



doi:10.7659/j.issn.1005-6947.2021.09.004  
http://dx.doi.org/10.7659/j.issn.1005-6947.2021.09.004  
Chinese Journal of General Surgery, 2021, 30(9):1017-1022.

· 述评 ·

## 新型冠状病毒相关性急性胰腺炎的认识现状

张韬, 朱帅, 黄耿文

(中南大学湘雅医院 胰腺外科, 湖南 长沙 410008)



黄耿文

### 摘要

新型冠状病毒肺炎(简称新冠肺炎)依然在全球肆虐,有关新冠肺炎的文献报道呈指数增长,其中已有病例报道、回顾性研究以及生物信息学数据开始关注新冠肺炎与急性胰腺炎的关联。新冠病毒攻击胰腺的具体机制尚不明确,但新冠病毒受体在胰腺组织中的表达已被证实,且在新冠肺炎患者的胰腺组织中可分离出新冠病毒成分。这些均提示新冠病毒与急性胰腺炎之间可能存在因果关系。新冠病毒相关性急性胰腺炎临床上易被漏诊,其诊断、严重程度分级及预后均都具有一定的特殊性,值得特别关注。

### 关键词

胰腺炎; 新型冠状病毒肺炎; 新冠病毒

中图分类号: R657.5

## Current knowledge of SARS-CoV-2 associated acute pancreatitis

ZHANG Tao, ZHU Shuai, HUANG Gengwen

(Department of Pancreatic Surgery, Xiangya Hospital, Central South University, Changsha 410008, China)

### Abstract

The global pandemic of coronavirus disease 2019 (COVID-19) is still ongoing, and the literature concerning COVID-19 is growing exponentially. The existing data from case reports, retrospective cohort studies and bioinformatics have suggested the relationship between SARS-CoV-2 and acute pancreatitis (AP). The mechanism of how SARS-CoV-2 attacks pancreas remains unclear. However, the expression of the receptor of SARS-CoV-2 in pancreatic tissue has been confirmed, and the components of SARS-CoV-2 have been isolated in the pancreas from patients with COVID-19. These evidences indicate that there may be a causality between SARS-CoV-2 and AP. The SARS-CoV-2 associated acute pancreatitis (SAAP) is likely to be misdiagnosed in clinical settings. Its diagnosis, severity classification and prognosis have specificities that deserve special attention.

### Key words

Pancreatitis; Coronavirus Disease 2019; SARS-CoV-2

CLC number: R657.5

基金项目: 国家自然科学基金资助项目(81802450); 湖南省自然科学基金资助项目(2020JJ4133)。

收稿日期: 2021-08-15; 修订日期: 2021-09-23。

作者简介: 黄耿文, 中南大学湘雅医院主任医师, 主要从事胆胰外科和疝外科方面的研究。

通信作者: 黄耿文, Email: huanggengwen@csu.edu.cn

新型冠状病毒肺炎（简称新冠肺炎）作为一种新型呼吸系统传染性疾病仍在全球肆虐。据世界卫生组织统计，截至2021年9月21日，新冠肺炎已造成全球2.28亿例次的感染，累计死亡例数超过460万<sup>[1]</sup>。新型冠状病毒（简称新冠病毒）不仅可以造成肺部损伤，还可累及心血管、胃肠道、肝、肾、脑等多种肺外器官<sup>[2]</sup>。目前已有证据显示，新冠病毒与急性胰腺炎（acute pancreatitis, AP）的发生可能存在关联，但关联程度尚存争议<sup>[3]</sup>。在常态化疫情防控背景之下，新冠病毒相关性急性胰腺炎（SARS-CoV-2 associated acute pancreatitis, SAAP）存在的可能性值得临床高度重视。

## 1 新冠病毒与AP的关系

众所周知，胆石症、高甘油三酯血症和酒精是引起AP的常见病因。病毒也是AP的确切病因之一，但占比不到1%，常见的可引起AP的病毒包括巨细胞病毒、腮腺炎病毒和EB病毒等<sup>[4]</sup>。

自新冠肺炎疫情暴发以来，已有较多的病例报道和回顾性研究提示新冠病毒与AP存在关联。Wang等<sup>[5]</sup>首先报道，52例新冠肺炎患者中有9例（17%）出现血清淀粉酶和/或脂肪酶的异常增高，虽均未达到AP的诊断标准，但提示胰腺可能是新冠病毒攻击的潜在靶器官。此后，世界各地陆续报道了新冠肺炎合并AP的病例和队列研究。笔者在PubMed上检索了2019年12月—2021年5月间已发表的SAAP病例报道30篇<sup>[6-35]</sup>，共33例患者。在这些患者中，32例（97.0%）患者未发现胆源性、酒精性或高脂血症等常见病因，亦未证实自身免疫性因素或药源性因素等罕见病因，故推测新冠病毒可能为AP的致病因素。

