急性胆源性胰腺炎诊疗进展：循证更新与临床实践优化

唐玉强[1]　刘林勋[2*]
1.青海大学临床医学院　青海西宁　810000
2.青海省人民医院　青海西宁　810000

摘　要：急性胆源性胰腺炎（ABP）作为胆石症最严重的并发症，占急性胰腺炎病因的50%-70%，其全球疾病负担因胆石症患病率上升而持续加重。本文聚焦三大核心议题：（1）诊断革新：提出基于内镜超声（EUS）联合MRCP的病因分型策略，显著提升微结石检出率（51% vs. 20%），指导个体化干预；（2）关键争议优化：ERCP指征决策：强调合并胆管炎/梗阻时24小时内行ERCP可降低病死率（OR=0.42），但无梗阻者需规避误吸性肺炎等风险（OR=4.00）；胆囊切除术时机：同次住院手术（IAC）使复发风险降低90%（RR=0.10），延迟手术（>4周）致33.3%患者再入院；重症管理：微创升阶梯策略降低病死率15%，早期肠内营养（24-72小时）及抗生素分层使用规范疗效显著；（3）未来方向：人工智能驱动影像组学提升早期诊断精度，靶向肠道菌群干预及机器人辅助清创术等微创技术将重塑诊疗范式。综述撰写目的在于整合2020-2024年循证证据，破解临床实践差异，构建个体化诊疗框架，最终改善预后并减轻医疗系统负担。

关键词：急性胆源性胰腺炎；内镜逆行胰胆管造影术；胆囊切除术时机；内镜超声；微创治疗；多学科管理

引言

急性胆源性胰腺炎（acute biliary pancreatitis，ABP）是胆石症最常见的严重并发症，占急性胰腺炎病因的50%-70%[1]。全球范围内，胆石症患病率呈显著上升趋势，欧美国家成人患病率达10%-15%，亚洲国家虽略低但增速明显，这与生活方式改变导致的肥胖率增加、饮食结构西化密切相关[1, 2]。在美国，ABP年发病率约为30/10万，其中约20%进展为重症（SABP），病死率高达20%-30%[3]。中国虽缺乏全国性流行病学数据，但区域性研究显示ABP占急性胰腺炎的58.7%，且农村地区因医疗资源匮乏导致重症转化率较城市高37%[4]。值得注意的是，ABP复发风险突出：未行胆囊切除术患者1年内复发率达32%，显著增加医疗负担[5]。ABP的核心发病机制是胆石移行导致胰胆管梗阻[6]。当胆囊微结石（<3mm）或胆泥通过Oddi括约肌时，引发胆汁反流激活胰酶，导致腺体自消化[4]。当前治疗策略存在三大关键争议：（1）ERCP指征：对合并胆管炎/黄疸者急诊ERCP可降低病死率（OR=0.42），但无梗阻的预测重症患者获益不明确[6]；（2）胆囊切除术时机：轻型ABP行同次住院期手术（IAC）使复发风险降低90%（RR=0.10），但全球仅55.6%患者接受该治疗，医疗资源差异是主要障碍[3, 5]；（3）重症管理：微创升阶梯策略（经皮引流→内镜清创）使病死率降低15%，但营养支持与抗生素选择仍存争议[7]。鉴于ABP诊疗策略的快速革新与临床实践差异，本文聚焦三大核心议题：①基于最新循证证据优化ERCP指征决策树；②阐明胆囊切除术时机选择的生物医学与社会经济学影响因素；③解析重症ABP多学科管理的技术突破。通过整合2020-2024年高质量临床研究（如APEC试验、PONCHO试验），为普外科医生提供个体化诊疗框架，最终改善患者预后并降低医疗系统负担。

