# THE IMPORTANCE OF INFUSION THERAPY IN THE INTENSIVE TREATMENT OF PATIENTS WITH OBSTRUCTIVE JAUNDICE

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**Abstract:** Pathologies occurring in the body are characterized by the induction of severe complications affecting all systems. The significance of perioperative monitoring of key homeostatic parameters, including colloid osmotic pressure, blood plasma osmolality, and blood coagulation potential, is highlighted. Alterations in these parameters are considered inevitable during surgical interventions, particularly in patients with concomitant diseases. The correction of volume disturbances is considered a primary task determining the outcome of surgical treatment. Infusion-transfusion therapy utilizing colloid and crystalloid solutions, along with the accompanying hemodilution, has a significant impact on homeostatic parameters. This literature review was conducted to gain a deeper understanding of the pathophysiology of these processes.

## Factors Causing Obstructive Jaundice and Infusion Therapy

Rational infusion therapy is a fundamental component of anesthetic care and intensive therapy. This is potentially due to the absence of an optimal infusion medium that can be safely administered in the volume necessary to maintain circulating blood volume (CBV). Another reason for the ineffectiveness of infusion therapy is the lack of timely monitoring of various physiological and biochemical parameters that are affected by infusion solutions [1, 2]. Difficulties also arise in their comprehensive assessment. Analysis of the literature emphasizes the importance of monitoring and correctly interpreting hemodynamic parameters, blood composition, osmolarity, and plasma oncotic pressure, as well as coagulation status, when conducting infusion therapy [3, 5].

**The Significance of Osmolality in Infusion Therapy**

Maintaining osmotic pressure is the process of water movement across a semipermeable membrane from an area of lower solute concentration to an area of higher solute concentration. Osmotic pressure is the amount of hydrostatic pressure required to stop the osmotic flow of water. Osmolality is a measure of a solution's ability to draw water across a semipermeable membrane via osmosis. It is defined as the total concentration of solute particles in a true solution (in mosmol/kg water), irrespective of their size, shape, or electrical charge [6, 9, 11]. Normally, plasma osmolality is approximately 285 ± 5 mosmol/kg water, and this range can expand under compensated normo-osmolality. The osmolality created by substances that cannot readily cross cell membranes, such as inorganic ions, glucose, and proteins, is referred to as tonicity. The law of isoosmolality dictates that osmolality should be consistent across all fluid compartments in the body. Deviations from this can lead to various cellular dysfunctions, including mechano-osmotic tension of the plasma membrane, detachment from the cytoskeleton, intracellular potassium loss, and disruption of cellular bioelectrical processes. Some researchers note that fluid distribution in the body is linked to the distribution of osmotically active substances [12]. Under normal conditions, this distribution is maintained by biological barriers and ion pumps.

The importance of osmometry in the initial operative period is confirmed by the research of F.I. Turayev. He demonstrated that changes in osmotic parameters, in conjunction with neuroendocrine (insulin, glucagon, cortisol, antidiuretic hormone, renin) and volemic (CBV) indicators, could predict the development of surgical and purulent-septic complications in the early postoperative period. Early detection of these changes allows for the implementation of preventative corrective therapy [13]. Furthermore, the widespread use of crystalloids, while advantageous due to their affordability and low reactivity, can present certain challenges. For example, the excess chloride present in "physiological saline" can lead to hyperchloremic acidosis in cases

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of high-volume infusion. Additionally, the hypo-osmolality of Ringer's solution also raises some concerns [14]. It has been confirmed that altering plasma osmolality can have a positive impact on hemodynamics. Thus, osmolality, by regulating water movement across different fluid compartments, significantly impacts tissue perfusion and cellular functional status, indirectly influencing the effectiveness of surgical treatment [10].

