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IMPROVEMENT OF COMPREHENSIVE SURGICAL TACTICS AND OPTIMIZATION OF TREATMENT OUTCOMES IN CHOLANGIOSEPSIS

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Abstract. This article addresses the issues of improving comprehensive surgical tactics in patients with cholangiosepsis. The aim of the study is to develop a stage-based surgical approach and evaluate its clinical effectiveness. The study analyzes the outcomes of surgical interventions focused on biliary decompression, elimination of purulent-inflammatory processes, and their integration with intensive care therapy. The results demonstrate that early implementation of a comprehensive surgical strategy reduces the severity of sepsis, decreases complication rates, and improves treatment outcomes. The proposed optimized surgical approach contributes to enhanced clinical management of patients with cholangiosepsis.

Keywords: cholangiosepsis, comprehensive surgical tactics, biliary decompression, acute cholangitis, intensive care, surgical treatment.

XOLANGIOGEN SEPSISDA KOMPLEKS XIRURGIK TAKTIKANI TAKOMILLASHTIRISH VA DAVOLASH NATIJALARINI OPTIMALLASHTIRISH

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Annotatsiya. Ushbu maqolada xolangiogen sepsis bilan kasallangan bemorlarni davolashda kompleks xirurgik taktikani takomillashtirish masalalari yoritilgan. Tadqiqotning maqsadi xolangiogen sepsisda bosqichma-bosqich xirurgik yondashuvni ishlab chiqish va uning klinik samaradorligini baholashdan iborat. Tadqiqot davomida bemorlarda biliar dekompressiya, yiringli-o‘tkir yallig‘lanish jarayonini bartaraf etish hamda intensiv terapiya bilan uyg‘unlashgan xirurgik aralashuvlarning natijalari tahlil qilindi. Olingan natijalar kompleks xirurgik taktikaning erta qo‘llanilishi asoratlar sonini kamaytirishi, sepsis og‘irligini pasaytirishi va davolash samaradorligini oshirishini ko‘rsatdi. Taklif etilgan takomillashtirilgan xirurgik yondashuv xolangiogen sepsisni davolashda klinik natijalarni optimallashtirishga xizmat qiladi.

Kalit so‘zlar: xolangiogen sepsis, kompleks xirurgik taktika, biliar dekompressiya, o‘tkir xolangit, intensiv terapiya, xirurgik davolash.

СОВЕРШЕНСТВОВАНИЕ КОМПЛЕКСНОЙ ХИРУРГИЧЕСКОЙ ТАКТИКИ И ОПТИМИЗАЦИЯ РЕЗУЛЬТАТОВ ЛЕЧЕНИЯ ПРИ ХОЛАНГИОГЕННОМ СЕПСИСЕ

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Аннотация. В статье рассматриваются вопросы совершенствования комплексной хирургической тактики у пациентов с холангиогенным сепсисом. Целью исследования является разработка этапного хирургического подхода и оценка его клинической эффективности. В ходе исследования проанализированы результаты хирургических вмешательств, направленных на билиарную декомпрессию, устранение гнойно-воспалительного процесса, а также их сочетание с интенсивной терапией. Полученные данные свидетельствуют о том, что раннее применение комплексной хирургической тактики способствует снижению тяжести сепсиса, уменьшению частоты осложнений и улучшению исходов лечения. Предложенный тактический алгоритм позволяет оптимизировать хирургическое лечение пациентов с холангиогенным сепсисом.

Ключевые слова: холангиогенный сепсис, комплексная хирургическая тактика, билиарная декомпрессия, острый холангит, интенсивная терапия, хирургическое лечение.

Cholangiosepsis remains one of the most severe complications of biliary tract diseases and is associated with high morbidity and mortality rates despite advances in modern surgery and intensive care. The condition develops as a result of biliary obstruction complicated by bacterial infection, leading to systemic inflammatory response, multiple organ dysfunction, and septic shock. According to contemporary clinical data, delayed diagnosis and inadequate surgical management significantly worsen treatment outcomes in patients with cholangiosepsis.

Timely elimination of biliary obstruction is considered a key principle in the management of cholangiosepsis. However, the choice of optimal surgical tactics, the timing of intervention, and the sequence of procedures remain controversial. Traditional approaches based on emergency open surgery are often associated with high rates of postoperative complications, prolonged hospital stay, and increased mortality, especially in patients with severe sepsis and multiple comorbidities.