一、急性胆源性胰腺炎的诊断

急性胆源性胰腺炎（ABP）的确诊需结合生化、影像及病因学三联证据：典型症状：上腹持续性剧痛伴血清淀粉酶/脂肪酶＞3倍正常值上限[8]；影像学确认胆道病因：经腹超声（TUS）初筛胆囊结石（灵敏度＞90%），但对胆总管结石灵敏度仅50%-80%[9]；内镜超声（EUS）检测微结石（≤5mm）及胆汁淤积灵敏度达92.4%，可弥补TUS阴性患者的漏诊[10, 11]；胆汁分析：刺激后引流胆汁检出胆红素钙颗粒或胆固醇晶体，阳性预测值100%[10]；排除酒精、高脂血症等非胆道病因[12]。基于病因及结石特征的分型指导个体化干预：微结石型（1-5mm）：占不明原因ABP的54.8%，EUS联合MRCP检出率高于单独MRCP（51% vs. 20%，P=0.001），早期胆囊切除术可预防复发[13, 14]；胆汁淤积型（≤1mm无钙化）：EUS显示胆囊内高回声无影物，伴典型胆绞痛

者胆囊切除术后症状缓解率达90.5%[10, 15]；遗传代谢型：如ABCB4基因突变致低磷脂相关性胆石症（LPAC），特征为年轻患者（<40岁）、肝内结石及术后复发，需长期熊去氧胆酸治疗[16]Oddi括约肌功能障碍型：占特发性复发性胰腺炎的30%–65%，需胰管括约肌切开术预防复发[17]。

二、早期内镜干预

ERCP作为急性胆源性胰腺炎（ABP）的重要干预手段，其技术可行性已得到广泛验证。大型单中心研究显示，早期ERCP（<48小时）的成功率达97%，且不受胰腺炎严重程度影响[18]。对于合并胆道梗阻或胆管炎的患者，24小时内行ERCP可显著降低并发症风险[19]。多国指南（如ASGE）明确建议：ABP合并胆管炎或持续性胆道梗阻时，应优先选择早期ERCP[12]。此外，内镜超声（EUS）引导的ERCP可精准筛选需胆道减压的患者，优化医疗资源配置[20]。患者对ERCP的接受度受干预时机与并发症风险影响。荷兰调查表明，96.6%的胃肠病学家认为ABP需早期ERCP，但仅35%支持在无胆道梗阻时常规实施[21]。近期研究显示，ERCP相关不良事件（如胰腺炎恶化）在早期组（<48小时）发生率仅15%，显著低于延迟组的29%[18]。此外，早期ERCP缩短住院时间（4.2天 vs. 7.1天），减轻患者经济与心理负担[22]。因此，结合患者个体化风险评估制定ERCP策略至关重要[23]。早期ERCP显著优化医疗资源利用。美国国家住院样本（NIS）分析显示，ABP患者行ERCP>48小时，住院费用增加23%，而24小时内干预可降低总成本[24]。Weissman等的全国性研究证实，ERCP在24小时内实施可减少ICU入住率（OR=0.62）及胰腺引流手术需求（OR=0.58）[22]。对于恶性胆道梗阻合并胆管炎者，24小时内ERCP使30天死亡率降至2.2%，远低于延迟组的13.5%[25]。这表明早期干预通过降低并发症间接节约医疗支出。ERCP的安全性及时机选择是核心争议点。2019年ASGE指南指出：无胆管炎的ABP患者，早期ERCP未显著改善死亡率（RR=0.74，95%CI：0.18–3.03），但合并胆道梗阻时局部并发症风险降低46%[26]。值得注意的是，症状出现后18小时内行ERCP可能增加误吸性肺炎（OR=4.00）及低血压风险（OR=11.9）[18]。德国多中心研究进一步警示，无梗阻性黄疸者早期ERCP可能加重呼吸衰竭[27]。因此，严格筛选适应症（如胆管炎、持续梗阻）是平衡获益与风险的关键[28]。随着微创技术发展，ERCP在ABP治疗中的地位将持续强化。Dupont等强调，重症ABP的胆囊切除术时机仍存争议，而ERCP可替代外科手术处理胆管残留结石[29]。EUS引导的精准患者筛选、新型胆道支架及器械创新（如激光碎石）有望进一步提升ERCP安全性[23]。未来需聚焦高危人群（如老年、衰弱患者）的个体化干预策略，并探索预防性括约肌切开术对复发风险的抑制作用[30]。