Inamdar等<sup>[36]</sup>对疫情期间美国纽约12家医院收治的48 012例住院患者进行回顾性分析，其中AP患者189例，新冠病毒感染例数为11 883例。在新冠病毒阴性的AP患者中，21%（33/157）未明确病因，而在新冠病毒阳性的AP患者中，这一比例高达69%（22/32）。在Dirweesh等<sup>[37]</sup>报道中也有类似结果。新冠病毒感染的AP患者中，特发性胰腺炎的比例显著高于新冠病毒阴性的AP患者，提示新冠病毒可能是这部分特发性胰腺炎的致病原因。

然而，需要特别注意的是，由于新冠病毒的

传染性，AP患者合并新冠病毒感染时，临床医师往往顾忌或很难对患者进行充分的辅助检查，如内镜超声（EUS）等，从而可能导致胆道泥沙样结石等AP病因的漏诊<sup>[38-39]</sup>。因此，不完善的辅助检查可能是新冠病毒感染的AP患者特发性胰腺炎比例较高的原因之一。此外，治疗新冠肺炎的药物也可能引起AP<sup>[32]</sup>，且药物源性AP的诊断很难和病毒性胰腺炎相鉴别。因此，新冠病毒感染患者中特发性胰腺炎比例较高虽然提示新冠病毒可能是AP的致病因素，但由于偏倚因素较多，尚不足以据此断定新冠病毒就是AP的病因。根据现有报道，新冠肺炎患者的AP发病率并未明显增加。西班牙的一项多中心回顾性研究<sup>[40]</sup>显示，63 822例新冠肺炎患者中，AP的发病率仅为0.07%。Inamdar等<sup>[36]</sup>研究亦显示，新冠肺炎患者中AP的发病率为0.27%（32/11 883），尚低于队列中AP的总发病率（0.39%）。

基础研究表明，冠状病毒通过跨膜丝氨酸蛋白酶2（transmembrane serine protease 2, TMPRSS2）预处理后的刺突蛋白与人体细胞表达的血管紧张素转换酶2（angiotensin-converting enzyme 2, ACE2）结合进入靶细胞<sup>[41]</sup>，靶细胞上ACE2和TMPRSS2共表达是病毒进入细胞的必要条件。这两种蛋白在胃肠道上皮细胞表达丰富。Liu等<sup>[42]</sup>通过RNA测序发现ACE2 mRNA在胰腺组织中有表达，且在胰腺组织中的表达水平高于肺，并通过单细胞测序发现，胰腺外分泌细胞和胰岛细胞中均表达ACE2 mRNA。Coate等<sup>[43]</sup>在胰腺导管上皮细胞中检测到ACE2和TMPRSS2的共表达。Kusmartseva等<sup>[44]</sup>发现ACE2 mRNA及蛋白在人胰管上皮细胞和微血管内皮细胞中表达水平较高，并且在1例新冠肺炎患者的胰腺导管上皮中检测到新冠病毒核蛋白。此外，Schepis等<sup>[45]</sup>在胰腺假性囊肿囊液中分离出新冠病毒RNA，且病毒载量较高。上述实验研究表明，表达ACE2受体的胰腺细胞可能成为新冠病毒攻击的靶细胞，SAAP的分子基础是存在的（图1）。尽管存在上述实验证据，但目前为止，能确切证明新冠病毒就是AP新病因的证据还不充分，比如，尚未能在动物模型中证明新冠病毒引起AP的致病性，也没有任何证据表明新冠病毒的载量与AP发生率相关等。由于新冠病毒刺突蛋白与野生型小鼠模型的ACE2受体相互作用较弱，构建新冠病毒感染的小鼠模型存在很大困难<sup>[46]</sup>。而且，由于人

