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# PERIDURAL ANALGESIA DURING OPERATIVE INTERVENTIONS IN ABDOMINAL SURGERY

***Abstract.*** *We compared anesthetic management for high-traumatic and reconstructive abdominal surgeries using general anesthesia in combination with peridural analgesia by an infusion of a standard solution of 0.25% Longocain and bolus dosing of prepared bupivacaine. It has been established that the combination of general anesthesia with peridural analgesia by means of an infusion of a standard solution of 0.25% Longocain is optimal regarding the course and the use of anesthetic drugs.*

***Key words:*** *peridural analgesia, anesthetic management in abdominal surgery.*

The range of surgical interventions in abdominal surgery includes both long-lasting high-traumatic in terms of their extent and short-lasting less traumatic endoscopic surgeries. Inadequate analgesia during a surgical intervention and the postoperative period induces the stress response and may lead to the dysfunction of the gastrointestinal tract, respiratory, cardiovascular disorders, contributes to chronic pain syndrome, which significantly delays the postoperative recovery, prolongs the rehabilitation period and increases the cost of treatment [1—4]. Endoscopic surgery and less traumatic interventions are not pretentious to the state-of-the-art capabilities of the anesthetic management. An active implementation of Sevoflurane anesthesia in the semi-closed contour of low-flow anesthesia in combination with the intravenous component guarantees a sufficient highly controlled and safe range of anesthetic managements for surgical interventions of this category [5—7]. At that, long-lasting, high-traumatic and reconstructive abdominal surgeries require an uneventful and sufficient analgesic component during a surgery with a minimal impact on hemodynamics, prevention of traumatic intestinal ischemia due to manipulations, the term of the intervention. Unlike short-lasting abdominal surgeries, long-lasting and reconstructive procedures require a smooth postoperative analgesia, which reduces the number of early postoperative complications and the terms of inpatient treatment [8—14]. In addition to the mentioned above, in patients preparing for reconstructive, long-lasting and traumatic surgeries, a concomitant pathology is often present, as well as long-lasting digestive disorders, which reduces the patient's ability to adapt to the operational trauma, the postoperative period course. At the same time, it should be noted that by no means all of high-traumatic surgeries on the abdominal organs are performed at the tertiary level. A high enough percentage of the surgeries are accounted for district and city hospitals, which limits the applicability of sophisticated diagnostic and monitoring methods and anesthesia and respiratory devices of the new generation. Therefore, simplification and accessibility to the possibilities of the anesthetic management of the surgeries belonging to this category under technically limited conditions are required [15—18].

One of the most accessible and quite controlled anesthetic techniques for long-lasting surgeries on the abdominal organs is using a combination of general anesthesia with peridural analgesia [19—21]. As known, the limitation of using spinal and peridural anesthesia during abdominal surgeries is related to a complete sympathetic block, which is clinically realized by negative effects on hemodynamics. Whereas peridural anesthesia has a minimal hypotensive effect on hemodynamics and does not induce the blood stasis. That is exactly why we used peridural analgesia as a component of general anesthesia for anesthetic managements of reconstructive and high-traumatic abdominal surgeries. Moreover, the introduction of peridural analgesia into the complex of the postoperative management of this category of patients provides better outcomes of surgical treatment. However, the uneventfulness and pronouncement of the analgesic component during peridural analgesia largely depend on the characteristics of the local anesthetic, its availability and mode of administration [22].

That is exactly why the objective of our study was to compare the techniques of peridural analgesia during anesthetic management of high-traumatic and reconstructive abdominal surgeries using the most available local anesthetics and methods of drug administration into the peridural space.

## Materials and Methods

The anesthetic management of 45 patients with the 3rd degree of the surgical risk according to ASA undergoing elective high-traumatic abdominal surgeries (gastric resection, gastroentero-, entero-entero-, choledocho-duodeno-anastomoses, ulcer resections, giant ventral hernias) in the environment of the Vinnytsya Regional Clinical Hospital was analyzed. The patients were randomized according to their age, the surgery extent and duration and divided into 2 groups depending on the anesthetic management techniques. In Group 1, we used the combination of general anesthesia with endothracheal mechanical lung ventilation (e/t MLV) and peridural analgesia by 0.25% bupivacaine solution, which was obtained by dilution of 0.5% standard solution and administered in a bolus on the basis of 1.7 ml per a segment of the surgical area. In Group 2, we used the combination of general anesthesia with e/t MLV and peridural analgesia with 0.25% *Longocain* standard solution, which, at the beginning of anesthesia, was administered in a bolus on the basis of 1.7 ml per a segment of the surgical area and further in an infusion. In Group 1, in the postoperative period, bolus dosing of 0.25% bupivacaine (diluted from 0.5% solution) was used for anesthesia against the background of non-narcotic analgesics; in Group 2, an infusion of 0.25% *Longocain* standard solution was used.