三、胆囊切除术时机

胆囊切除术（laparoscopic cholecystectomy）急性胆源性胰腺炎（ABP）的根治性治疗手段，尤其适用于胆源性病因患者。研究表明，无论胰腺炎严重程度如何，腹腔镜胆囊切除术（LC）均可安全实施，且能有效预防ABP复发[31]。对于轻中度ABP，早期LC（入院后72小时内）可显著缩短住院时间，并降低胆道再入院风险[32, 33]。若延迟手术，约25%–38.8%的患者在等待期间可能出现复发性胆绞痛、胰腺炎或胆管炎[34, 35]。此外，东京指南（TG13）推荐中重度急性胆囊炎患者也可接受早期LC，打破既往认为需延迟手术的局限[36]。轻中度ABP：建议在首次住院期间完成手术。Riquelme等的随机对照试验表明，72小时内行LC较延迟手术（症状缓解后）住院时间缩短109小时（58h vs 167h，P=0.001），且并发症无差异[33]。48小时内：Mueck等提出”24小时方案”可进一步减少内镜逆行胰胆管造影（ERCP）需求（15% vs 29%）和总住院时间（50h vs 77h）[37]。72小时至4周：Lyu等的Meta分析支持”同次入院”手术（无论具体时间点），因延迟超过4周会使胆道事件风险增加33%（P<0.001）[38]。

重度ABP的个体化处理：若合并胰腺坏死，需优先控制感染及器官衰竭，胆囊切除术应推迟至稳定后[39]。早期LC的安全性已获多项研究验证：轻中度ABP患者早期与延迟LC的总体并发症率无统计学差异（6% vs 8.7%，P=0.83）[40]。早期手术的中转率（2%–5.2%）与延迟手术相当（1.3%–17.2%），主要因胆囊三角粘连或解剖不清[41, 42]。中重度急性胆囊炎患者行早期LC后，17.2%需次全胆囊切除，但严重并发症（如胆管损伤）发生率仅1.7%[36]。需注意，若术中发现未识别的胰腺坏死，器官衰竭和感染性坏死风险将显著增加[39]。延迟胆囊切除术是ABP复发及再入院的核心危险因素：延迟手术组（>4周）33.3%因复发性胆胰事件再入院，而同期手术组无此现象[43]。延迟LC患者21%需非计划再入院，主要诊断为胰腺炎复发（34%）、胆绞痛（34%）和急性胆囊炎（26%）[35]。Cho等基于12.9万例数据分析显示，延迟手术（>2天）使再入院率增加12%（OR=1.12），住院费用上升$2700/例，且非居家出院比例增高（OR=1.42）[32]。

四、综合管理进展

早期肠内营养（EN）是ABP管理的基石。研究证实，发病24–72小时内启动EN可降低感染性坏死风险，缩短住院时间[44]。耐受性评估是关键：若无恶心、呕吐或肠梗阻，首选口服营养；若口服困难，经鼻胃管或鼻空肠管EN同样有效，且胃管喂养与空肠管喂养在安全性上无显著差异[45]。全肠外营养（TPN）仅适用于EN不可行或不耐受者[46]。对于接受坏死引流术的患者，术后持续EN可维持肠黏膜屏障功能，减少细菌易位[47]。需监测营养状态，出院后体重下降可能提示胰腺外分泌功能不全，需补充胰酶[44]。抗生素应用需严格分层：不推荐预防性使用：无菌性坏死患者使用抗生素不能降低感染率[46]。感染明确或高度怀疑时启用：指征包括坏死区积气、脓毒症或临床恶化[48]。首选穿透力强的广谱静脉抗生素（如碳青霉烯类、喹诺酮类联合甲硝唑），疗程通常7–10天[46]。抗真菌药物：仅在真菌培养阳性时使用[49]。CT引导下细针穿刺（FNA）细菌培养并非必需，临床征象结合影像学（如CT见”气泡征”）足以指导治疗[50]。生长抑素及其类似物（如奥曲肽）的作用尚存争议。部分研究支持其在预防ERCP术后胰腺炎中的价值[51]，但对ABP病程本身的改善缺乏高质量证据[52]。蛋白酶抑制剂（如乌司他丁）可抑制全身炎症反应，Meta分析显示其能降低重症ABP患者病死率[48]，但仍需更多随机对照试验验证。目前指南未将其列为常规推荐，建议个体化评估[45]。

