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Individualized Surgical Strategy in Infected Pancreatic Necrosis with Diabetes

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ABSTRACT

Infected pancreatic necrosis (IPN) is one of the most severe and life-threatening complications of acute necrotizing pancreatitis. In patients with diabetes mellitus, the clinical course of IPN is aggravated by immune dysfunction, microvascular complications, and metabolic instability. Traditional surgical approaches often fail to account for the individual variability in disease progression, infection severity, and patient resilience. This review aims to provide an overview of current literature on the role of personalized surgical strategies in the management of IPN in diabetic patients. Emphasis is placed on early risk stratification, imaging-based staging, timing and modality of intervention, and perioperative glycemic control. Advances in minimally invasive necrosectomy, step-up approaches, and multidisciplinary decision-making are discussed in the context of diabetic physiology. The need for individualized treatment algorithms that integrate clinical, biochemical, and radiological data is highlighted as a cornerstone of modern surgical practice in IPN.

Keywords: *Infected pancreatic necrosis, diabetes mellitus, individualized surgery, step-up approach, necrosectomy*

INTRODUCTION

Infected pancreatic necrosis (IPN) is a critical and often life-threatening sequela of acute necrotizing pancreatitis, representing the most severe end of the disease spectrum. While the incidence of necrotizing pancreatitis is estimated at 10-20% of all acute pancreatitis cases, infection of necrotic pancreatic or peripancreatic tissue significantly increases morbidity and mortality, with reported lethality reaching 30-50% in untreated or inadequately managed patients [1, 2]. The introduction of minimally invasive techniques and step-up approaches

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has significantly improved outcomes over the past two decades; however, a substantial subset of patients—particularly those with diabetes mellitus (DM-continue to experience poor clinical trajectories, prolonged intensive care stays, multiple interventions, and delayed recovery [3, 4].

Diabetes mellitus profoundly alters the natural course of IPN. The condition of hyperglycemia-driven immunosuppression, microvascular dysfunction, impaired wound healing, and chronic inflammation leads to an atypical and often more aggressive clinical manifestation of pancreatic infection [5]. Diabetic patients with IPN tend to present later, have more extensive necrosis, and suffer higher rates of sepsis, organ failure, and postoperative complications than nondiabetic counterparts [6, 7]. Traditional one-size-fits-all surgical protocols fail to account for this variability, contributing to suboptimal decision-making in terms of timing, approach, and perioperative care. This has triggered an increasing recognition of the need for personalized treatment algorithms that can adapt surgical and medical strategies to patient-specific metabolic and inflammatory profiles.

In this context, personalization does not solely refer to choice of surgical technique, but rather to a dynamic and integrative process involving early disease stratification, radiological staging, individualized metabolic management, and structured postoperative monitoring. Several emerging paradigms now promote the use of risk stratification tools - including the Acute Physiology and Chronic Health Evaluation II (APACHE II), Computed Tomography Severity Index (CTSI), and Sequential Organ Failure Assessment (SOFA)—to predict the clinical trajectory of IPN, yet these models are seldom calibrated specifically for diabetic individuals [8–10]. Similarly, while early percutaneous drainage and minimally invasive necrosectomy have been adopted as cornerstones of step-up care, there is limited consensus on how to tailor their timing and extent in patients with coexisting diabetes and metabolic dysregulation.

This review aims to explore the evolving role of individualized surgical strategies in the management of IPN among patients with diabetes mellitus. We begin by analyzing the unique pathophysiological features that complicate infection control and wound healing in diabetics. Then, we discuss diagnostic frameworks for early recognition and stratification of necrosis severity, highlighting the limitations of conventional scoring systems in this subgroup. The core of the review is focused on surgical decision-making: how patient-specific data—radiological, metabolic, immunological—can be integrated into rational algorithms that inform the timing, type, and intensity of intervention. Finally, we address future directions, including the implementation of multidisciplinary team-based care, the use of artificial intelligence for outcome prediction, and the design of adaptive treatment pathways.

