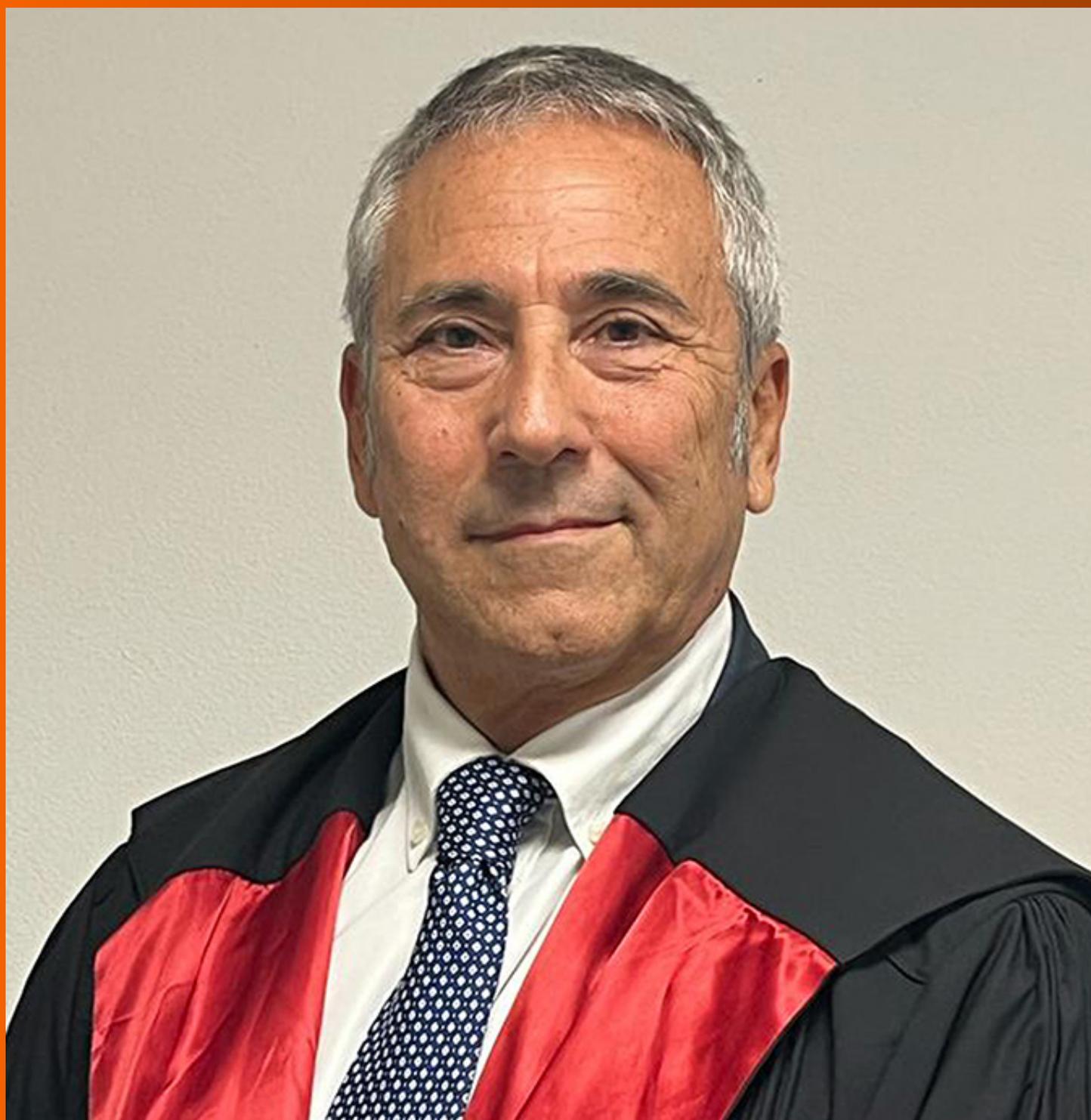


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World J Gastrointest Surg 2024 January 27; 16(1): 1-259



EDITORIAL

- 1 Novel prognostic factors after radical resection of hepatocellular carcinoma: Updating an old issue
Bencini L
- 6 Prospects in the application of ultrasensitive chromosomal aneuploidy detection in precancerous lesions of gastric cancer
Qian ST, Xie FF, Zhao HY, Liu QS, Cai DL

MINIREVIEWS

- 13 Prognostic value of ultrasound in early arterial complications post liver transplant
Zhao NB, Chen Y, Xia R, Tang JB, Zhao D

