protrusion in the postoperative scar (cholecystectomy in 1982). The patient has a history of: AH stage III, risk II; type 2 diabetes mellitus; obesity III-IV stage. (height 158 cm; weight 130 kg).

After premedication with the use of narcotic analgesics (promedol), the patient underwent high spinal anesthesia in the operating room with a G-25 needle in the sitting position, anesthetic marcaine (bupivacaine) in an amount of 20 mg with an adjuvant - adrenaline 0.1% - 0, 1 ml at the L level, with paravertebral access on the right, after preliminary anesthesia of the access point (lidocaine 2% - 40 mg). The neuromuscular block has developed to the clavicular regions, which corresponds to the first-second thoracic vertebrae (Th12). In addition, the patient was sedated with phenazepam - 1 mg (in total) and ketamine - 100 mg (fractionally at the final stage of surgical treatment). The success rate for high spinal anesthesia was 100%. Assessment of the location and severity of the block was carried out by a needle injection and palpation (determination of pain sensitivity). The level of spinal anesthesia was regulated by changing the angle of inclination of the operating table. The patient underwent hernia repair, preperitoneal plastic surgery with a mesh polypropylene prosthesis. Intraoperative blood loss was 500 ml. Infusion-corrective therapy was carried out into the peripheral vein and amounted to 5600 ml. Hypotonic hemodynamic drops were observed at the initial stage of surgery during the development and formation of a neuromuscular block in the form of a decrease in heart rate to 48 per minute (correction - fractional administration of atropine 0.1% - 1.0), as well as a peripheral vascular resistance with a subsequent redistribution of the intravascular volume of fluid with a decrease in the tone of capacitive and resistive vessels. Subsequently, hemodynamics proceeded according to the normotensive type against the background of an adequate intravascular rate of administration of solutions. The time of anesthetic benefit was 4 hours 25 minutes. The operation time was 4 hours and 20 minutes. After the operation, the patient was transferred to the general ward of the surgical department and was discharged from the hospital on the 14th day after the removal of the stitches, without complications.

CONCLUSIONS

The use of high spinal anesthesia for upper abdominal surgery is the treatment of choice. This type of anesthesia has advantages over other types of anesthesia, since it does not have a pronounced effect on the indicators of central hemodynamics and is more easily tolerated by patients. The proposed method of regional anesthesia - high spinal anesthesia - has broad prospects for use in clinical practice.

LITERATURE

1. Barakh P.D., Cullen B.F., Stalting R.K. Clinical anesthesia. - M .: Medicine, 2007 .-- 300 p.

Barakh PD, Kullen BF, Stelting RK. (2007). Clinical anesthesia [Klinicheskaya anesteziya]. Moskva, 300 p.

2. Borovskikh N.A., Rosengard S.A. Medical provision of prolonged subarachnoid anesthesia // Mater. interregion. scientific-practical conf. surgeons "Minimally invasive technologies in surgery". - Makhachkala, 2006 .-- S. 61-62.

Borovskikh NA, Rosengard SA. (2006). Drug support of the prolonged subarachnoid anesthesia [Medicamentoznoe obespechenie prodlennoy subarakhnoidal'noy anestezii]. Materialy mezhregional'noy nauchno-praktich-eskoy konferentsii khirurgov "Maloinvazivnye tekhnologii v khirurgii". Makhachkala, 61-62.

3. Vitenbek I.A., Kovalenko G.A., Isangulova S.G. Adverse reactions and complications of epidural analgesia with local anesthetics and narcotic analgesics // Anesthesiology and resuscitation. - 1987. - No. 5. - S. 62-66.

Vitenbek IA, Kovalenko GA, Isangulova SG. (1987). Adverse reactions and complications of epidural local anesthetics and narcotic analgesics [Pobochnye reaktsii i oslozhneniya epidural'noy analgezii mestnymi anesthetics i narkoticheskimi anal'getikami]. Anesteziologiya i reanimatologiya, (5), 62-66.

4. Gaikovich A.A. Problems of labor pain relief: bupivacaine or ropivacaine // Tez. report VIII All-Russia.

congress of anesthesiologists and resuscitators. - Omsk, 2004 .-- S. 46-47.

Gaikovich AA. (2004). Problems of labor analgesia: bupivacaine and ropivacaine [Problemy obezbolivaniya rodov: bupivakain ili ropivakain]. Tezisy dokladov VIII Vse- rossiyskogo sjezda anesteziologov i reanimatologov. Omsk, 46-47.