Through this lens, we argue that personalization in IPN surgery for diabetic patients is not a luxury, but a clinical imperative - necessary to reduce variability in outcomes, optimize resource use, and most importantly, to improve survival and quality of life in this high-risk population.

1. Pathophysiological Features of Infected Pancreatic Necrosis in Diabetic Patients

The pathophysiology of infected pancreatic necrosis (IPN) is inherently complex, involving the progressive autodigestion of pancreatic and peripancreatic tissues, inflammation-induced ischemia, and translocation of intestinal flora. In patients with diabetes mellitus (DM), these processes are significantly magnified by systemic metabolic dysfunction, creating a clinical picture that is more aggressive, less predictable, and more resistant to standard surgical and medical interventions [11].

A fundamental pathophysiological alteration in diabetic patients is immune dysfunction. Hyperglycemia impairs neutrophil chemotaxis, phagocytosis, and intracellular killing, which are essential in localizing and eliminating infection in necrotic tissue [12]. At the same time, chronic low-grade inflammation driven by advanced glycation end-products (AGEs), insulin resistance, and oxidative stress creates a paradoxical milieu where inflammatory mediators are elevated but ineffective [13]. This dysfunctional immune response contributes to early and extensive microbial colonization of necrotic tissue, sepsis, and delayed resolution of infection.

Equally significant is the role of microvascular and endothelial dysfunction. Diabetes is characterized by capillary basement membrane thickening, impaired vasodilation due to reduced nitric oxide availability, and increased vascular permeability—all of which compromise tissue perfusion [14]. In the setting of acute pancreatitis, where ischemic and reperfusion injury are central to necrosis formation, the diabetic microangiopathy further restricts the delivery of oxygen and antibiotics to infected tissues. This promotes anaerobic bacterial pro-

liferation and impairs the host's ability to mount an effective response to infection and surgical trauma.

Moreover, diabetic patients often exhibit altered stress responses and delayed metabolic adaptation to critical illness. Cortisol, catecholamines, and proinflammatory cytokines such as IL-6 and TNF-α are frequently dysregulated, leading to catabolic dominance and hyperglycemic decompensation during acute phases of pancreatitis [15]. This translates clinically into increased insulin requirements, metabolic acidosis, and early organ dysfunction—all of which must be considered in the perioperative planning of necrosectomy or drainage.

Another factor is the increased prevalence of polymicrobial and drug-resistant infections in diabetic individuals. Studies have shown that infected pancreatic necrosis in these patients is more frequently associated with Gram-negative rods (E. coli, Klebsiella spp.), anaerobes (Bacteroides fragilis), and fungal pathogens (Candida albicans) [16]. This microbiological complexity necessitates early and broad-spectrum antibiotic coverage, which must later be adjusted based on culture results. However, the reduced perfusion and immune penetration at the infection site often render systemic antibiotics only partially effective, reinforcing the importance of timely and complete source control through surgery.

Finally, the healing capacity of necrosectomy wounds and peripancreatic collections is impaired in diabetic patients. Hyperglycemia inhibits fibroblast proliferation, angiogenesis, and collagen deposition, while also promoting apoptosis of reparative immune cells such as macrophages [17]. These alterations delay granulation tissue formation and increase the likelihood of secondary infections, fistula formation, and postoperative complications such as hemorrhage or abscess recurrence.

Taken together, these pathophysiological disturbances explain why diabetic patients with IPN exhibit a disproportionately high risk of severe sepsis, multiorgan failure, and death, even under seemingly standard protocols of care. These insights form the basis for the argument that the surgical management of IPN in this population must depart from conventional algorithms and move toward individualized approaches that take into account immunometabolic fragility, altered microbiology, and impaired wound physiology.

2. The Role of Early Diagnosis and Risk Stratification

Early diagnosis and risk stratification are pivotal components in the management of infected pancreatic necrosis (IPN), particularly in patients with diabetes mellitus, where the clinical course is often atypical, rapidly progressive, and complicated by systemic decompensation. Diabetic patients may present with subtler symptoms due to autonomic neuropathy and blunted inflammatory responses, which can delay recognition and timely initiation of appropriate surgical or interventional strategies [18]. Therefore, clinicians must rely on a combination of clinical scores, imaging modalities, and biochemical markers to accurately stage disease severity and identify candidates for early intervention.