ORIGINAL ARTICLE**Case Control Study**

- 21 Added value of ratio of cross diameters of the appendix in ultrasound diagnosis of acute appendicitis
Gu FW, Wu SZ

Retrospective Cohort Study

- 29 Oncological features and prognosis of colorectal cancer in human immunodeficiency virus-positive patients: A retrospective study
Yang FY, He F, Chen DF, Tang CL, Woraiikat S, Li Y, Qian K

Retrospective Study

- 40 Laparoscopic *vs* open surgery for gastric cancer: Assessing time, recovery, complications, and markers
Lu YY, Li YX, He M, Wang YL
- 49 Single-incision laparoscopic transabdominal preperitoneal repair in the treatment of adult female patients with inguinal hernia
Zhu XJ, Jiao JY, Xue HM, Chen P, Qin CF, Wang P
- 59 Computerized tomography-guided therapeutic percutaneous puncture catheter drainage-combined with somatostatin for severe acute pancreatitis: An analysis of efficacy and safety
Zheng XL, Li WL, Lin YP, Huang TL
- 67 Impact of open hepatectomy on postoperative bile leakage in patients with biliary tract cancer
Wu G, Li WY, Gong YX, Lin F, Sun C
- 76 Clinical observation of gastrointestinal function recovery in patients after hepatobiliary surgery
Zeng HJ, Liu JJ, Yang YC

- 85 Predictive value of machine learning models for lymph node metastasis in gastric cancer: A two-center study
Lu T, Lu M, Wu D, Ding YY, Liu HN, Li TT, Song DQ
- 95 Post-operative morbidity after neoadjuvant chemotherapy and resection for gallbladder cancer: A national surgical quality improvement program analysis
Kim M, Stroever S, Aploks K, Ostapenko A, Dong XD, Seshadri R
- 103 Risk factors for recurrence of common bile duct stones after surgical treatment and effect of ursodeoxycholic acid intervention
Yuan WH, Zhang Z, Pan Q, Mao BN, Yuan T
- 113 Clinical efficacy of modified Kamikawa anastomosis in patients with laparoscopic proximal gastrectomy
Wu CY, Lin JA, Ye K
- 124 Clinical effect of laparoscopic radical resection of colorectal cancer based on propensity score matching
Liu Y, Wang XX, Li YL, He WT, Li H, Chen H
- 134 Different timing for abdominal paracentesis catheter placement and drainage in severe acute pancreatitis complicated by intra-abdominal fluid accumulation
Chen R, Chen HQ, Li RD, Lu HM
- 143 Comparison of different preoperative objective nutritional indices for evaluating 30-d mortality and complications after liver transplantation
Li C, Chen HX, Lai YH
- 155 Predictive value of NLR, Fib4, and APRI in the occurrence of liver failure after hepatectomy in patients with hepatocellular carcinoma
Kuang TZ, Xiao M, Liu YF
- 166 Practical effect of different teaching modes in teaching gastrointestinal surgery nursing
Rong XJ, Ning Z
- Observational Study**
- 173 Predictive factors and model validation of post-colon polyp surgery *Helicobacter pylori* infection
Zhang ZS
- Randomized Controlled Trial**
- 186 Micro-power negative pressure wound technique reduces risk of incision infection following loop ileostomy closure
Xu DY, Bai BJ, Shan L, Wei HY, Lin DF, Wang Y, Wang D
- 196 Paravertebral block's effect on analgesia and inflammation in advanced gastric cancer patients undergoing transarterial chemoembolization and microwave ablation
Xiong YF, Wei BZ, Wang YF, Li XF, Liu C

META-ANALYSIS

- 205** Unraveling the efficacy network: A network meta-analysis of adjuvant external beam radiation therapy methods after hepatectomy
Yang GY, He ZW, Tang YC, Yuan F, Cao MB, Ren YP, Li YX, Su XR, Yao ZC, Deng MH
- 215** Estimation of Physiologic Ability and Surgical Stress scoring system for predicting complications following abdominal surgery: A meta-analysis spanning 2004 to 2022
Pang TS, Cao LP
- 228** Role of Oncostatin M in the prognosis of inflammatory bowel disease: A meta-analysis
Yang Y, Fu KZ, Pan G

CASE REPORT

- 239** Endoscopic treatment of extreme esophageal stenosis complicated with esophagotracheal fistula: A case report
Fang JH, Li WM, He CH, Wu JL, Guo Y, Lai ZC, Li GD
- 248** Intestinal tuberculosis with small bowel stricture and hemorrhage as the predominant manifestation: Three case reports
Huang G, Wu KK, Li XN, Kuai JH, Zhang AJ