群中新冠病毒感染者AP的发病率很低,新冠肺炎动物模型发生AP亦可能是罕见的。因此,要在新

冠肺炎动物模型中证明新冠病毒就是AP的病因将面临很大的困难。

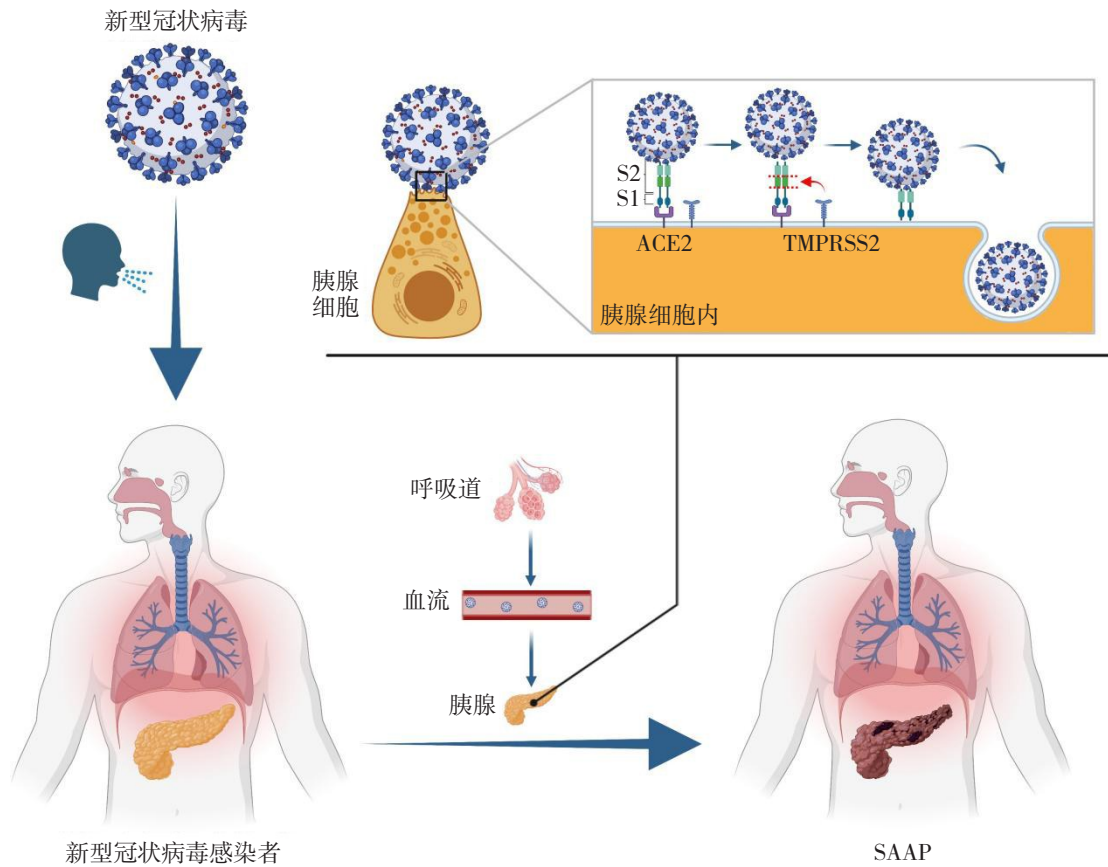


图1 新冠病毒相关性急性胰腺炎的可能发生机制 (S1: 刺突蛋白亚基1; S2: 刺突蛋白亚基2)  
Figure 1 The potential mechanism of SAAP (S1: spike protein trimer 1; S2: spike protein trimer 2)

## 2 SAAP的诊断

在新冠病毒核酸检测阳性的基础上,符合急性胰腺炎诊断标准,即以下标准中的任意两条:(1)符合AP特点的腹痛;(2)血淀粉酶和/或脂肪酶升高至正常上限3倍以上;(3)影像学表现符合AP特点。同时需排除其他已知的AP病因。

由于临床医生对于此病的认识不深刻以及病毒的传染性等多种原因,SAAP可能被漏诊或被低估。多项荟萃分析和观察性研究结果显示,新冠肺炎患者的消化道症状发生率约为17%~20%,其中腹痛发生率为1%~9%<sup>[47-49]</sup>。在病情危重的新冠肺炎患者中,腹痛的症状可能被掩盖,此时,AP的诊断主要依赖于血淀粉酶和/或脂肪酶与影像学检查,但AP的诊断需要由临床表现来启动,故危重

症新冠肺炎患者中AP可能被漏诊<sup>[20]</sup>。因此,临床医师应重视新冠肺炎患者的消化道症状,尤其是对腹痛症状和体征的评估,尽可能避免SAAP的漏诊<sup>[50]</sup>。