Among the clinical tools used to assess severity and predict outcomes in acute pancreatitis, the Acute Physiology and Chronic Health Evaluation II (APACHE II) and Sequential Organ Failure Assessment (SOFA) scores remain the most widely adopted in intensive care settings. These scores incorporate vital parameters, organ function, and laboratory indices to assess overall patient stability [19, 20]. However, these models are nonspecific and may underestimate severity in diabetic patients due to altered baseline physiology and chronic organ dysfunction. For instance, renal impairment or cardiovascular dysautonomia may already be present in diabetics, masking the progression of systemic inflammation.

Imaging plays a central role in stratifying the extent of necrosis and detecting signs of infection. Contrast-enhanced computed tomography (CECT) is the gold standard for visualizing pancreatic and peripancreatic collections, assessing the degree of necrosis, and identifying complications such as gas bubbles, which are pathognomonic of infection [21]. The Computed Tomography Severity Index (CTSI - which combines the extent of necrosis with inflammatory changes - has been shown to correlate with morbidity and mortality, yet its discriminatory power in diabetic subgroups remains understudied [22]. Recent advances in magnetic resonance imaging (MRI) and contrast-enhanced ultrasound (CEUS) offer promising alternatives, especially in patients with contrast allergy or renal dysfunction—both of which are more prevalent in diabetics.

In recent years, efforts have focused on integrating biomarkers of inflammation and infection into risk stratification models. Serum C-reactive protein (CRP) levels above 150 mg/L within 72 hours of symptom onset have been shown to predict severe pancreatitis and the development of necrosis [23]. Procalcitonin, a more specific marker of bacterial infection, has gained traction in predicting infected necrosis and guiding decisions regarding the initiation of antibiotics or drainage [24]. Diabetic

patients, however, may exhibit a blunted acute phase response, necessitating repeated measurements and correlation with clinical status. Emerging biomarkers such as interleukin-6 (IL-6), D-dimer, and lipopolysaccharide-binding protein (LBP) have also demonstrated predictive value in early studies but have yet to be fully validated in large diabetic cohorts [25].

Another important consideration is the timing of intervention, which is intricately linked to accurate staging. The current consensus guidelines favor a delayed approach to intervention—typically after 3-4 weeks from symptom onset—when the necrotic tissue has become "walled off" and demarcated [26]. However, in diabetic patients, the progression to systemic sepsis or organ failure may necessitate earlier intervention, challenging the classical paradigm of waiting for maturation. This underscores the need for dynamic, individualized decision-making, guided by frequent reassessment using both clinical and radiological tools.

Finally, some researchers have proposed composite risk models that combine clinical scores, imaging findings, and laboratory parameters into predictive nomograms or decision trees. While promising, these models require further refinement and validation in diabetic subpopulations. One proposed framework includes HbA1c levels, APACHE II score, procalcitonin level, and necrosis volume to estimate the probability of intervention failure or mortality—a potentially valuable tool in preoperative planning [27].

In summary, early diagnosis and precise risk stratification in diabetic patients with IPN demand a multimodal approach that integrates objective scores, advanced imaging, and metabolic/inflammatory biomarkers. The limitations of existing tools in the diabetic context highlight the pressing need for diabetes-specific scoring systems that account for unique immunometabolic dynamics. Accurate risk assessment not only improves surgical timing and modality selection but also optimizes resource allocation and guides discussions with patients and families regarding prognosis.