In recent years, the concept of a comprehensive and stage-based surgical approach has gained increasing attention. This strategy combines early biliary decompression, adequate control of the infectious source, and intensive care support aimed at stabilizing hemodynamic and metabolic parameters. Minimally invasive techniques, including endoscopic and percutaneous biliary drainage, have expanded the therapeutic options for critically ill patients, allowing for reduced surgical trauma and improved postoperative recovery.

Despite the availability of various surgical and minimally invasive methods, there is still no unified algorithm for the comprehensive surgical management of cholangiosepsis. The lack of standardized criteria for selecting surgical tactics and determining the optimal timing of interventions contributes to inconsistent clinical outcomes. Therefore, improving comprehensive surgical tactics and optimizing treatment results in cholangiosepsis remain urgent and clinically significant tasks in modern hepatobiliary surgery.

Cholangiosepsis is widely described in the literature as a severe manifestation of acute cholangitis associated with biliary obstruction and systemic infection. According to the **Tokyo Guidelines 2018**, cholangiosepsis develops as a result of sustained biliary hypertension combined with bacterial contamination of bile, leading to rapid progression of systemic inflammatory response and multiple organ dysfunction [1]. These guidelines emphasize that delayed biliary drainage is a major predictor of unfavorable outcomes and increased mortality.

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The pathophysiology and clinical severity of cholangiosepsis have been extensively investigated by Kiriyama et al., who demonstrated that early biliary decompression significantly reduces endotoxemia, improves hemodynamic stability, and enhances the effectiveness of antimicrobial therapy [2]. Their findings support the concept that conservative treatment alone is insufficient without prompt elimination of biliary obstruction.

The importance of early source control is also highlighted in the **Sepsis-3 Consensus**, which defines sepsis as a life-threatening organ dysfunction caused by a dysregulated host response to infection [3]. Within this framework, biliary obstruction in cholangiosepsis represents the primary infectious source and requires urgent surgical or endoscopic intervention to prevent progression to septic shock.

Minimally invasive methods of biliary decompression have been widely studied in recent decades. Freeman et al. reported that early endoscopic retrograde cholangiopancreatography (ERCP) with biliary drainage significantly reduces mortality and complication rates in patients with severe acute cholangitis when performed within the first 24–48 hours [4]. Similarly, Lee et al. demonstrated that percutaneous transhepatic biliary drainage is an effective alternative in patients who are unsuitable candidates for endoscopic procedures, particularly in critically ill and unstable patients [5].

Despite the advantages of minimally invasive approaches, several authors emphasize their limitations. Strasberg et al. noted that endoscopic or percutaneous drainage may be insufficient in cases of extensive purulent inflammation, biliary tract destruction, or persistent septic focus [6]. In such situations, staged surgical management involving delayed open surgery after initial stabilization is recommended to achieve definitive source control.

The concept of comprehensive and stage-based surgical tactics is further supported by the **Surviving Sepsis Campaign**, which stresses the necessity of integrating timely surgical source control with intensive care measures, including hemodynamic stabilization, organ support, and targeted antimicrobial therapy [7]. However, these guidelines do not provide specific surgical algorithms for cholangiosepsis, resulting in variability of clinical practice.

In summary, the reviewed literature confirms the critical role of early biliary decompression and source control in the management of cholangiosepsis. At the same time, the absence of standardized, evidence-based surgical algorithms regarding the sequence and combination of interventions remains a significant limitation. This underscores the need for further studies aimed at improving comprehensive surgical tactics and optimizing treatment outcomes in patients with cholangiosepsis.

This study was conducted as a retrospective and prospective clinical analysis of patients diagnosed with cholangiosepsis who were treated in a specialized surgical department over a defined study period. The diagnosis of cholangiosepsis was established based on clinical presentation, laboratory findings, imaging data, and severity criteria in accordance with the Tokyo Guidelines 2018 and Sepsis-3 definitions. Inclusion criteria comprised patients with acute cholangitis complicated by systemic inflammatory response and organ dysfunction requiring surgical intervention. Patients with non-biliary sources of sepsis or terminal-stage malignancies were excluded from the study.