五、总结与展望

急性胆源性胰腺炎（ABP）的管理正朝着精准化、微创化与智能化方向发展。在诊断层面，人工智能（AI）驱动的影像组学模型可通过分析CT/MRI图像自动识别胆源性病因、坏死范围及感染风险，提升早期诊断准确性[53]。例如，AI算法整合临床数据与影像特征，可预测胆总管结石风险，优化ERCP决策[54]。治疗上，靶向肠道菌群的干预成为新焦点：研究表明特定益生菌（如乳杆菌属）及菌群代谢产物（短链脂肪酸）可减轻胰腺炎症、修复肠屏障，降低感染性坏死风险[55，56]。微创技术亦持续革新，内镜机器人辅助坏死清创术能提高复杂坏死病灶的操作精度，而可降解金属支架的应用有望减少透壁引流相关并发症[57]。此外，基于机器学习的复发风险预测模型（如MINERVA评分）将指导个体化胆囊切除术时机选择，降低复发率[58]。ABP的预防需构建多级防控体系。一级预防聚焦危险因素控制：针对胆石症高发人群（如肥胖、代谢综合征患者），推广肠道菌群监测与靶向益生菌补充，调节胆汁酸代谢以预防结石形成[56]；同时加强抗生素合理使用规范，避免肠道菌群失调诱发胆道感染[59]。二级预防依托AI预警系统：开发社区级健康数据库，整合超声筛查数据与生化指标（如ALT、胆红素），自动识别无症状胆石症患者并干预，降低ABP发病率[53，54]。三级预防强调多学科协作网络：建立区域性ABP诊疗中心，通过远程会诊平台实现基层医院与专家团队的实时协作，确保复杂病例的规范化管理[60]。未来还需推动成本效益研究，验证预防策略的卫生经济学价值[61]。

参考文献

[1]PATEL H, JEPSEN J. Gallstone Disease: Common Questions and Answers [J]. Am Fam Physician, 2024, 109(6): 518–24.

[2]RESHETNYAK V I. Concept of the pathogenesis and treatment of cholelithiasis [J]. World J Hepatol, 2012, 4(2): 18–34.

[3]ETHERIDGE J C, CASTILLO–ANGELES M, SINYARD R D, et al. Impact of hospital characteristics on best–practice adherence for gallstone pancreatitis: a nationwide analysis [J]. Surg Endosc, 2023, 37(1): 127–33.

[4]WANG G J, GAO C F, WEI D, et al. Acute pancreatitis: etiology and common pathogenesis [J]. World J Gastroenterol, 2009, 15(12): 1427–30.

[5]PRASANTH J, PRASAD M, MAHAPATRA S J, et al. Early Versus Delayed Cholecystectomy for Acute Biliary Pancreatitis: A Systematic Review and Meta–Analysis [J]. World J Surg, 2022, 46(6): 1359–75.

[6]VAN GEENEN E J, VAN DER PEET D L, BHAGIRATH P, et al. Etiology and diagnosis of acute biliary pancreatitis [J]. Nat Rev Gastroenterol Hepatol, 2010, 7(9): 495–502.

