

## Low-volume spinal anesthesia with Longocain for the lower limb arthroscopy as a reliable and efficient method of conduction anesthesia.

«The whole is acquired partially»  
*Seneca*

Spinal anesthesia is the most commonly used technique of conduction anesthesia for the lower limb surgery. Arthroscopic operations on hip, knee and ankle joints are not the exception [4, 9]. In our hospital, the frequency of spinal anesthesia use for these interventions is 76% and the number of such operations per year is more than 300.

In this article the authors share the experience of Longocain and Longocain Heavy (Yuria-Pharm, Ukraine) use, which have recently appeared on the Ukrainian market and aroused particular interest. The active substance of these drugs is known 0.5% bupivacaine. The difference is only in drugs baricity: Longocain is an **isobaric** 0.5% bupivacaine solution, Longocain Heavy is a **hyperbaric** 0.5% bupivacaine solution, its higher density is due to the addition of 8% dextrose solution (glucose).

It seems that every anesthesiologist, who uses local anesthetics in his own practice, makes special demands on them.

1. First of all, it's the efficacy and safety of the drug. Apart from pure anesthetic properties, local anesthetics must be non-toxic and must not irritate the spine radices in the subarachnoid space or meninges [8]. The risk of adverse effects on patient may be minimized by using the lowest effective dose of local anesthetic [9]. Lowdose spinal anesthesia makes a special contribution to the safety of the methodology.

2. A sufficient concentration effect. It is necessary to select such concentration of anesthetic to achieve sufficient block depth, and block onset time. The use of the 0.75% bupivacaine solution provides a faster effect than the equivalent dose of 0.25% solution in milligrams [6, 8]. The advantage of higher concentrations use can be negated by the risk of a rapid increase of blood drug levels to the toxic range [6, 8]. Therefore, authors selected for the study 0.5% bupivacaine solution (Longocain), which has the optimized drug concentration to ensure sufficient block depth and onset time.

3. Selection of the appropriate volume of local anesthetic. The toxicity of drugs increases along with the volume [6, 8, 9]. We used the low-volume doses of 0.5% bupivacaine solution (Longocain), which were less than 10 mg.

4. The baricity of local anesthetic. Due to the specificity

of hyperbaric solutions spread in subarachnoid space, it is possible to perform a selective unilateral block of the lower limb, which allows achieving the desired anesthesia level, with minimizing its effect on the patient's body [2, 5].

5. Duration of action. The duration of the local anesthetic blocking is determined by many factors, the essential one is the type of drug used. The specific lipid affinity and the ability to bind with proteins determine the time of the drug effective action on the lipid layer of the nerve cell membrane. It is difficult to foresee the influence of other factors on clinical activity duration and it depends on the characteristics of drug action and the patient's individual characteristics [6].

Among the available drugs on the Ukrainian market, which are allowed to intrathecal administration, we use lidocaine and bupivacaine (table 1). From our point of view, bupivacaine predominates lidocaine in many characteristics (no neurotoxicity, longer action, available officinal hyperbaric form, less marked arterial hypotension than in the case of lidocaine use [8], accostable drug price).

**Objective** of the work: to study the efficiency, safety, reliability and control of low-volume doses of Longocain and Longocain Heavy in spinal anesthesia for lower limbs arthroscopic interventions.

### Research materials and methods

The authors performed 53 spinal anesthetics. All patients underwent spinal anesthesia (SA) in the lateral position. Patients were divided into two groups (table 2).

We investigated the development of vegetative, pain and motor blocks on both sides. A clinical assessment of the sensory blocking was carried out by a "pinprick" test (loss of skin pain sensitivity in response to a needle irritation), a vegetative blocking - by the cold test. The Bromage [8] scale was used to estimate the depth and duration of the motor blocking. The block characteristic included the determination of the maximum segmental level, the time when it was reached, and sensitivity recovery. Tests were performed at five-minute intervals during the first 20 minutes, then after the end of the operation and every 15 minutes until the block was completely regressed.