研究<sup>[42]</sup>表明,血淀粉酶和/或脂肪酶升高在新冠肺炎患者中的发生率约为10%~30%,而且重症新冠肺炎患者中淀粉酶增高的比例明显高于轻症患者(17.9% vs. 1.85%)。现已公认,新冠肺炎是一个全身性疾病,可累及肺、心、肝、肾、胃肠道和胰腺等多个器官。血淀粉酶和/或脂肪酶异常并非胰腺炎的特异性指标。酸中毒、糖尿病和肾脏受累等均可导致血淀粉酶和/或脂肪酶的升高。因此,血清淀粉酶和/或脂肪酶异常可能更多地反映患者整体病情的严重程度。

### 3 SAAP的严重程度分级和预后

修订后的亚特兰大分级标准基于局部并发症和器官功能衰竭两个方面将AP分为轻症、中度重症和重症<sup>[51]</sup>。在SAAP患者中，由于新冠肺炎和AP这两种疾病均可诱发系统性炎症反应，进而导致呼吸、循环、肾脏等多器官功损害。因此，在对SAAP进行严重程度分级时，应审慎地进行判断。Stevens等<sup>[33]</sup>报道1例10岁SAAP患者病程中出现多器官功能衰竭，但CT仅显示水肿性胰腺炎，并无胰腺坏死积液。作者认为，若将此病例归为重症胰腺炎，显然不妥。Bulthuis等<sup>[52]</sup>报道的5例SAAP亦存在类似情况。根据现有文献资料，SAAP患者的器官功能损害更可能与新冠肺炎有关，而非胰腺炎所致。在对SAAP进行严重程度评估时，一定要结合影像学证据来进行综合评估。

SAAP有两种临床类型：一类是以AP为首表现；另一类是以新冠肺炎为首表现，继而在病程中发生AP。这两种类型的SAAP的预后特点不相同。Kumar等<sup>[53]</sup>研究表明，以AP为首表现的SAAP患者总体预后优于以新冠肺炎为首表现的SAAP患者。这提示，以AP为首表现的SAAP可能是新冠病毒攻击胰腺所致的病毒性胰腺炎，而以新冠肺炎为首表现的SAAP，其发生可能为全身炎症反应失衡所致的多器官功能损害的表现。

研究<sup>[54]</sup>表明，新冠病毒感染对AP的预后有不利影响。一项国际多中心队列研究纳入1 777例AP患者，其中包括149例新冠病毒阳性和1 628例新冠病毒阴性患者。结果显示，新冠病毒阳性组的30 d病死率显著高于新冠病毒阴性组（分别为14.7%和2.6%）。在Dirweesh等<sup>[37]</sup>的队列以及近期的荟萃分析<sup>[55]</sup>中也得到类似的结果。但目前尚无可靠证据表明，AP的发生会对新冠肺炎的预后产生影响。现有资料显示，SAAP大多为水肿性胰腺炎或轻型胰腺炎，对新冠肺炎患者的临床结局影响较小。未来，需要更大样本量的研究来证明AP对新冠肺炎患者预后的可能影响。

### 4 总结

目前有证据表明，新冠病毒与AP的发生很可能存在密切关联，但根据现有证据，尚不足以确定新冠病毒就是AP的新病因，未来需要更严谨的

科学研究来证明，包括尸检、活检等病理学研究，动物模型的构建以及胰腺原代细胞实验的开展等。在新冠肺炎患者中，临床医师应高度警惕并重视SAAP发生的可能，并严格按照现行的诊断标准对AP进行诊断和分级。虽然大多数SAAP是水肿性胰腺炎或轻型胰腺炎，但一旦出现胰腺坏死或器官功能衰竭，将导致更高的病死率。