[7]WILKINS T, AGABIN E, VARGHESE J, et al. Gallbladder Dysfunction: Cholecystitis, Choledocholithiasis, Cholangitis, and Biliary Dyskinesia Early Versus Delayed Cholecystectomy for Acute Biliary Pancreatitis: A Systematic Review and Meta–Analysis [J]. Prim Care, 2017, 44(4): 575–97.

[8]BORNMAN P C, BECKINGHAM I J, KRIGE J E, et al. Gallstone pancreatitis––a critical review of current treatment strategies [Acute biliary pancreatitis. Therapeutic

trends][J]. S Afr J Surg, 2000, 38(4): 97-9.

[9]ŞURLIN V, SĂFTOIU A, DUMITRESCU D. Imaging tests for accurate diagnosis of acute biliary pancreatitis [J]. World J Gastroenterol, 2014, 20(44): 16544-9.

[10]DILL J E, HILL S, CALLIS J, et al. Combined endoscopic ultrasound and stimulated biliary drainage in cholecystitis and microlithiasis--diagnoses and outcomes [J]. Endoscopy, 1995, 27(6): 424-7.

[11]ŻORNIAK M, SIRTL S, BEYER G, et al. Consensus definition of sludge and microlithiasis as a possible cause of pancreatitis [J]. Gut, 2023, 72(10): 1919-26.

[12]BUXBAUM J L, ABBAS FEHMI S M, SULTAN S, et al. ASGE guideline on the role of endoscopy in the evaluation and management of choledocholithiasis [J]. Gastrointest Endosc, 2019, 89(6): 1075-105 e15.

[13]MAITRA I, BENNETT G, MORAIS C, et al. Laparoscopic cholecystectomy for mild acute gallstone pancreatitis-indication itself is a good predictor of (minimal) intraoperative difficulty-a retrospective cohort study [J]. Turk J Surg, 2021, 37(2): 103-8.

[14]ORTEGA A R, GÓMEZ-RODRÍGUEZ R, ROMERO M, et al. Prospective comparison of endoscopic ultrasonography and magnetic resonance cholangiopancreatography in the etiological diagnosis of "idiopathic" acute pancreatitis [J]. Pancreas, 2011, 40(2): 289-94.

[15]MONTENEGRO A, ANDÚJAR X, FERNáNDEZ-BAñARES F, et al. Usefulness of endoscopic ultrasound in patients with minilithiasis and/or biliary sludge as a cause of symptoms of probable biliary origin after cholecystectomy Combined endoscopic ultrasound and stimulated biliary drainage in cholecystitis and microlithiasis--diagnoses and outcomes Idiopathic acute pancreatitis-A myth or reality? Role of endoscopic ultrasonography and magnetic resonance cholangiopancreatography in its diagnosis [J]. Gastroenterol Hepatol, 2022, 45(2): 91-8.

[16]ROSMORDUC O, POUPON R. Low phospholipid associated cholelithiasis: association with mutation in the MDR3/ABCB4 gene [J]. Orphanet J Rare Dis, 2007, 2: 29.

[17]ELTA G H. Sphincter of Oddi dysfunction and bile duct microlithiasis in acute idiopathic pancreatitis [J]. World J Gastroenterol, 2008, 14(7): 1023-6.

[18]MALOOF T, RODRIGUES D, LI T, et al. Early Endoscopic Retrograde Cholangiopancreatography in Gallstone Pancreatitis Is Safe: Results From a Large Single-Center Retrospective Study [J]. Pancreas, 2024, 53(8): e657-e61.

[19]VAN SANTVOORT H C, BESSELINK M G, DE VRIES A C, et al. Early endoscopic retrograde cholangiopancreatography in predicted severe acute biliary pancreatitis: a prospective multicenter study [J]. Ann Surg, 2009, 250(1): 68-75.