The authors performed a preoperational infusion of

crystalloid solutions in the amount of 10-12 ml/kg (700-800 ml) within 15-20 minutes, followed by the intraoperative infusion of crystalloid solutions in average volume up to 1000 ml, they also measured arterial blood pressure, pulse and saturation before, during and after the operation. The patients' physical status in both groups corresponded to the 1-2 class on the ASA scale [3], the average age was (34.6 ± 4.3) years old, the average duration of the operation was (64 ± 15 minutes). Premedication was not performed to patients. During the operation, the patients were fully conscious. After surgery, all patients were taken to the ward.

**Results of the study**

The results obtained in both groups are presented in table 3.

**Conclusions**

1. Both drugs (Longocain and Longocain Heavy) demonstrated 100% reliability and efficiency. All patients developed the predicted level of spinal block.

2. The absence of any allergic reactions after the intrathecal administration of Longocain and Longocain Heavy represents their safety (which is typical for amide anesthetics).

3. The results showed that the use of small amounts of

Longocain and Longocain Heavy is a sufficiently controlled method of subarachnoid anesthesia. The use of small volumes made it possible to achieve the necessary anesthesia, minimizing its effect on patient's body.

4. The use of the Longocain Heavy has resulted in a quality unilateral (selective) block required only for the area of surgery.

5. The successful selective unilateral subarachnoid anesthesia was achieved due to the adherence to number of rules while performing it: the choice of hyperbaric anesthetic (Longocain Heavy), patient's positioning taking into account baricity of the anesthetic drug (position on the sick side), the use of small amounts of anesthetic drug (< 10 mg), the low speed of drug injection and the timing of the fixed time frames.

6. The spinal anesthesia coverage for many trauma and general surgery operations is obviously excessive because the area of surgery is much smaller than the zone of blocking development. Greater use should be made of selective SA techniques to minimize possible complications and improve the conditions of the patient's stay on the operating table.

The reference list is in the editors office.

**Table 1. Comparative characteristic of bupivacaine and lidocaine for intrathecal administration**

The drug	Time of action [4, 7-9]	Toxicity	Relative potency [8, 9]	The onset of action [9]	Time of fixation to the nerve radices [8, 9, 11]	The availability of hyperbaric form
Bupivacaine 0,5%	1.5-3 hours	Cardiotoxic in case of IV injection*	28	10-15 minutes	Is quickly fixated	Yes (Longocain Heavy)
Lidocaine 2%	45 minutes-1.5 hours	Neurotoxicity (cauda equina syndrome) [7, 9-11]	4	5-7 minutes	Fixates badly and can "crawl" up (risk of high blocking)	5% solution is moderately hyperbaric (in such concentration it may have a neurotoxic effect)

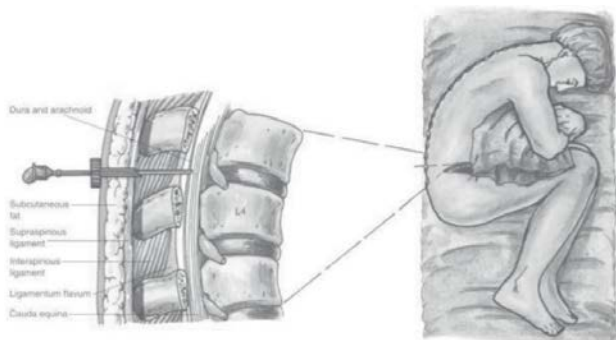
Note: \*- more pronounced cardiotoxicity of bupivacaine comparing to lidocaine for spinal anesthesia makes no difference because of low doses [9].