### 参考文献

- [1] World Health Organization. Coronavirus disease 2019 (COVID-19) situation report [EB/OL]. 2021[2021-9-21]. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports>.
- [2] Wang T, Du Z, Zhu FX, et al. Comorbidities and multi-organ injuries in the treatment of COVID-19[J]. *Lancet*, 2020, 395(10228):e52. doi: 10.1016/S0140-6736(20)30558-4.
- [3] de-Madaria E, Capurso G. COVID-19 and acute pancreatitis: examining the causality[J]. *Nat Rev Gastroenterol Hepatol*, 2021, 18(1):3-4. doi: 10.1038/s41575-020-00389-y.
- [4] Forsmark CE, Vege SS, Wilcox CM. Acute Pancreatitis[J]. *N Engl J Med*, 2016, 75(3):1972-1981. doi: 10.1056/NEJMra1505202.
- [5] Wang F, Wang HZ, Fan JL, et al. Pancreatic Injury Patterns in Patients With Coronavirus Disease 19 Pneumonia[J]. *Gastroenterology*, 2020, 159(1): 367-370. doi: 10.1053/j.gastro.2020.03.055.
- [6] Abbas M, Törnhaage CJ. Family Transmission of COVID-19 Including a Child with MIS-C and Acute Pancreatitis[J]. *Int Med Case Rep J*, 2021, 14:55-65. doi: 10.2147/IMCRJ.S284480.
- [7] Alloway BC, Yaeger SK, Mazzaccaro RJ, et al. Suspected case of COVID-19-associated pancreatitis in a child[J]. *Radiol Case Rep*, 2020, 15(8):1309-1312. doi: 10.1016/j.radcr.2020.06.009.
- [8] Anand ER, Major C, Pickering O, et al. Acute pancreatitis in a COVID-19 patient[J]. *Br J Surg*, 2020, 107(7):e182. doi: 10.1002/bjs.11657.
- [9] Binesfar N, Mirahmadi A, Karbasian F, et al. Acute Pancreatitis as a Possible Unusual Manifestation of COVID-19 in Children[J]. *Case Rep Pediatr*, 2021, 2021:6616211. doi: 10.1155/2021/6616211.
- [10] SMMABokhari, Mahmood F. Case Report: Novel Coronavirus-A Potential Cause of Acute Pancreatitis? [J]. *Am J Trop Med Hyg*, 2020, 103(3):1154-1155. doi: 10.4269/ajtmh.20-0568.
- [11] Bouali M, Ouchane M, Elbakouri A, et al. Total gastric necrosis following acute pancreatitis in a patient with COVID -19: Case report and literature review[J]. *Ann Med Surg (Lond)*, 2021, 62: 362-364. doi: 10.1016/j.amsu.2021.01.061.
- [12] Brikman S, Denysova V, Menzal H, et al. Acute pancreatitis in a 61-