[20]HALLENSLEBEN N D, STASSEN P M C, SCHEPERS N J, et al. Patient selection for urgent endoscopic retrograde cholangio-pancreatography by endoscopic ultrasound in predicted severe acute biliary pancreatitis (APEC-2): a multicentre prospective study Timing of Performing Endoscopic Retrograde Cholangiopancreatography and Inpatient Mortality in Acute Cholangitis: A Systematic Review and Meta-Analysis [J]. Gut, 2023, 72(8): 1534-42.

[21]VAN GEENEN E J, MULDER C J, VAN DER PEET D L, et al. Endoscopic treatment of acute biliary pancreatitis: a national survey among Dutch gastroenterologists Early Endoscopic Retrograde Cholangiopancreatography in Gallstone Pancreatitis Is Safe: Results From a Large Single-Center Retrospective Study [J]. Scand J Gastroenterol, 2010, 45(9): 1116-20.

[22]WEISSMAN S, SHARMA S, EHRLICH D, et al. The role and timing of endoscopic retrograde cholangiopancreatography in acute biliary pancreatitis without cholangitis: A nationwide analysis Optimal timing of endoscopic retrograde cholangiopancreatography for acute cholangitis associated with distal malignant biliary obstruction [J]. J Hepatobiliary Pancreat Sci, 2023, 30(6): 767-76.

[23]BUONOCORE M R, GERMANI U, CASTELLANI D, et al. Timing of endoscopic therapy for acute bilio-pancreatic diseases: a practical overview [J]. Ann Gastroenterol, 2021, 34(2): 125-9.

[24]PARIKH M P, WADHWA V, THOTA P N, et al. Outcomes Associated With Timing of ERCP in Acute Cholangitis Secondary to Choledocholithiasis [J]. J Clin Gastroenterol, 2018, 52(10): e97-e102.

[25]PARK N, LEE S H, YOU M S, et al. Optimal timing of endoscopic retrograde cholangiopancreatography

for acute cholangitis associated with distal malignant biliary obstruction [J]. BMC Gastroenterol, 2021, 21(1): 175.

[26]TSE F, YUAN Y. Early routine endoscopic retrograde cholangiopancreatography strategy versus early conservative management strategy in acute gallstone pancreatitis [J]. Cochrane Database Syst Rev, 2012, 2012(5): CD009779.

[27]FöLSCH U R, NITSCHE R, L ü DTKE R, et al. Early ERCP and papillotomy compared with conservative treatment for acute biliary pancreatitis. The German Study Group on Acute Biliary Pancreatitis Urgent ERCP in all cases of acute biliary pancreatitis? A prospective randomized multicenter study [J]. N Engl J Med, 1997, 336(4): 237-42.

[28]TAN M, SCHAFFALITZKY DE MUCKADELL O B, LAURSEN S B. Association between early ERCP and mortality in patients with acute cholangitis [J]. Gastrointest Endosc, 2018, 87(1): 185-92.

[29]DUPONT B, LOZAC' H J, ALVES A. Etiological treatment of gallstone acute pancreatitis [J]. World J Gastrointest Surg, 2025, 17(5): 105410.

[30]SVATOŇ R, KALA Z, NOVOTNý I, et al. The timing of ERCP in acute biliary pancreatitis [J]. Rozhl Chir, 2019, 98(1): 10-3.

[31]ACKERMANN T G, CASHIN P A, ALWAN M, et al. The Role of Laparoscopic Cholecystectomy After Severe and/or Necrotic Pancreatitis in the Setting of Modern Minimally Invasive Management of Pancreatic Necrosis Effect of surgical timing on outcomes after cholecystectomy for mild gallstone pancreatitis [J]. Pancreas, 2020, 49(7): 935-40.

[32]CHO N Y, CHERVU N L, SAKOWITZ S, et al. Effect of surgical timing on outcomes after cholecystectomy for mild gallstone pancreatitis [J]. Surgery, 2023, 174(3): 660-5.