3. Modern Surgical Approaches: From Open Necrosectomy to Minimally Invasive Strategies

The surgical treatment of infected pancreatic necrosis (IPN) has undergone a dramatic transformation over the past two decades, moving away from traditional open necrosectomy toward more conservative and staged techniques. This evolution, known as the «step-up approach», has been driven by robust clinical evidence demonstrating reduced mortality, fewer complications, and shorter hospital stays when minimally invasive interventions are employed in appropriately selected patients [28]. However, in patients with diabetes mellitus, the optimal surgical strategy remains complex and must be tailored to the individual's immunometabolic status, infection burden, and organ function reserve.

Historically, open necrosectomy was considered the definitive treatment for IPN. The classical technique involved extensive midline or subcostal laparotomy with blunt dissection and debridement of necrotic tissue, followed by open packing or continuous lavage [29]. While effective in removing devitalized tissue, this approach was associated with high rates of complications, including bleeding, pancreatic and enteric fistulas, wound infections, and incisional hernias. Mortality in high-risk patients, such as those with diabetes, often exceeded 40% [30]. These outcomes prompted the development of less invasive alternatives.

The minimally invasive step-up approach, first popularized by the Dutch PANTER trial, revolutionized the management of IPN by advocating for initial percutaneous catheter drainage (PCD) under radiologic guidance, followed—if necessary—by minimally invasive retroperitoneal necrosectomy [31]. This method demonstrated a significant reduction in major complications compared to primary open surgery. The philosophy behind the step-up model is based on two principles: source control through drainage and time-dependent demarcation of necrotic tissue, allowing safer and more targeted surgical intervention.

Diabetic patients, however, often present a unique challenge to this approach. On one hand, they are more susceptible to infectious complications and wound healing impairment; on the other, their systemic inflammatory response may evolve more rapidly, necessitating earlier intervention than in non-diabetic counterparts. In such cases, timing becomes critical. While delayed intervention (typically after 3-4 weeks) remains ideal in terms of tissue demarcation, clinical deterioration due to sepsis or organ failure may require earlier escalation. This calls for nuanced judgment, balancing radiological signs of collection maturity with clinical urgency [32].

Several minimally invasive techniques have been adopted, depending on anatomical location, available expertise, and patient condition:

Video-assisted retroperitoneal debridement (VARD): A preferred option for collections in the left paracolic

gutter or retroperitoneum, offering direct access to necrotic tissue with reduced systemic impact [33].

Transgastric or transduodenal endoscopic necrosectomy: Particularly useful for centrally located or lesser sac collections; benefits include internal drainage, reduced risk of external fistula, and shorter recovery [34].

Laparoscopic necrosectomy: Though technically demanding, it offers a compromise between open and purely percutaneous techniques in selected patients with favorable anatomy [35].

In diabetic patients, surgical technique selection must consider tissue perfusion, glycemic control, and immune competence. For instance, in those with peripheral vascular disease or poorly controlled hyperglycemia, wound healing may be compromised even after minimally invasive procedures. Therefore, preoperative optimization - including aggressive glycemic management, volume resuscitation, and nutritional support - is indispensable.

Another important consideration is access route planning. In patients with abdominal wall scarring, obesity, or prior surgeries (a frequent occurrence in diabetics) radiologic and endoscopic access may be limited, requiring hybrid or modified approaches. Multi-disciplinary coordination with interventional radiologists and endoscopists becomes essential in such scenarios [36].

Despite its advantages, the minimally invasive approach is not without limitations. Multiple drainage procedures may be needed over time, and in some cases, source control may remain inadequate. In such instances, early conversion to open necrosectomy should not be delayed, especially if there is persistent sepsis or rising organ dysfunction. The decision to convert must be individualized, based on imaging, clinical response, and biomarker trends.

In conclusion, while modern surgical management of IPN favors minimally invasive step-up strategies, their success in diabetic patients depends on meticulous selection, timing, and perioperative optimization. No single technique suits all, and the approach must be individualized, informed by the patient's anatomical, metabolic, and immunological status. As such, algorithm-guided personalization of surgical tactics represents the most rational path forward in this complex and heterogeneous population.