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All patients underwent comprehensive clinical assessment upon admission, including hemodynamic monitoring, biochemical and hematological testing, inflammatory markers evaluation, and imaging studies such as abdominal ultrasound and computed tomography. Disease severity was assessed using established scoring systems, including SOFA and APACHE II, to determine the urgency and extent of surgical intervention.

The study population was divided into two groups depending on the applied surgical tactics. The control group received conventional surgical management, which included delayed or single-stage surgical intervention after initial conservative stabilization. The main group was treated according to an improved comprehensive surgical strategy that emphasized early biliary decompression, staged source control, and close integration with intensive care therapy.

The comprehensive surgical approach involved early minimally invasive biliary decompression using endoscopic retrograde cholangiopancreatography or percutaneous transhepatic biliary drainage within the first 24–48 hours of admission, followed by definitive surgical intervention when indicated. Open surgical procedures were performed only after partial stabilization of the patient's condition. Intensive care management included targeted antimicrobial therapy, fluid resuscitation, vasopressor support, organ function monitoring, and correction of metabolic disturbances.

Clinical outcomes were evaluated based on mortality rate, frequency of postoperative complications, duration of intensive care unit stay, total hospital length of stay, and dynamics of laboratory inflammatory markers. Statistical analysis was performed using standard descriptive and comparative methods, with significance set at $p < 0.05$.

The implementation of the improved comprehensive surgical tactics demonstrated a significant positive impact on treatment outcomes in patients with cholangiosepsis. Patients in the main group showed earlier stabilization of hemodynamic parameters and faster regression of systemic inflammatory response compared to those in the control group.

Early biliary decompression resulted in a rapid decrease in serum bilirubin levels, inflammatory markers, and markers of organ dysfunction. The duration of septic shock was notably shorter in patients who underwent early minimally invasive intervention. In contrast, delayed decompression in the control group was associated with prolonged endotoxemia and higher incidence of multiple organ failure.

Postoperative complication rates were significantly lower in the main group. Complications such as bile leakage, wound infection, intra-abdominal abscess formation, and prolonged mechanical ventilation were observed less frequently in patients treated with the staged comprehensive approach. Additionally, the need for repeat surgical interventions was reduced due to effective early source control.

Mortality analysis revealed a marked reduction in overall mortality in the main group compared to the control group. The greatest benefit was observed in patients with moderate to severe cholangiosepsis, where early decompression and staged surgical management prevented progression to irreversible organ dysfunction.

The length of intensive care unit stay and total hospitalization duration were also significantly reduced in the main group. Faster recovery of organ function allowed earlier

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transfer to surgical wards and timely initiation of rehabilitation measures. These findings indicate that the optimized surgical tactics not only improve survival but also enhance healthcare efficiency.

The results of this study confirm that cholangiosepsis requires an integrated and timely surgical approach aimed at rapid elimination of biliary obstruction and effective control of the infectious source. The findings align with existing literature emphasizing the inadequacy of conservative therapy alone in managing biliary sepsis.

One of the key advantages of the improved comprehensive surgical strategy is the prioritization of early biliary decompression. By reducing biliary hypertension and bacterial load, early decompression interrupts the pathophysiological cascade leading to systemic inflammation and organ failure. This explains the observed reduction in sepsis severity and faster clinical stabilization in the main group.

The staged nature of the proposed surgical tactics allows for individualized decision-making based on patient condition and disease severity. Minimally invasive techniques serve as an initial life-saving intervention, particularly in critically ill patients, while delayed definitive surgery ensures complete source control with minimal operative risk. This approach addresses the limitations of both immediate open surgery and exclusive reliance on minimally invasive methods.

The integration of surgical tactics with intensive care management plays a crucial role in optimizing outcomes. Continuous monitoring, early antimicrobial therapy, and organ support create favorable conditions for surgical intervention and postoperative recovery. The observed reduction in postoperative complications underscores the importance of multidisciplinary coordination.

Despite the positive outcomes, certain limitations should be acknowledged. Variability in anatomical features of biliary obstruction and the presence of comorbidities may influence surgical decision-making and outcomes. Additionally, institutional resources and availability of endoscopic expertise can affect the feasibility of early minimally invasive intervention.