**Preparations Used for Infusion Therapy**

One of the factors influencing blood volume is the interplay of opposing forces, namely hydrostatic and colloid osmotic pressures, which operate both within and outside the vascular system. Colloid osmotic pressure (COP), also known as oncotic pressure, is a component of osmotic pressure generated by colloid molecules that are unable to permeate capillary walls. Other researchers identify statistical differences between colloid osmotic pressure (COP) and COP calculated using the Landis-Pappenheimer formula, which utilizes the total protein concentration in plasma. Liquid heparin coating the walls of a syringe or cannula can dilute the sample and lead to erroneously low COP values; therefore, cannula walls should be coated with dry heparin. Colloid osmotic pressure (COP) measurements may show elevated values during hypernatremia (and alkalosis, which enhances the effect of the Gibbs-Donnan effect on osmolality). Conversely, in cases of hyponatremia (and acidosis), values will be reduced, which is related to the technical specifications of the oncometer. If sodium levels in the sample are normal, but hyperosmolality is due to elevated levels of glucose, urea, mannitol, or other non-electrolytes, this error is not observed. Dextran and hydroxyethyl starch (HES) molecules are electroneutral, and their effect on plasma colloid osmotic pressure (COP) is not accompanied by the Gibbs-Donnan effect, which is observed with albumin preparations. COP measurements in plasma with these infusion agents should be interpreted cautiously, as a significant proportion of HES molecules can pass through the oncometer membrane with a permeability of 30,000

Da. In such cases, using a membrane with a permeability limit of 10,000 Da may be more appropriate.

Average normal COP values decrease with age: in individuals under 50 years of age, the average is 21.1 ± 4.8 mm Hg, while in those aged 70–89 years, this value is 19.7 ± 3.7 mm Hg. Even strict bed rest lasting several hours leads to a decrease in COP of approximately 15%. Daily fluctuations in COP levels within ±10% in the same patient are considered normal. According to local researchers, plasma COP is a key factor regulating water movement between tissues and capillaries. This implies that the endothelium has high permeability for inorganic ions but low permeability for polymeric ions, including proteins (under normal conditions). However, under pathological conditions, this permeability increases [44]. Some authors highlight a decrease in plasma colloid osmotic pressure (COP) levels in dogs receiving crystalloid infusions and in dogs undergoing ovariohysterectomy who did not receive any infusions [33]. The decrease in COP in the perioperative period is associated with blood loss and its replacement with hypo-oncotic solutions, as well as the catabolic phase of protein metabolism, tissue hypoxia and acidosis, and increased permeability of blood vessel walls. The endothelial glycocalyx is considered a second protective layer, in addition to the endothelial cell lining, against unrestricted extravasation. This layer, by binding plasma proteins, performs a primary function of molecular filtration and generates an effective oncotic gradient within a confined space [18]. Some researchers emphasize the significance of the pressure gradient between blood hydrostatic and oncotic pressures and the sub-endothelial glycocalyx space for transcapillary fluid exchange, suggesting it is more crucial than interstitial pressure.

Damage to the endothelial glycocalyx during the perioperative period is considered inevitable due to the effects of inflammatory mediators, leading to the development of interstitial edema. A study by Brandstrup, using colorectal surgeries as an example, demonstrated that reducing the volume of intravenous infusions administered perioperatively to 2.7 L/day (restricted group) from 5.4 L/day (liberal

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regimen group) significantly decreased the incidence of postoperative complications such as anastomotic leakage, pulmonary edema, pneumonia, and wound infection [5]. Concurrently, colloids were primarily used in the restricted group, whereas crystalloids were used in the liberal regimen group. To assess circulating blood volume (CBV), J. Boldt recommends considering hemodynamic indicators (arterial pressure, pulse pressure variations, cardiac output), filling pressure parameters (such as central venous pressure), diuresis data, and indicators of arterial and central venous blood gas composition, including acid-base balance [9].