**Table 2. Groups of patients**

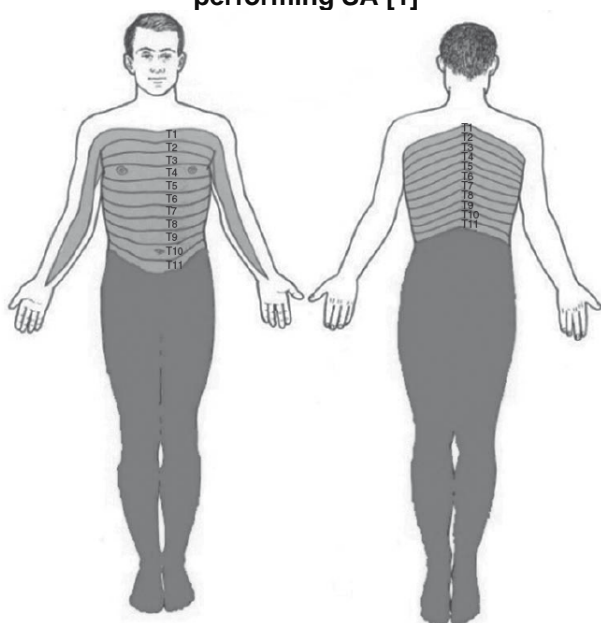
Group	Drug, which is administered intrathecally	Dose, mg	Position on the table (fig.1)	Puncture level	Time of exposition
Group 1	Longocain	9 mg	On the one side	L <sub>III</sub> L <sub>IV</sub>	-
Group 2	Longocain Heavy	9 mg	On a sick side	L <sub>III</sub> -L <sub>IV</sub>	15 minutes

**Table 3. Spinal block characteristic and patient status indicators**

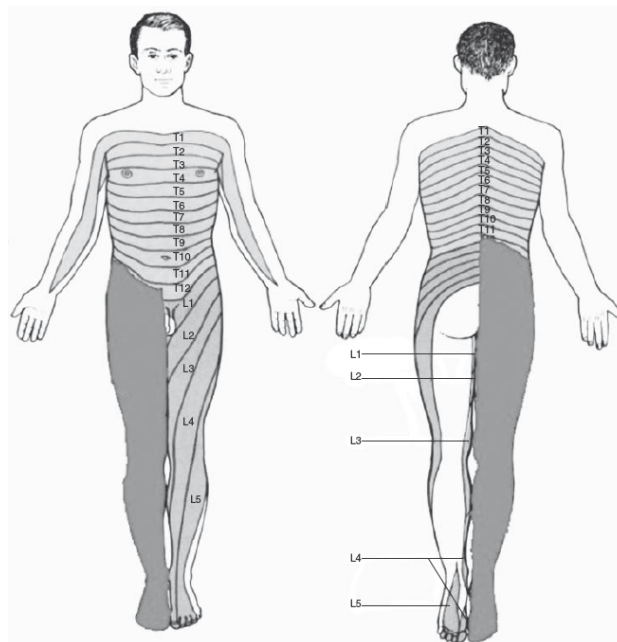
Indicator	Group of patients	
	1-Longocain (n=27)	Longocain Heavy (n=26)
Block onset time	In 18-22 minutes	In 15-17 minutes
Somatic sensory block level (Figure 2, 3)	Th <sub>XI</sub> -Th <sub>XII</sub>	Th <sub>XI</sub> (unilateral)
Motor block degree on Bromage scale[8]	21 patients-3rd degree 5 patients-2nd degree 1 patient-1st degree	All patients had the third degree (full motor block of lower limb)
Block recovery time	150-180 minutes	170-200 minutes
Blood pressure	Most patients maintained stable hemodynamics. An additional infusion of 400 ml of the multi-component polyion colloid-hyperosmolar solution Gekoton (130:0.4) was required in 3 cases	Completely stable hemodynamics that does not require an additional fluid load
Pulse	There was a tendency towards a decreased pulse rate (decreased by 6-12%)	No significant deviations
Saturation	Usually declined but slightly (2 to 5%)	No changes
Shivering during surgery	12 (44%) patients	5 (19%) patients
Comfort on the operating table	7 patients noted discomfort due to loss of sensitivity below the waist	All patients felt comfortable on the operating table. The loss of sensitivity only in the sick limb was perceived positively



**Figure. 1. The patient's position on the side while performing SA [1]**



**Figure. 2. Somatic sensory block level in Group 1**



**Figure. 3. Somatic sensory block level in Group 2**