- year-old man with COVID-19[J]. *CMAJ*, 2020, 192(30):E858–859. doi: [10.1503/cmaj.201029](https://doi.org/10.1503/cmaj.201029).
- [13] Cheung S, Delgado Fuentes A, Fetterman AD. Recurrent Acute Pancreatitis in a Patient with COVID-19 Infection[J]. *Am J Case Rep*, 2020, 21:e927076. doi: [10.12659/AJCR.927076](https://doi.org/10.12659/AJCR.927076).
- [14] Chivato Martín-Falquina I, García-Morán S, Jiménez Moreno MA. Acute pancreatitis in SARS-CoV-2 infection. Beyond respiratory distress[J]. *Rev Esp Enferm Dig*, 2021, 113(5): 388–389. doi: [10.17235/reed.2021.7781/2020](https://doi.org/10.17235/reed.2021.7781/2020).
- [15] Ibrahim YS, Karuppusamy G, Parambil JV, et al. Case Report: Paralytic Ileus: A Potential Extrapulmonary Manifestation of Severe COVID-19[J]. *Am J Trop Med Hyg*, 2020, 103(4): 1600–1603. doi: [10.4269/ajtmh.20-0894](https://doi.org/10.4269/ajtmh.20-0894).
- [16] Kandasamy S. An unusual presentation of COVID-19: Acute pancreatitis[J]. *Ann Hepatobiliary Pancreat Surg*, 2020, 24(4):539–541. doi: [10.14701/ahbps.2020.24.4.539](https://doi.org/10.14701/ahbps.2020.24.4.539).
- [17] Karimzadeh S, Manzuri A, Ebrahimi M, et al. COVID-19 presenting as acute pancreatitis: Lessons from a patient in Iran[J]. *Pancreatol*, 2020, 20(5): 1024–1025. doi: [10.1016/j.pan.2020.06.003](https://doi.org/10.1016/j.pan.2020.06.003).
- [18] Kataria S, Sharif A, Ur Rehman A, et al. COVID-19 Induced Acute Pancreatitis: A Case Report and Literature Review[J]. *Cureus*, 2020, 12(7):e9169. doi: [10.7759/cureus.9169](https://doi.org/10.7759/cureus.9169).
- [19] Kumaran NK, Karmakar BK, Taylor OM. Coronavirus disease-19 (COVID-19) associated with acute necrotising pancreatitis (ANP) [J]. *BMJ Case Rep*, 2020, 13(9):e237903. doi: [10.1136/bcr-2020-237903](https://doi.org/10.1136/bcr-2020-237903).
- [20] Kurihara Y, Maruhashi T, Wada T, et al. Pancreatitis in a Patient with Severe Coronavirus Disease Pneumonia Treated with Venovenous Extracorporeal Membrane Oxygenation[J]. *Intern Med*, 2020, 59(22):2903–2906. doi: [10.2169/internalmedicine.5912-20](https://doi.org/10.2169/internalmedicine.5912-20).
- [21] Lakshmanan S, Malik A. Acute Pancreatitis in Mild COVID-19 Infection[J]. *Cureus*, 2020, 12(8):e9886. doi: [10.7759/cureus.9886](https://doi.org/10.7759/cureus.9886).
- [22] Maalouf RG, Kozhaya K, El Zakhem A. SARS-CoV-2 induced necrotizing pancreatitis[J]. *Med Clin (Barc)*, 2021, 156(12): 629–630. doi: [10.1016/j.medcli.2021.01.005](https://doi.org/10.1016/j.medcli.2021.01.005).
- [23] Meireles PA, Bessa F, Gaspar P, et al. Acalculous Acute Pancreatitis in a COVID-19 Patient[J]. *Eur J Case Rep Intern Med*, 2020, 7(6):001710. doi: [10.12890/2020\\_001710](https://doi.org/10.12890/2020_001710).
- [24] Mohammadi Arbaty M, Molseghi MH. COVID-19 Presenting as Acute Necrotizing Pancreatitis[J]. *J Investig Med High Impact Case Rep*, 2021, 9: 23247096211009393. doi: [10.1177/23247096211009393](https://doi.org/10.1177/23247096211009393).
- [25] Narang K, Szymanski LM, Kane SV, et al. Acute Pancreatitis in a Pregnant Patient With Coronavirus Disease 2019 (COVID-19) [J]. *Obstet Gynecol*, 2020, 137(3): 431–433. doi: [10.1097/AOG.0000000000004287](https://doi.org/10.1097/AOG.0000000000004287).