[33]RIQUELME F, MARINKOVIC B, SALAZAR M, et al. Early laparoscopic cholecystectomy reduces hospital stay in mild gallstone pancreatitis. A randomized controlled trial [J]. HPB (Oxford), 2020, 22(1): 26-33.

[34]BASILE G, VACANTE M, CORSARO A, et al. Treatment of acute pancreatitis Clinical outcomes of early and delayed cholecystectomy for acute gallstone-related disease [J]. Minerva Surg, 2025, 80(3): 236-57.

[35]CAMERON D R, GOODMAN A J. Delayed cholecystectomy for gallstone pancreatitis: re-admissions and outcomes [J]. Ann R Coll Surg Engl, 2004, 86(5): 358-62.

[36]AMIRTHALINGAM V, LOW J K, WOON W, et al. Tokyo Guidelines 2013 may be too restrictive and patients with moderate and severe acute cholecystitis can be managed by early cholecystectomy too [J]. Surg Endosc, 2017, 31(7): 2892-900.

[37]MUECK K M, WEI S, PEDROZA C, et al. Gallstone Pancreatitis: Admission Versus Normal Cholecystectomy-a Randomized Trial (Gallstone PANC Trial) [J]. Ann Surg, 2019, 270(3): 519-27.

[38]LYU Y X, CHENG Y X, JIN H F, et al. Same-admission versus delayed cholecystectomy for mild acute biliary pancreatitis: a systematic review and meta-analysis [J]. BMC Surg, 2018, 18(1): 111.

[39]KWONG W T, VEGE S S, MACES S, et al. Unrecognized necrosis at same admission cholecystectomy for pancreatitis increases organ failure and infected necrosis Cholecystectomy in Mild and Moderate Acute Pancreatitis: A Retrospective Study [J]. Pancreatology, 2017, 17(1): 41-4.

[40]GUADAGNI S, CENGELI I, PALMERI M, et al. Early cholecystectomy for non-severe acute gallstone pancreatitis: easier said than done [J]. Minerva Chir, 2017, 72(2): 91-7.

[41]AKSOY F, DEMIRAL G, EKINCI Ö. Can the timing of laparoscopic cholecystectomy after biliary pancreatitis change the conversion rate to open surgery? [J]. Asian J Surg, 2018, 41(4): 307-12.

[42]GIUFFRIDA P, BIAGIOLA D, CRISTIANO A, et al. Laparoscopic cholecystectomy in acute mild gallstone pancreatitis: how early is safe? Laparoscopic cholecystectomy in acute gallstone pancreatitis in index hospital admission: feasibility and safety [J]. Updates Surg, 2020, 72(1): 129-35.

[43]DEGRATE L, BERNASCONI D P, MERONI P, et al. Mild acute biliary pancreatitis: the timing of cholecystectomy should not exceed index admission [J]. Minerva Chir, 2017, 72(5): 383-90.

[44]ARVANITAKIS M, GKOLFAKIS P, FERNANDEZ Y V M, et al. Nutrition in acute pancreatitis American Gastroenterological Association Clinical Practice Update: Management of Pancreatic Necrosis [J]. Curr Opin Clin Nutr Metab Care, 2021, 24(5): 428-32.

[45]VISHNUPRIYA K, CHANMUGAM A, ARVANITAKIS M, et al. Acute Pancreatitis: The Increasing

Role of Medical Management of a Traditionally Surgically Managed Disease Nutrition in acute pancreatitis American Gastroenterological Association Clinical Practice Update: Management of Pancreatic Necrosis [J]. Am J Med, 2022, 135(2): 167-72.

[46]BARON T H, DIMAIO C J, WANG A Y, et al. American Gastroenterological Association Clinical Practice Update: Management of Pancreatic Necrosis [J]. Gastroenterology, 2020, 158(1): 67-75 e1.