5. Koryachkin V.A., Strashnov V.I. Spinal and epidural anesthesia. - SPb., 2000 .-- 238 p.

Koryachkin VA, Strashnov VI. (2000). Spinal and epidural anesthesia [Spinnomozgovaya i epidural'naya anesteziya]. Sankt-Peterburg, 238 p.

6. Kuzin M.I., Kharnas S.Sh. Local anesthesia. - M .: Medicine, 1982 .-- 143 p.

Kuzin MI, Kharnas SS. (1982). Local anesthesia [Mest noe obezbolivanie]. Moskva, 143 p.

7. Nikoda V.V., Bondarenko A.V. Continuous epidural infusion of ropivacaine in the postoperative period // Anesthesiology and Reanimatology. - 2006. - No. 5. - S. 76-79.

Nikoda VV, Bondarenko AV. (2006). Continuous epidural infusion of bupivacaine in postoperative peri¬od [Postoyannaya epidural'naya infuziya ropivakaina v posleoperatsionnom periode]. Anesteziologiya ireanima- tologiya, (5), 76-79.

8. Ovechkin A.M., Gnezdilov A.V. Naropin (ropivacaine) in pain management: an ideal choice? // Bulletin of intensive care. - 2000. - No. 3. - S. 13-17.

Ovechkin AM, Gnezdilov AV. (2000). Naropin (ropiva¬caine) in the treatment of pain: perfect choice? [Naropin (ropivakain) v lechenii boli: ideal'nyy vybor?]. Vestnik intensivnoy terapii, (3), 13-17.

9. Method of high spinal anesthesia during operations on the upper floor of the abdominal cavity: Patent 2599044 Ros. Federation; IPC A61M19 00 / Plekhanov A.N., Yakushevsky A.B .; applicant and patentee of the Federal State Budgetary Educational Institution of Higher Professional Education "Buryat State University". - No. 2015134630; declared 08/17/2015; publ. 10.10.2016.

Plekhanov AN, Yakushevskiy AB. (2016). Method of high spinal anesthesia in upper abdomen surgeries [Sposob vysokoyspinal'noy anesteziipri operatsiyakh na verkhnem etazhe bryushnoy polosti: Patent2599044Ros. Federatsiya].

10. Shtabnitsky A.M. Ropivacaine - an alternative to bupivacaine in obstetrics // Bulletin of intensive therapy. - 2001. - No. 1. - S. 51-54.

Shtabnitsky A.M. (2001). Ropivakain - an alternative to bupivacaine in obstetrics [Ropivakain - al'ternativa bupivakainu v akusherstve]. Vestnik intensivnoy terapii, (1), 51-54.

11. Shurygin I.A. Spinal anesthesia for caesarean section. - SPb .: Dialect, 2004 .-- 192 p.

Shurygin IA. (2004). Spinal anesthesia at cesarean operation [Spinal'naya anesteziya pri kesarevomsechenii]. Sankt-Peterburg, 192 p.

12. Alley EA. (2008). Hyperbaric spinal levobupiva- caine: a comparison to racemic bupivacaine in volunteers. Anesth. Analg. 94, 188-193.

13. Atanassoff PG, Ocampo CA. (2006) Ropivacaine 0.2% and Lidocaine 0.5% for intravenous regional anes¬thesia in outpatient surgery. Anesthesiology, 95, 627-631.

14. Berti M, Casati A, Fanelli G. (2007) Ropivacaine 0.2% with or without fentanyl for patient-controlled epidur¬al analgesia after major abdominal surgery: a double-blind study. Anesthesiol. 12, 292-297.

15. Carvalho AC. (2007) Spinal anesthesia with 0.5% hyperbaric ropivacaine and 0.5% hyperbaric bupivacaine: a comparative study. Revista Brasileira de Anestesiologia, 52, 659-665.

16. Fritz BA. (2016) Convergent validity of three methods for measuring postoperative complications. Anesthesiol. 12, 89-91.

17. Horlocker TT. (2005) Neurologic complication of spinal and epidural anesthesia. Reg. Anest. Pain Med. 25, 83-98.

18. Tanaka E. (2016). Lidocaine concentration in oral tissue by the addition of epinephrine. Anesth. Prog., 63, 17-24.