- [26] Patnaik RNK, Gogia A, Kakar A. Acute pancreatic injury induced by COVID-19[J]. *IDCases*, 2020, 22: e00959. doi: [10.1016/j.idcr.2020.e00959](https://doi.org/10.1016/j.idcr.2020.e00959).
- [27] Rabice SR, Altshuler PC, Bovet C, et al. COVID-19 infection presenting as pancreatitis in a pregnant woman: A case report[J]. *Case Rep Womens Health*, 2020, 27: e00228. doi: [10.1016/j.crwh.2020.e00228](https://doi.org/10.1016/j.crwh.2020.e00228).
- [28] Samies NL, Yarbrough A, Boppana S. Pancreatitis in Pediatric Patients With COVID-19[J]. *J Pediatric Infect Dis Soc*, 2021, 10(1): 57–59. doi: [10.1093/jpids/piaa125](https://doi.org/10.1093/jpids/piaa125).
- [29] Sandhu H, Mallik D, Lokavarapu MJ, et al. Acute Recurrent Pancreatitis and COVID-19 Infection: A Case Report with Literature Review[J]. *Cureus*, 2021, 13(2): e13490. doi: [10.7759/cureus.13490](https://doi.org/10.7759/cureus.13490).
- [30] Tollard C, Champenois V, Delemer B, et al. An inaugural diabetic ketoacidosis with acute pancreatitis during COVID-19[J]. *Acta Diabetol*, 2020, 58(3):389–391. doi: [10.1007/s00592-020-01624-3](https://doi.org/10.1007/s00592-020-01624-3).
- [31] Wang K, Luo J, Tan F, et al. Acute Pancreatitis as the Initial Manifestation in 2 Cases of COVID-19 in Wuhan, China[J]. *Open Forum Infect Dis*, 2020, 7(9):ofaa324. doi: [10.1093/ofid/ofaa324](https://doi.org/10.1093/ofid/ofaa324).
- [32] Yamamoto K, Oka K, Sakae K, et al. Acute Pancreatitis Related to COVID-19 Infection[J]. *Intern Med*, 2021, 60(13):2159–2160. doi: [10.2169/internalmedicine.7400-21](https://doi.org/10.2169/internalmedicine.7400-21).
- [33] Stevens JP, Brownell JN, Freeman AJ, et al. COVID-19-Associated Multisystem Inflammatory Syndrome in Children Presenting as Acute Pancreatitis[J]. *J Pediatr Gastroenterol Nutr*, 2020, 71(5): 669–671. doi: [10.1097/MPG.0000000000002860](https://doi.org/10.1097/MPG.0000000000002860).
- [34] Mazrouei SSA, Saeed GA, Helali AAA. COVID-19-associated acute pancreatitis: a rare cause of acute abdomen[J]. *Radiol Case Rep*, 2020, 15(9):1601–1603. doi: [10.1016/j.radcr.2020.06.019](https://doi.org/10.1016/j.radcr.2020.06.019).
- [35] Marchi G, Vianello A, Crisafulli E, et al. Cytomegalovirus-Induced Gastrointestinal Bleeding and Pancreatitis Complicating Severe Covid-19 Pneumonia: A Paradigmatic Case[J]. *Mediterr J Hematol Infect Dis*, 2020, 12(1):e2020060. doi: [10.4084/MJHID.2020.060](https://doi.org/10.4084/MJHID.2020.060).
- [36] Inamdar S, Benias PC, Liu Y, et al. Prevalence, Risk Factors, and Outcomes of Hospitalized Patients With Coronavirus Disease 2019 Presenting as Acute Pancreatitis[J]. *Gastroenterology*, 2020, 159(6): 2226–2228. doi: [10.1053/j.gastro.2020.08.044](https://doi.org/10.1053/j.gastro.2020.08.044).
- [37] Dirweesh A, Li Y, Trikudanathan G, et al. Clinical Outcomes of Acute Pancreatitis in Patients With Coronavirus Disease 2019[J]. *Gastroenterology*, 2020, 159(5): 1972–1974. doi: [10.1053/j.gastro.2020.07.038](https://doi.org/10.1053/j.gastro.2020.07.038).
- [38] Umans DS, Rangkuti CK, Sperna Weiland CJ, et al. Endoscopic ultrasonography can detect a cause in the majority of patients with idiopathic acute pancreatitis: a systematic review and meta-analysis