[47]GOMES C A, DI SAVERIO S, SARTELLI M, et al. Severe acute pancreatitis: eight fundamental steps revised according to the 'PANCREAS' acronym [J]. Ann R Coll Surg Engl, 2020, 102(8): 555-9.

[48]TAKADA T, ISAJI S, MAYUMI T, et al. JPN clinical practice guidelines 2021 with easy-to-understand explanations for the management of acute pancreatitis Acute Pancreatitis: The Increasing Role of Medical Management of a Traditionally Surgically Managed Disease Nutrition in acute pancreatitis American Gastroenterological Association Clinical Practice Update: Management of Pancreatic Necrosis [J]. J Hepatobiliary Pancreat Sci, 2022, 29(10): 1057-83.

[49]PODDA M, PELLINO G, DI SAVERIO S, et al. Infected pancreatic necrosis: outcomes and clinical predictors of mortality. A post hoc analysis of the MANCTRA-1 international study [J]. Updates Surg, 2023, 75(3): 493-522.

[50]HERBERS U, TRAUTWEIN C, TACKE F, et al. [Diagnosis and stage-adapted treatment of acute pancreatitis[J]. Med Klin Intensivmed Notfmed, 2018, 113(7): 593-605.

[51]BRUNO M J. Improving the Outcome of Acute Pancreatitis [J]. Dig Dis, 2016, 34(5): 540-5.

[52]LEE P J, PAPACHRISTOU G I. Management of Severe Acute Pancreatitis [J]. Curr Treat Options Gastroenterol, 2020, 18(4): 670-81.

[53]BUSH N, KHASHAB M, AKSHINTALA V S. Current and Emerging Applications of Artificial Intelligence (AI) in the Management of Pancreatobiliary (PB) disorders [J]. Curr Gastroenterol Rep, 2024, 26(11): 304-9.

[54]HU J X, ZHAO C F, WANG S L, et al. Acute pancreatitis: A review of diagnosis, severity prediction and prognosis assessment from imaging technology, scoring system and artificial intelligence [J]. World J Gastroenterol, 2023, 29(37): 5268-91.

[55]LIU Q, RUAN K, AN Z, et al. Updated review of research on the role of the gut microbiota and microbiota-derived metabolites in acute pancreatitis progression and inflammation-targeted therapy [J]. Int J Biol Sci, 2025, 21(3): 1242-58.

[56]ZHANG C, LI G, LU T, et al. The Interaction of Microbiome and Pancreas in Acute Pancreatitis [J]. Biomolecules, 2023, 14(1).

[57]TAKENAKA M, SAITO T, HAMADA T, et al. Disconnected pancreatic duct syndrome: diagnostic and therapeutic challenges and future directions Current and Emerging Applications of Artificial Intelligence (AI) in the Management of Pancreatobiliary (PB) disorders A Modified AUGIS Delphi Process to Establish Future Research Priorities in Benign Upper Gastrointestinal Surgery Acute pancreatitis: management update and future directions of pancreatic imaging [J]. Expert Rev Gastroenterol Hepatol, 2024, 18(10): 631-45.

[58]PODDA M, PISANU A, PELLINO G, et al. Machine learning for the rElapse risk eValuation in acute biliary pancreatitis: The deep learning MINERVA study protocol [J]. World J Emerg Surg, 2025, 20(1): 17.

[59]DI VINCENZO F, NICOLETTI A, NEGRI M, et al. Gut Microbiota and Antibiotic Treatments for the Main Non-Oncologic Hepato-Biliary-Pancreatic Disorders [J]. Antibiotics (Basel), 2023, 12(6).

[60]CRIBARI C, TIERNEY J, LAGRONE L. Managing complicated pancreatitis with more knowledge and a bigger toolbox! [J]. Trauma Surg Acute Care Open, 2025, 10(Suppl 1): e001798.

[61]中华医学会消化病学分会胰腺疾病学组.中国急性胰腺炎诊治指南（草案）[J].中华消化杂志，2004，(03)：62-64.