When evaluating the influence of plasma colloid osmotic pressure (COP) on transcapillary fluid movement, it is crucial to consider the structural and functional differences between systemic and pulmonary circulation. Researchers determined that a 50% reduction in COP significantly elevates the risk of pulmonary edema, but only in the context of left ventricular failure and when the left atrial end-diastolic pressure exceeds 10 mm Hg. Demling R.H. and colleagues, in experiments conducted on sheep lungs, found that in hypoproteinemia, the rate of transcapillary filtration in the lungs is less dependent on low plasma oncotic pressure but is significantly correlated with capillary hydrostatic pressure. Conversely, studies by V. Velanovich across numerous experimental models and clinical trials have not demonstrated a clear correlation between oncotic pressure and the volume of tissue water in the lungs [15]. According to O. Habler, blood transfusions do not benefit ICU patients suffering from polytrauma and sepsis if they raise hemoglobin levels above 90 g/L [12]. In such cases, the blood coagulation system is activated, erythrocytes enter a state of rouleaux formation (coin stacking), and they are also damaged within fibrin networks [13].

A. Shander argues that an individual's reaction to anemia depends on their ability to adapt to this condition, and manifests differently in each person. Many symptoms associated with anemia may arise from inadequate circulating volume repletion, and simply normalizing this physiological parameter may be sufficient to eliminate them. Despite a significant reduction in oxygen delivery, oxygen consumption also decreases,

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and the load on the left ventricle reduces even more than oxygen delivery. This positive compensation occurs due to improved blood viscosity, a significant decrease in total peripheral resistance, and a reduction in filling pressures within the cardiac chambers [15]. A.V. Koloskov's assertion highlights the importance of considering hemoglobin levels in patients with cardiovascular diseases, especially in the context of surgical stress. Low hemoglobin levels (below 100 g/L) increase the risk of mortality in these cases. The role of myocardial ischemia, which often manifests at the end of surgery but is masked by anesthetics, is also emphasized, leading to delayed signaling of cardiovascular decompensation [16]. Some researchers point out that red blood cells play a crucial role not only in gas transport function but also in stabilizing hemostasis when hematocrit is above 30% and hemoglobin levels are 100 g/L or higher [12, 13]. In the study by Singbartl K. and colleagues, the importance of a critically low plasma fibrinogen concentration (below 1 g/L) as a limiting factor for hemodilution was emphasized [14]. One of several explanations for changes in blood coagulation associated with hemodilution is an imbalance between anti- and procoagulant mechanisms. Some studies have reported the activation of fibrinolysis in the perioperative period. S.G. Reshetnikov attributes this to the suppression of endogenous antifibrinolytics by synthetic colloids and their incorporation into the thrombus structure, resulting in a softer thrombus that is more easily lysed.

**Conclusion:**

In conclusion, to ensure the successful outcome of surgical treatment in the intensive care of patients with obstructive jaundice, it is essential to address and correct adverse conditions related to hematocrit and hemostasis disorders. This can be achieved through the rational and judicious application of infusion solutions. Analysis of the literature indicates that this problem remains unresolved in contemporary practical medicine. The information presented here can enable specialists to more effectively target and optimize infusion therapy for the underlying pathology.

**References**

1. Aralov, U.A., Joniev, S.Sh., & Rakhimov, A.U. (2015). Improving the effectiveness of preoperative preparation methods in thyroid surgery [Text]. *Problems of Biology and Medicine (Problemy Biologii i Meditsiny)*, (1), 11-14.

2. Joniev, S.Sh., & Rakhimov, A.U. (2015). Comparison of methods of preoperative preparation in thyroid gland [Text]. In *Proceedings of the VI International Conference "Sharing the Results of Research Towards Closer Global Convergence of Scientists"*. Ontario, Canada, pp. 38-43.

3. Joniev, S.Sh., & Babajanov, A.S. (2016). Evaluation of the effectiveness of preoperative preparation and anesthesia in thyroid pathologies surgeries [Text]. In *Materials of the "XXI Century - Century of Intellectual Generation" Samarkand Regional Scientific-Practical Conference*. Samarkand, Uzbekistan: SamDChTI Publishing House, pp. 190-193.

4. Joniev, S.Sh. (2022). Features of preoperative preparation and anesthesia in thyroid pathology [Text]. *British Medical Journal*, *Volume-2*(4), 212-215.

5. Joniev, S.Sh. (2022). Anesthesiological allowance for operations for diffuse goiter [Text]. *Journal of Integrated Education and Research*, *Volume 1*(Issue 5), 19-26.