- [J]. Endoscopy, 2020, 52(11):955–964. doi: [10.1055/a-1183-3370](https://doi.org/10.1055/a-1183-3370).
- [39] Wan JH, Ouyang YB, Chen Y, et al. Comparison of EUS with MRCP in idiopathic acute pancreatitis: a systematic review and meta-analysis[J]. Gastrointest Endosc, 2018, 87(5):1180–1188. doi: [10.1016/j.gie.2017.11.028](https://doi.org/10.1016/j.gie.2017.11.028).
- [40] Miró Ò, Llorens P, Jiménez S, et al. Frequency of five unusual presentations in patients with COVID-19: Results of the UMC-19-S1[J]. Epidemiol Infect, 2020, 148: e148. doi: [10.1017/S0950268820001910](https://doi.org/10.1017/S0950268820001910).
- [41] Hoffmann M, Kleine-Weber H, Schroeder S, et al. SARS-CoV-2 Cell Entry Depends on ACE2 and TMPRSS2 and Is Blocked by a Clinically Proven Protease Inhibitor[J]. Cell, 2020, 181(2): 271–280. doi: [10.1016/j.cell.2020.02.052](https://doi.org/10.1016/j.cell.2020.02.052).
- [42] Liu FR, Long X, Zhang BX, et al. ACE2 Expression in Pancreas May Cause Pancreatic Damage After SARS-CoV-2 Infection[J]. Clin Gastroenterol Hepatol, 2020, 18(9):2128–2130. doi: [10.1016/j.cgh.2020.04.040](https://doi.org/10.1016/j.cgh.2020.04.040).
- [43] Coate KC, Cha J, Shrestha S, et al. SARS-CoV-2 Cell Entry Factors ACE2 and TMPRSS2 Are Expressed in the Microvasculature and Ducts of Human Pancreas but Are Not Enriched in beta Cells[J]. Cell Metab, 2020, 32(6):1028–1040. doi: [10.1016/j.cmet.2020.11.006](https://doi.org/10.1016/j.cmet.2020.11.006).
- [44] Kusmartseva I, Wu W, Syed F, et al. Expression of SARS-CoV-2 Entry Factors in the Pancreas of Normal Organ Donors and Individuals with COVID-19[J]. Cell Metab, 2020, 32(6): 1041–1051. doi: [10.1016/j.cmet.2020.11.005](https://doi.org/10.1016/j.cmet.2020.11.005).
- [45] Schepis T, Larghi A, Papa A, et al. SARS-CoV2 RNA detection in a pancreatic pseudocyst sample[J]. Pancreatol, 2020, 20(5):1011–1012. doi: [10.1016/j.pan.2020.05.016](https://doi.org/10.1016/j.pan.2020.05.016).
- [46] Dinnon KH 3rd, Leist SR, Schäfer A, et al. A mouse-adapted model of SARS-CoV-2 to test COVID-19 countermeasures[J]. Nature, 2020, 586(7830):560–566. doi: [10.1038/s41586-020-2708-8](https://doi.org/10.1038/s41586-020-2708-8).
- [47] Cheung KS, Hung IFN, Chan PPY, et al. Gastrointestinal Manifestations of SARS-CoV-2 Infection and Virus Load in Fecal Samples From a Hong Kong Cohort: Systematic Review and Meta-analysis[J]. Gastroenterology, 2020, 159(1):81–95. doi: [10.1053/j.gastro.2020.03.065](https://doi.org/10.1053/j.gastro.2020.03.065).
- [48] Li J, Huang DQ, Zou BY, et al. Epidemiology of COVID-19: A Systematic Review and Meta-analysis of Clinical Characteristics, Risk factors and Outcomes[J]. J Med Virol, 2020, 93(3): 1449–1458. doi: [10.1002/jmv.26424](https://doi.org/10.1002/jmv.26424).
- [49] AlSamman M, Caggiula A, Ganguli S, et al. Non-respiratory presentations of COVID-19, a clinical review[J]. Am J Emerg Med, 2020, 38(11):2444–2454. doi: [10.1016/j.ajem.2020.09.054](https://doi.org/10.1016/j.ajem.2020.09.054).
- [50] 黄耿文. 新型冠状病毒肺炎疫情下实施普通外科手术的思考和 建议[J]. 中国普通外科杂志, 2020, 29(2):127–130. doi: [10.7659/j.issn.1005-6947.2020.02.001](https://doi.org/10.7659/j.issn.1005-6947.2020.02.001).
- Huang GW. Thoughts and advice on performing procedures in general surgery during the outbreak of novel coronavirus pneumonia[J]. Chinese Journal of General Surgery, 2020, 29(2): 127–130. doi: [10.7659/j.issn.1005-6947.2020.02.001](https://doi.org/10.7659/j.issn.1005-6947.2020.02.001).
- [51] Banks PA, Bollen TL, Dervenis C, et al. Classification of acute pancreatitis–2012: revision of the Atlanta classification and definitions by international consensus[J]. Gut, 2013, 62(1): 102–111. doi: [10.1136/gutjnl-2012-302779](https://doi.org/10.1136/gutjnl-2012-302779).
- [52] Bulthuis MC, Boxhoorn L, Beudel M, et al. Acute pancreatitis in COVID-19 patients: true risk?[J]. Scand J Gastroenterol, 2021, 56 (5):585–587. doi: [10.1080/00365521.2021.1896776](https://doi.org/10.1080/00365521.2021.1896776).
- [53] Kumar V, Barkoudah E, Souza DAT, et al. Clinical course and outcome among patients with acute pancreatitis and COVID-19[J]. Eur J Gastroenterol Hepatol, 2021, 33(5):695–700. doi: [10.1097/MEG.0000000000002160](https://doi.org/10.1097/MEG.0000000000002160).
- [54] Pandanaboyana S, Moir J, Leeds JS, et al. SARS-CoV-2 infection in acute pancreatitis increases disease severity and 30-day mortality: COVID PAN collaborative study[J]. Gut, 2021, 70(6): 1061–1069. doi: [10.1136/gutjnl-2020-323364](https://doi.org/10.1136/gutjnl-2020-323364).
- [55] Mutneja HR, Bhurwal A, Arora S, et al. Acute pancreatitis in patients with COVID-19 is more severe and lethal: a systematic review and meta-analysis[J]. Scand J Gastroenterol, 2021. doi: [10.1080/00365521.2021.1971757](https://doi.org/10.1080/00365521.2021.1971757). [Online ahead of print]

( 本文编辑 姜晖 )

**本文引用格式:**张韬, 朱帅, 黄耿文. 新型冠状病毒相关性急性胰腺炎的认识现状[J]. 中国普通外科杂志, 2021, 30(9):1017–1022. doi: [10.7659/j.issn.1005-6947.2021.09.004](https://doi.org/10.7659/j.issn.1005-6947.2021.09.004)

**Cite this article as:** Zhang T, Zhu S, Huang GW. Current knowledge of SARS-CoV-2 associated acute pancreatitis[J]. Chin J Gen Surg, 2021, 30(9):1017–1022. doi: [10.7659/j.issn.1005-6947.2021.09.004](https://doi.org/10.7659/j.issn.1005-6947.2021.09.004)