LETTER TO THE EDITOR

- 257** Sarcopenia in cirrhotic patients: Does frailty matter while waiting for a liver transplant?
Li XJ, He K

ABOUT COVER

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The primary aim of *World Journal of Gastrointestinal Surgery* (*WJGS, World J Gastrointest Surg*) is to provide scholars and readers from various fields of gastrointestinal surgery with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJGS mainly publishes articles reporting research results and findings obtained in the field of gastrointestinal surgery and covering a wide range of topics including biliary tract surgical procedures, biliopancreatic diversion, colectomy, esophagectomy, esophagostomy, pancreas transplantation, and pancreatectomy, *etc.*

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Retrospective Study

Computerized tomography-guided therapeutic percutaneous puncture catheter drainage-combined with somatostatin for severe acute pancreatitis: An analysis of efficacy and safety

Xue-Lan Zheng, Wan-Ling Li, Yan-Ping Lin, Ting-Long Huang

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Abstract

BACKGROUND

Severe acute pancreatitis (SAP), a condition with rapid onset, critical condition and unsatisfactory prognosis, poses a certain threat to human health, warranting optimization of relevant treatment plans to improve treatment efficacy.

AIM

To evaluate the efficacy and safety of computerized tomography-guided therapeutic percutaneous puncture catheter drainage (CT-TPPCD) combined with somatostatin (SS) in the treatment of SAP.

METHODS

Forty-two SAP patients admitted to The Second Affiliated Hospital of Fujian Medical University from June 2020 to June 2023 were selected. On the basis of routine treatment, 20 patients received SS therapy (control group) and 22 patients were given CT-TPPCD plus SS intervention (research group). The efficacy, safety (pancreatic fistula, intra-abdominal hemorrhage, sepsis, and organ dysfunction syndrome), abdominal bloating and pain relief time, bowel recovery time, hospital stay, inflammatory indicators (C-reactive protein, interleukin-6, and procalcitonin), and Acute Physiology and Chronic Health Evaluation (APACHE) II score of both groups were evaluated for comparison.

RESULTS

Compared with the control group, the research group had a markedly higher total effective rate, faster abdominal bloating and pain relief and bowel recovery,

shorter hospital length of stay, fewer complications, and lower posttreatment inflammatory indices and APACHE-II scores.

CONCLUSION

CT-TPPCD in combination with SS is effective for SAP patients, which can reduce complications, accelerate symptom resolution, inhibit inflammation, and improve patient condition, with promising prospects for clinical promotion.

Key Words: Computerized tomography guidance; Therapeutic percutaneous puncture catheter drainage; Somatostatin; Severe acute pancreatitis; Efficacy and safety

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Core Tip: Severe acute pancreatitis (SAP) is a severe acute manifestation of pancreatitis, which may lead to disease deterioration due to local and systemic infections. Therefore, an effective and safe intervention method is urgently needed to optimize the management of SAP patients. This study suggests that computerized tomography-guided therapeutic percutaneous puncture catheter drainage combined with somatostatin for SAP patients has high clinical efficacy and safety, providing a novel option for the clinical management optimization of such patients.

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INTRODUCTION

Pancreatitis, an inflammatory disease occurring in the pancreatic tissue, is classified as either acute or chronic and is associated with high morbidity and mortality, imposing a socioeconomic burden[1,2]. The pathogenesis of this disease involves early protease activation, activation of nuclear factor kappa-B-related inflammatory reactions, and infiltration of immune cells[3]. Severe acute pancreatitis (SAP) is a serious condition involving systemic injury and subsequent possible organ failure, accounting for 20% of all acute pancreatitis cases[4]. SAP is also characterized by rapid onset, critical illness and unsatisfactory prognosis and is correlated with serious adverse events such as systemic inflammatory response syndrome and acute lung injury, threatening the health of patients[5,6]. Therefore, timely and effective therapeutic interventions are of great significance for improving patient prognosis and ensuring therapeutic effects.