4. Personalized Decision-Making Algorithms: Integrating Clinical, Radiological, and Metabolic Data

In the context of infected pancreatic necrosis (IPN) complicated by diabetes mellitus, the standardization of surgical care must be reconciled with the physiological heterogeneity of patients. Increasingly, this challenge is being addressed through the development of personalized decision-making algorithms, which seek to combine objective clinical metrics with radiological findings and individualized metabolic profiles to guide therapeutic interventions. These frameworks move beyond rigid staging and adopt a dynamic, data-informed approach to optimize timing, modality, and perioperative support.

At the core of this personalization lies the concept of multifactorial patient profiling. Diabetic patients present a spectrum of immunometabolic dysfunction, ranging from compensated insulin resistance to overt ketoacidosis and multi-organ involvement. Preoperative assessment must therefore include not only acute physiology scores (APACHE II, SOFA) and anatomical parameters (CTSI, necrosis extent), but also metabolic variables such as HbA1c, insulin requirements, serum lactate, and albumin levels [37,38]. These markers provide insight into the patient's ability to withstand surgery, heal postoperatively, and resist secondary infections.

One proposed framework is a four-domain matrix, integrating:

- Anatomical extent of necrosis (e.g., <30%, 30–50%, >50%)
- Infection burden and microbial profile (e.g., polymicrobial flora, fungal coinfection)
- Host response capacity (e.g., SOFA score, cytokine levels, albumin)
- Metabolic reserve (e.g., HbA1c, C-peptide, stress hyperglycemia ratio)

Each domain contributes a risk tier, and cumulative scoring guides the escalation of intervention from conservative management to percutaneous drainage, minimally invasive necrosectomy, or open surgery [39]. Such stratification systems not only facilitate rational decision-making but also serve as a communication platform among multidisciplinary teams.

Importantly, timing of intervention is highly sensitive to personalized parameters. While classical guidelines recommend waiting until necrosis is encapsulated ("walled-off necrosis"), emerging evidence suggests that in diabetic patients with escalating SOFA scores, persistent lactic acidosis, or refractory hyperglycemia despite insulin therapy, early intervention may be lifesaving, even before radiological maturity [40]. Personalized algorithms must therefore incorporate trend monitoring (e.g., serial procalcitonin, CRP, lactate) to

override static imaging criteria when clinical deterioration occurs.

Another crucial component of individualized care is antimicrobial strategy optimization. In the diabetic setting, empirical antibiotic regimens must consider high rates of multidrug-resistant organisms and fungal colonization. Personalized protocols now often recommend early antifungal coverage when risk factors such as prolonged hyperglycemia, total parenteral nutrition, and prior antibiotic exposure are present [41]. Microbiological data should be reassessed serially, and de-escalation should be pursued whenever possible to minimize toxicity and resistance.

Perioperative glucose control represents yet another cornerstone of personalization. Poorly controlled hyperglycemia has been associated with impaired neutrophil function, decreased fibroblast activity, and increased mortality after necrosectomy [42]. Real-time glucose monitoring and intravenous insulin infusion protocols are recommended, particularly in unstable patients or those undergoing repeat interventions. Algorithms may also flag patients with HbA1c >9% or stress hyperglycemia ratio >1.8 as high-risk for complications, prompting more aggressive metabolic optimization prior to surgical escalation.

From a systems perspective, the implementation of institutional clinical pathways based on personalized algorithms has shown promising results. These protocols provide structured checkpoints—imaging at days 3 and 7, biomarker panels every 48 hours, predefined triggers for drainage or surgery—thereby reducing variability and ensuring consistency in complex decision-making [43]. Some centers have even developed mobile applications and digital dashboards to visualize these data layers in real time and support bedside decisions.

The success of personalized algorithms ultimately depends on team coordination, data integration, and iterative reassessment. As new biomarkers and imaging modalities emerge, these frameworks must be updated and recalibrated for evolving clinical realities. In the diabetic IPN patient, this approach provides a means to deliver precision care in the midst of complexity, balancing the risks of overtreatment and undertreatment, and adapting dynamically to the patient's changing physiology.