Nevertheless, the study highlights the clinical significance of developing standardized algorithms for the comprehensive surgical management of cholangiosepsis. The proposed tactical approach can serve as a foundation for future clinical guidelines and multicenter studies aimed at further refining treatment strategies.

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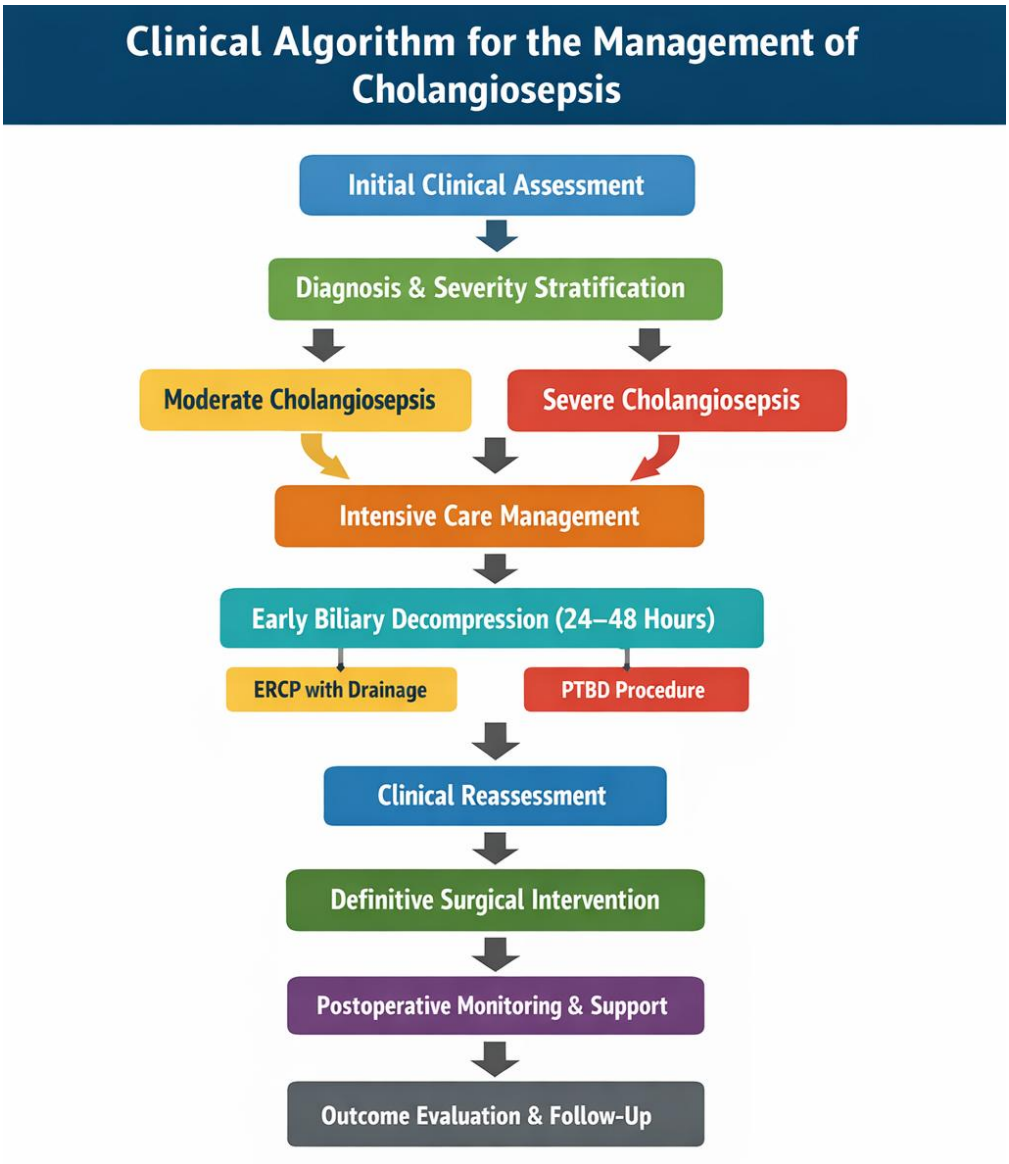

1-picture. Clinical Algorithm for the Comprehensive Surgical Management of Cholangiosepsis

Step 1. Initial Clinical Assessment

Patients admitted with suspected cholangiosepsis undergo immediate clinical evaluation, including assessment of vital signs, mental status, and hemodynamic stability. Laboratory investigations include complete blood count, liver function tests, inflammatory markers, blood cultures, and renal function parameters. Disease severity is assessed using SOFA and APACHE II scoring systems in accordance with the **Tokyo Guidelines 2018** and Sepsis-3 criteria.