Somatostatin (SS), a peptide hormone that can be secreted by endocrine cells and the central nervous system, is involved in the regulatory mechanism of glucagon and insulin synthesis in the pancreas[7]. It has complex and pleiotropic effects on the gastrointestinal tract, which can inhibit the release of gastrointestinal hormones and negatively modulate the exocrine function of the stomach, pancreas and bile, while exerting a certain influence on the absorption of the digestive system[8,9]. SS has shown certain clinical effectiveness when applied to SAP patients and can regulate the severity of SAP and immune inflammatory responses, and this regulation is related to its influence on leukocyte apoptosis and adhesion[10,11]. Computerized tomography-guided therapeutic percutaneous puncture catheter drainage (CT-TPPCD) is a surgical procedure to collect lesion fluid and pus samples from necrotic lesions and perform puncture and drainage by means of CT image examination and precise positioning[12]. In the research of Liu *et al*[13], CT-TPPCD applied to patients undergoing pancreatic surgery contributes to not only good curative effects but also a low surgical risk. Baudin *et al* [14] also reported that CT-TPPCD has a clinical success rate of 64.6% in patients with acute infectious necrotizing pancreatitis, with nonfatal surgery-related complications found in only two cases, suggesting that this procedure is clinically effective and safe in the treatment of the disease.

In light of the limited studies on the efficacy and safety of SS plus CT-TPPCD in SAP treatment, this study performed a relevant analysis to improve clinical outcomes in SAP patients.

MATERIALS AND METHODS

Patient information

Forty-two SAP patients admitted to The Second Affiliated Hospital of Fujian Medical University between June 2020 and June 2023 were selected. In addition to routine treatment, 20 patients in the control group received SS treatment, and the rest 22 patients in the research group received CT-TPPCD plus SS intervention. The inclusion criteria were as follows: Diagnosis of SAP[15]; presence of seroperitoneum and intraperitoneal abscess as indicated by imaging examination;

presence of symptoms such as nausea, vomiting and abdominal pain; treatment-naive SAP patients; no contraindications to the medication used in this study; and complete medical records. The exclusion criteria were as follows: Malignant tumors, autoimmune disease, cardiovascular disorders, coagulation dysfunction, *etc.*; mental illness; previous history of abdominal surgery; severe organ dysfunction; serious abnormality of basic gastrointestinal function; and lactating or pregnant women.

Methods

Both groups received routine treatment, primarily including fasting, anti-infection, maintenance of water and electrolyte balance, pain relief, and reduction of gastrointestinal hypertension. In addition, the control group was treated with SS intravenously, with the SS dose gradually adjusted according to the patient's condition.

Based on the above measures, the research group was supplemented with CT-TPPCD. First, the patient was examined with a CT. The feasibility of catheter drainage was indicated by the presence of peripancreatic effusion, pancreatic necrosis, a pseudocyst, and local infection. A puncture was performed after precise positioning by CT, routine disinfection, and local anesthesia. Focal fluid and pus samples from necrotic lesions were collected. A disposable abdominal cavity drain catheter was then placed, and a common drainage bag was inserted after successful indwelling. After checking and confirming normal drainage, the patient's skin was sutured and the drainage tube was secured to complete the procedure. The collected samples were immediately sent for examination and bacterial culture, and bacterial drug sensitivity tests were performed.

Endpoints

Statistics on efficacy, adverse events [pancreatic fistula (PF), intra-abdominal hemorrhage (IAH), sepsis, and organ dysfunction syndrome], postoperative abdominal bloating and pain relief, bowel recovery time, hospital length of stay, inflammatory indices [C-reactive protein (CRP), interleukin-6 (IL-6) and procalcitonin (PCT)], and Acute Physiological and Chronic Health Evaluation (APACHE) II score were collected for comparative analyses. Among them, the efficacy is assessed as follows: Cure refers to the disappearance of clinical symptoms and signs and the return of laboratory indicators and imaging tests to normal; improvement is indicated by relieved clinical symptoms and signs and an incomplete recovery from complications such as infection, inflammation and false abscess shown by auxiliary examination; if the patient's clinical symptoms and signs did not improve or worsen, it was considered ineffectiveness. Second, CRP, IL-6, and PCT were all determined by enzyme-linked immunosorbent assays (ELISAs). Before detection, 5 mL of fasting elbow venous blood was extracted from each patient, and the serum was separated as a sample for detection. Finally, APACHE-II, including acute physiology (the sum of Glasgow Coma Scale score and various physiological variable scores, with a score range of 0-60), age (0-6 points), and chronic health subscales (0-5 points), was used to evaluate physical health status; on a scale of 0-71, the score is directly proportional to the severity of SAP.

Statistical treatment

The GraphPad Prism 7.0 software package was used for data analyses, and the level of statistical significance was $P < 0.05$. Categorical variables [described as the number of samples (percentage), n (%)] and continuous variables (represented by $SD \pm SEM$) were compared by the χ^2 test and the independent sample t test, respectively.

RESULTS

General information

The two groups were similar in age, sex, course of disease, body mass index, classification of intra-abdominal hypertension, type of pancreatitis, and other general data ($P > 0.05$) (Table 1).