5. Future Directions: Multidisciplinary Care and Emerging Technologies in Personalized IPN Management

The future of managing infected pancreatic necrosis (IPN) in diabetic patients lies in converging multidisciplinary expertise with technological innovation. The complexity of the diabetic host response, the variability of necrotic disease expression, and the narrow margin for error demand more than technical excellence - they require a systems-based, adaptive model of care. Emerging evidence supports the hypothesis that coordinated, personalized interventions delivered by integrated teams and enhanced by data-driven platforms result in significantly better outcomes than isolated, specialty-specific approaches [44].

A cornerstone of this vision is the multidisciplinary care model, where surgeons, intensivists, endocrinologists, interventional radiologists, infectious disease specialists, and clinical nutritionists work in concert. In this model, each domain of the patient's physiology - hemodynamics, immune response, glucose metabolism, organ perfusion, and catabolism - is continuously monitored and adjusted through consensus-based decision-making. Diabetic patients undergoing necrosectomy, for example, benefit from preoperative glycemic optimization by endocrinology, antimicrobial de-escalation protocols coordinated by infectious disease experts, and post-necrosectomy wound management with input from surgical and wound-care teams [45].

Technology plays an increasingly central role in enhancing personalization. Artificial intelligence (AI) and machine learning models are now being explored to predict outcomes, optimize timing of intervention, and stratify patients by risk. Using large datasets, algorithms can identify patterns in laboratory values, imaging changes, and vital signs that may precede clinical deterioration, prompting preemptive intervention [46]. Some centers are piloting AI-based sepsis early warning systems, which may be especially valuable in diabetic patients with altered inflammatory profiles.

Additionally, the application of digital clinical decision support systems (CDSS) has gained momentum. These systems integrate real-time data from electronic medical records (EMRs), lab results, and imaging into visual dashboards that flag threshold breaches and suggest guideline-based next steps [47]. In the context of IPN, CDSS platforms can assist in dynamic reassessment, suggesting, for example, percutaneous drainage in the presence of >30% necrosis with gas formation, or

recommending reimaging based on persistent fever and rising procalcitonin.

Biotechnology and molecular diagnostics are also expanding the frontiers of personalized care. The use of point-of-care cytokine assays, rapid multiplex PCR for pathogen identification, and real-time microdialysis of peripancreatic fluid to assess local metabolic shifts are promising tools that may soon be incorporated into daily surgical workflows [48]. These technologies offer the potential to detect subclinical infection progression, antibiotic resistance, or early grafting of fungal organisms—all of which are more common in diabetics and frequently underdiagnosed by conventional methods.

In parallel, precision nutrition and metabolic support are becoming recognized as essential adjuncts. Novel strategies—such as glucose-modulated enteral formulas, micronutrient-enriched feeding (e.g., zinc, selenium, arginine), and tailored insulin delivery systems—can improve anabolic recovery and immune competence postoperatively [49]. Incorporating these into personalized care plans is especially pertinent for diabetic patients, whose catabolic responses are more pronounced and whose nutritional deficits are often underappreciated.

Looking ahead, prospective multicenter studies are needed to validate and refine these multidisciplinary, technology-assisted models in diverse populations. Key research priorities include the development of diabetes-specific IPN scoring systems, exploration of biomarker-guided surgical timing, and evaluation of long-term outcomes such as endocrine and exocrine pancreatic insufficiency, glycemic control post-necrosectomy, and quality of life. Additionally, cost-effectiveness analyses of algorithm-based versus conventional care pathways will be essential to drive policy and resource allocation, particularly in middle-income countries where both diabetes and pancreatitis are rising in parallel [50].

In conclusion, the personalized surgical management of infected pancreatic necrosis in diabetic patients is evolving from reactive surgery to proactive, systematized precision care. By embedding algorithmic decision-making within multidisciplinary teams and augmenting human judgment with technology, we move closer to a paradigm where surgical outcomes are determined not by chance or protocol alone, but by comprehensive, individualized understanding of the patient.