6. Abdulaev, E.G., & Babyshin, V.V. (2013). Plasmapheresis in the complex treatment of patients with obstructive jaundice. *Bulletin of Surgery (Vestnik Khirurgii)*, (1/2), 92–95.

7. Vorobyev, A.I., et al. (2017). *Acute massive blood loss*. Moscow. 132 p. [In Russian]

8. Pugachev, A.V., & Achkasov, E.E. (2017). *Assessment of nutritional status and determination of the need for nutritional support*. Moscow. 86 p. [In Russian]

9. Galperin, E.I., & Vetшев, P.S. (2019). *Guide to biliary tract surgery*. Moscow. 568 p. [In Russian]

10. Kostyuchenko, A.L., Zhelezny, O.G., & Shvedov, A.K. (2014). *Enteral artificial nutrition in clinical medicine*. Petrozavodsk. 202 p. [In Russian]

11. Luzhnikov, E.A., Goldfarb, Yu.S., & Musselius, S.G. (2014). *Detoxification therapy*. St. Petersburg. 236 p. [In Russian]

12. Park, G., & Row, P. (2015). *Infusion therapy*. Moscow. 134 p. [In Russian - likely a translation]

13. Pasricha, P.J., & Kalloo, A.N. (2012). Therapy of sphincter of Oddi dysfunction. *Gastrointestinal Endoscopy Clinics of North America*, *6*(1), 117–125.

14. Milroy, D.R., & Kharasch, E.D. (2015). Acute intravascular volume expansion with rapidly administered crystalloid or colloid in the setting of moderate hypovolemia. *Anesthesia & Analgesia*, *96*, 1572–1577.

15. Freedman, Y.Y., Blajchman, M.A., & Combie, N.M. (2013). Transfusion Medicine Reviews. *Transfusion Medicine Reviews*, *8*(1), 67-69.

16. Khalikov, P.Kh., & Sharofiddinkhojayev, N.Sh. (2005). Biology. *Biologiya*, pp. 232-269. [Likely a textbook or chapter in Uzbek, page range suggests chapter]

17. Joniev, S.Sh. (2022). Improving the results of anesthesia in thyroid pathology [Text]. *Uzbek Medical Journal*, *Volume 3*(Issue 3), 23-28.

18. Joniev, S.Sh., & Pardayev, Sh.K. (2021). Application of general multicomponent anesthesia in thyroid surgeries [Text]. *New Day in Medicine (Tibbiyotda yangi kun)*, *6*(38/1), 443-479.

19. Joniev S.Sh. Determining the level of preoperative preparation and conducting anesthesia in patients with thyroid pathologies [Tekst] / Joniev S.Sh. // Danish Scientific Journal (DSJ). — 2022. — № 59. — S. 19-23.

20. Joniev S.Sh. Improvement of the results of anesthesia in thyroid pathology [Tekst] / Joniev S.Sh. // Annali d'Italia. — 2022. — № Vol 1. 30. — S. 78-82.

21. Joniev S.Sh.,Yakubov I.,Pormonov Kh., Daminov I., Ensuring adequate premedication in patients with thyroid pathology [Tekst] / Joniev S.Sh., Yakubov I., Pormonov Kh.,Daminov I., // Norwegian Journal of development of the International Science. — 2022. — № 86. — S. 17-20.

22. Joniev S.Sh., Tukhsanbaev S., Kurbanov K., Abdaliev D., Predicting the effectiveness of anesthesia in thyroid pathology [Tekst] / Joniev S.Sh., Tukhsanbaev S., Kurbanov K., Abdaliev D., // Polish journal of science. — 2022. — № 51. — S. 30-34.

**23.** Joniev S.Sh., Ganiev A., Ibrokhimov Z., Melikboboev A., Analysis of the effectiveness of anesthesia methods in thyroid pathology [Tekst] / Joniev S.Sh., Ganiev A., Ibrokhimov Z., Melikboboev A., // Znanstvena misel journal Slovenia. — 2022. — № 67. — S. 32-35.