Step 2. Diagnosis Confirmation and Severity Stratification

Cholangiosepsis is confirmed based on the presence of acute cholangitis combined with systemic inflammatory response and organ dysfunction. Patients are stratified into moderate or

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severe disease categories. This stratification determines the urgency and type of surgical intervention.

Step 3. Immediate Intensive Care Management

Simultaneously with diagnostic procedures, intensive care measures are initiated. These include early broad-spectrum antimicrobial therapy, fluid resuscitation, vasopressor support if required, correction of metabolic disturbances, and continuous monitoring of organ functions. Intensive care management continues throughout all subsequent stages of treatment.

Step 4. Early Biliary Decompression (Within 24–48 Hours)

Early elimination of biliary obstruction is prioritized as the primary source control measure. Depending on patient condition and anatomical considerations, minimally invasive biliary decompression is performed using:

— Endoscopic retrograde cholangiopancreatography with biliary drainage, or

— Percutaneous transhepatic biliary drainage in patients unsuitable for endoscopic intervention.

This step aims to reduce biliary hypertension, bacterial load, and systemic endotoxemia.

Step 5. Clinical Reassessment After Decompression

Following biliary decompression, patients are reassessed for hemodynamic stability, regression of sepsis signs, and improvement in laboratory markers. Positive dynamics indicate effective initial source control and allow transition to the next stage of management.

Step 6. Staged Definitive Surgical Intervention

In cases where minimally invasive decompression is insufficient or where structural pathology persists (e.g., stones, strictures, purulent destruction), definitive surgical intervention is planned. Open or laparoscopic surgery is performed after partial stabilization of the patient's condition to ensure complete elimination of the infectious focus while minimizing operative risk.

Step 7. Postoperative Intensive Monitoring and Support

Postoperative management includes continued intensive care, targeted antimicrobial therapy based on culture results, organ support, and prevention of complications. Early mobilization and nutritional support are introduced as the patient stabilizes.

Step 8. Outcome Evaluation and Follow-Up

Treatment outcomes are evaluated based on mortality, complication rates, duration of intensive care unit stay, and total hospital length of stay. Long-term follow-up focuses on biliary function restoration and prevention of recurrent biliary infections.

The proposed clinical algorithm emphasizes early biliary decompression, staged surgical intervention, and close integration of surgical and intensive care strategies. This comprehensive

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and flexible approach allows individualized treatment planning and contributes to improved clinical outcomes in patients with cholangiosepsis.

Cholangiosepsis remains a critical condition requiring timely and well-coordinated surgical and intensive care management. The findings of this study demonstrate that improvement of comprehensive surgical tactics plays a decisive role in optimizing treatment outcomes in patients with cholangiosepsis. Early identification of disease severity and prompt elimination of biliary obstruction are fundamental components in preventing the progression of systemic infection and multiple organ dysfunction.

The proposed comprehensive and stage-based surgical approach, which prioritizes early minimally invasive biliary decompression followed by definitive surgical intervention after partial stabilization, has shown clear clinical advantages. This strategy contributes to rapid reduction of biliary hypertension and endotoxemia, facilitates hemodynamic stabilization, and enhances the effectiveness of intensive care therapy. As a result, lower rates of postoperative complications, reduced mortality, and shorter intensive care and hospital stays were observed.

Integration of surgical decision-making with continuous intensive care management allows for individualized treatment planning based on the patient's clinical condition and sepsis severity. The developed clinical algorithm provides a structured and practical framework for the management of cholangiosepsis and can be adapted to different clinical settings depending on available resources and expertise.

In conclusion, the optimization of comprehensive surgical tactics through early source control, staged interventions, and multidisciplinary collaboration significantly improves clinical outcomes in cholangiosepsis. The proposed approach may serve as a foundation for standardized treatment protocols and further prospective studies aimed at refining evidence-based strategies in hepatobiliary sepsis management.

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