The following hemodynamic indices were analysed: dynamics of the mean arterial pressure (MAP), dynamics of the heart rate (HR), of the cardiohemodynamic index, the gas exchange indices. The amounts of used drugs for anesthesia, infusion and symptomatic therapy were compared. Also, the postoperative period course was analyzed on the basis of the hemodynamic indices and the visual analog scale (VAS) for pain. The data were statistically processed.

## Results and their discussion

The comparative analysis of the anesthetic management course in the patients of the two groups showed its more uneventful course in the patients of Group 2. Thus, in Group 1 patients, significant MAP variations between the minimum and maximum values during anesthesia were established, which was not observed in Group 2 (Table 1). In Group 1, a significant trend to hypokinetic hemodynamics (min. MAP 84.0 ± 1.6 mm Hg) was also established which was not observed in Group 2. Therefore, a constant infusion of standardized 0.25% Longocain solution is less associated with hemodynamic variations than a bolus dosing of bupivacaine. At the end of a surgery, no significant difference in the MAP values vs baseline data was observed in both groups.

The similar statistic patterns were found during the analysis of the MAP values and cardiohemodynamic index.

In total, the analysis of the amounts of used drugs for anesthesia, infusion and symptomatic therapy demonstrated their significantly less amounts in Group 2 patients (Table 2). Thus, the Sevoflurane concentration, the amounts of used Propofol and Fentanyl were significantly less in Group 2 vs Group 1: in Group 2, the mean concentration of Sevoflurane was 1.2 ± 0.1 vol/%, that of Fentanyl was 3.1 ± 0.2 μg/kg/hour; that of Propofol was 1.4 ± 0.1 μg/kg, and that of colloids 166 ± 0.1 ml/kg/hour, which is significantly less compared to the similar indices in Group 1.

Therefore, the applied technique of the standard 0.25% Longocain solution infusion for peridural analgesia in patients with elective surgeries on the abdominal organs is the most balanced regarding the course and the use of the anesthetic management means.

When analyzing the hemodynamic indices of the first postoperative day, it was established that the baseline MAP values did not significantly differ in Groups 1 and 2 and were 91.2 ± 2.1 mm Hg and 90.7 ± 2.2 mm Hg, respectively (Table 3). Wefound a significant difference in the increase in the maximum MAP up to 101.7 ± 2.5 mm Hg in Group 1 patients vs the maximum MAP of 94.3 ± 2.4 mm Hg in Group 2. Variations between the maximum and the minimum MAP were also observed when using a bolus dosing of Bupivacaine and, in Group 1, they were: max. MAP was 101.7 ± 2.5 mm Hg; min. MAP was 89.1 ± 1.9 mm Hg. When using *Longocain* infusion, the hemodynamic variations were insignificant.

***Table 1. Hemodynamic indices during the anesthetic management***

| Indices | Group 1 (n = 23) | Group 2 (n = 22) |
|---|---|---|
| Baseline MAP (mm Hg) | 91.2 ± 2.1 | 90.7 ± 2.2 |
| Maximum MAP (mm Hg) | 93.8 ± 2.2 | 92.8 ± 2.0 |
| Minimum MAP (mm Hg) | 84.0 ± 1.6* | 88.9 ± 1.7** |
| At the end of the surgery, MAP (mm Hg) | 89.3 ± 1.9 | 89.5 ± 1.8 |