CONCLUSION

Infected pancreatic necrosis (IPN) remains one of the most complex and high-risk conditions in surgical practice, particularly when compounded by diabetes mellitus. The altered immune response, impaired tissue perfusion, increased infection risk, and compromised wound healing seen in diabetic patients demand a departure from conventional protocols toward a personalized, algorithm-driven model of care. The integration of anatomical, metabolic, and immunological variables into surgical planning allows for more precise timing, method selection, and perioperative management.

Modern surgical approaches, especially the step-up strategy incorporating percutaneous drainage and minimally invasive necrosectomy, have revolutionized the field. However, their optimal implementation in diabetic populations requires robust preoperative risk stratification and dynamic reassessment throughout the course of illness. The personalization of surgical tactics (guided by imaging, biomarkers, and physiological reserve) enhances clinical judgment and supports more effective source control with fewer complications.

Multidisciplinary collaboration, enhanced by digital tools and clinical decision support systems, is vital for delivering individualized care. Future research must focus on developing diabetes-specific scoring models, validating novel biomarkers, and exploring the utility of artificial intelligence in real-time clinical decision-making. Personalized algorithms not only improve survival and reduce complications but also pave the way for a more predictive, preventive, and patient-centered approach to managing one of the most challenging entities in abdominal surgery.

Conflict of Interest

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QANDLI DIABETLI BEMORLARDA INFEKSIYALANGAN PANKREATIK NEKROZNI JARROHLIK DAVOLASHDA SHAXSIYLASHTIRILGAN YONDASHUV

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ANNOTATSIYA

Infeksiyalangan pankreatik nekroz (IPN) – bu o'tkir pankreatitning eng og'ir va hayot uchun xavfli asoratlaridan biridir. Qandli diabetli bemorlarda IPN kursi immunitetning buzilishi, mikrotsirkulyatsiyaning yetishmovchiligi va metabolik beqarorlik bilan murakkablashadi. An'anaviy jarrohlik yondashuvlari kasallikning og'irligi va individual xususiyatlarini yetarlicha hisobga olmaydi. Ushbu maqola diabetli bemorlarda IPNni boshqarishda shaxsiylashtirilgan jarrohlik strategiyalarining roli haqida mavjud ilmiy adabiyotlarni tahlil qiladi. Erta xavf baholash, vizualizatsiya, aralashuv vaqtini tanlash va glikemik nazoratga alohida e'tibor qaratiladi. Kam invaziv nekrektomiya, "step-up" yondashuvi va multidisipliner qarorlar asosida shaxsiylashtirilgan algoritmlarning zarurati ta'kidlanadi.

Kalit so'zlar: Infeksiyalangan pankreatik nekroz, qandli diabet, shaxsiylashtirilgan jarrohlik, step-up yondashuvi, nekrektomiya

ПЕРСОНАЛИЗИРОВАННЫЙ ПОДХОД К ХИРУРГИЧЕСКОЙ ТАКТИКЕ ПРИ ИНФИЦИРОВАННОМ ПАНКРЕОНЕКРОЗЕ У БОЛЬНЫХ САХАРНЫМ ДИАБЕТОМ

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АННОТАЦИЯ

Инфицированный панкреонекроз (ИПН) — одно из наиболее тяжёлых и жизнеугрожающих осложнений острого некротизирующего панкреатита. У пациентов с сахарным диабетом течение ИПН усугубляется выраженными иммунными нарушениями, микрососудистыми осложнениями и нестабильностью обмена веществ. Традиционные хирургические подходы зачастую не учитывают индивидуальные особенности течения заболевания. В обзоре обобщены современные данные о персонализированных стратегиях хирургического лечения ИПН у диабетиков. Рассматриваются алгоритмы стратификации риска, визуализация, выбор времени и объема вмешательства, а также значение гликемического контроля. Обоснована необходимость использования персонализированных алгоритмов, основанных на интеграции клинических, лабораторных и визуализирующих данных.

Ключевые слова: Инфицированный панкреонекроз, сахарный диабет, персонализированная хирургия, пошаговый подход, некрэктомия