***Notes: * — p < 0,05 vs maximum MAP; ** — p < 0,05 vs Group 1.***

***Table 2. Use of anesthetics and drugs for correction of hemodynamic disorders***

| Indices | Group 1 (n = 23) | Group 2 (n = 22) |
|---|---|---|
| Sevoflurane (gen. vol/%) | 1.5 ± 0.1 | 1.2 ± 0.1* |
| Fentanyl (μg/kg/hour) | 3.8 ± 0.2 | 3.1 ± 0.2* |
| Propofol (μg/kg) | 1.7 ± 0.1 | 1.4 ± 0.1* |
| Colloids ml/kg) | 1.6 ± 0.2 | 1.1 ± 0.1* |

***Note: * — p < 0,05 vs Group 1.***

*Table 3. Hemodynamic indices of the first postoperative day*

| Indices | Group 1 (n = 23) | Group 2 (n = 22) |
|---|---|---|
| Baseline MAP (before surgery) (mm Hg) | 91.2 ± 2.1 | 90.7 ± 2.2 |
| Maximum MAP (mm Hg) | 101.7 ± 2.5 | 94.3 ± 2.4** |
| Minimum MAP (mm Hg) | 89.1 ± 1.9* | 88.1 ± 2.1 |
| VAS (mm) | 49.8 ± 4.2 | 37.9 ± 3.6** |
| Maximum HR (bpm) | 98.9 ± 2.8 | 91.3 ± 1.8 ** |
| Minimum HR (bpm) | 76.4 ± 2.5* | 85.4 ± 2.6** |

***Notes: * — p < 0,05 vs maximum MAP; ** — p < 0,05 vs Group 1.***

*Table4 . Use of pharmaceuticals in the postoperative period*

| Indices | Group 1 (n = 23) | Group 2 (n = 22) |
|---|---|---|
| NSAIDs (Ketanov) (mg/kg/day) | 1.4 ± 0.1 | 1.0 ± 0.1* |
| 0.25% local anesthetic (mg/kg/hour) | 3.4 ± 0.3 | 2.5 ± 0.2* |
| Colloids / sympatomimetic therapy (persons/%) | 6/26 | 4/18 |

***Note: * — p < 0,05 vs Group 1.***

The found regularities of the arterial pressure variations correlated with the variations of the VAS for pain values. Thus, the VAS value was 49.8 ± 4.2 mm in Group 1 and significantly higher than the VAS in Group 2 мм (37.9 ± 3.6 mm). Significant differences in the HR variations were noted in Group 1 between the minimum and the maximum values, which significantly differed from the relevant values in Group 2. In Group 2, when using *Longocain* infusion, no significant HR variations were found.

Therefore, the 0.25% *Longocain* use provides a more hemodynamically uneventful course of the pain syndrome in the early postoperative period.

The analysis of the amounts of drugs used on the first postoperative day for anesthesia, sympatomimetic support and symptomatic therapy totally showed their significantly less amounts in Group 2 patients (Table 4). Thus, the amounts of nonsteroidal anti-inflammatory drugs (NSAIDs) used as background analgesics was significantly less in Group 2 patients (1.0 ± 0.1 μg/kg/day); the dose of used *Longocain* was significantly less compared to Bupivacaine; the frequency of the use of infusion drugs in Group 1 was by 8 % higher vs Group 2.

Therefore, 0.25% *Longocain* infusion provides a more uneventful course of the pain syndrome in the early postoperative period, which correlates with using lower doses of analgesics.

A similar pattern of using optimal doses of medicines was observed on the 2nd and 3rd postoperative days.

The long-term indices of the postoperative period course and treatment were analyzed. The term of peristalsis appearance and intestinal transit recovery was compared. Thus, in Groups 1 and 2, the peristalsis appeared after 2.2 ± 0.1 та 2.0 ± 0.1 days, respectively, which had no significant difference, but differed from the terms when using general anesthesia alone. Similar patterns were obtained when evaluating the terms of the complete intestinal recovery and those of inpatient treatment.

## Conclusions

1. Using peridural analgesia by means of 0.25% *Longocain* infusion both during the anesthetic management in abdominal surgery and after operative time provides smaller hemodynamic variations compared to bolus dosing of a similar concentration of Bupivacaine.

2. Using factory-made local anesthetic formulations (0.25% *Longocain* in our study) provides a more uneventful course of the anesthetic management and postoperative period compared to Bupivacaine solutions prepared from other concentrations.

3. This method provides less using drugs for anesthesia and contributes to an uneventful course of the postoperative period.

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