Efficacy of the two groups

The efficacy was comparatively analyzed to evaluate the effect of the two treatments on the therapeutic efficacy of SAP patients. The total effective rate was 90.91% in the research group, which was significantly higher than the 65.00% in the control group ($P < 0.05$) (Table 2).

Safety of the two groups

Adverse events were counted in both groups to assess the impact of the two treatments on patient safety. The total incidence of adverse events such as PF, IAH, sepsis, and organ dysfunction syndrome was 22.73% in the research group and 55.00% in the control group, with a significant intergroup difference ($P < 0.05$) (Table 3).

Abdominal bloating and pain relief time, bowel recovery time, and hospital stay of the two groups

The abdominal bloating and pain relief time, bowel recovery time, and hospital stay of both groups were recorded to evaluate the influence of the two treatments on SAP patients' recovery. The research group was found to have significantly faster abdominal bloating and pain relief and bowel recovery and shorter hospital stays than the control group ($P < 0.05$) (Figure 1).

Table 1 General information

Indicators	Control group (n = 20)	Research group (n = 22)	χ^2/t	P value
Age	37.20 ± 8.76	36.68 ± 10.61	0.172	0.864
Sex			0.877	0.349
Male	15 (75.00)	19 (86.36)		
Female	5 (25.00)	3 (13.64)		
Course of disease (h)	6.00 ± 2.49	6.82 ± 2.72		
BMI (kg/m ²)	21.76 ± 2.54	22.58 ± 2.68		
Intra-abdominal hypertension			0.479	0.787
I	12 (60.00)	13 (59.09)		
II	5 (25.00)	7 (31.82)		
III	3 (15.00)	2 (9.09)		
Types of pancreatitis			0.557	0.757
Hyperlipidemic pancreatitis	16 (80.00)	18 (81.82)		
Biliary	3 (15.00)	2 (9.09)		
Alcoholic	1 (5.00)	2 (9.09)		

BMI: Body mass index.

Table 2 Efficacy of the two groups

Indicators	Control group (n = 20)	Research group (n = 22)	χ^2	P value
Cure	8 (40.00)	12 (54.55)		
Improvement	5 (25.00)	8 (36.36)		
Ineffectiveness	7 (35.00)	2 (9.09)		
Effective rate	13 (65.00)	20 (90.91)	4.177	0.041

Table 3 Safety of the two groups

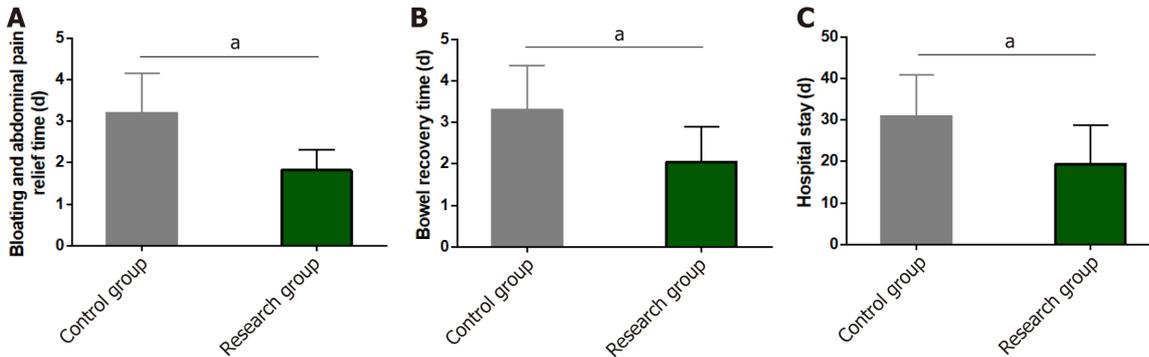
Indicators	Control group (n = 20)	Research group (n = 22)	χ^2	P value
Pancreatic fistula	3 (15.00)	1 (4.55)		
Intra-abdominal hemorrhage	3 (15.00)	2 (9.09)		
Sepsis	2 (10.00)	1 (4.55)		
Organ dysfunction syndrome	3 (15.00)	1 (4.55)		
Total	11 (55.00)	5 (22.73)	4.627	0.032

Inflammatory indices of the two groups

The effects of the two treatments on the serum inflammatory response of SAP patients were assessed by measuring CRP, IL-6, and PCT levels by ELISA. The levels of the above inflammatory factors were not significantly different between the groups before treatment ($P > 0.05$). CRP, IL-6 and PCT all decreased significantly after treatment ($P < 0.05$), with lower levels in the research group than in the control group ($P < 0.05$) (Figure 2).

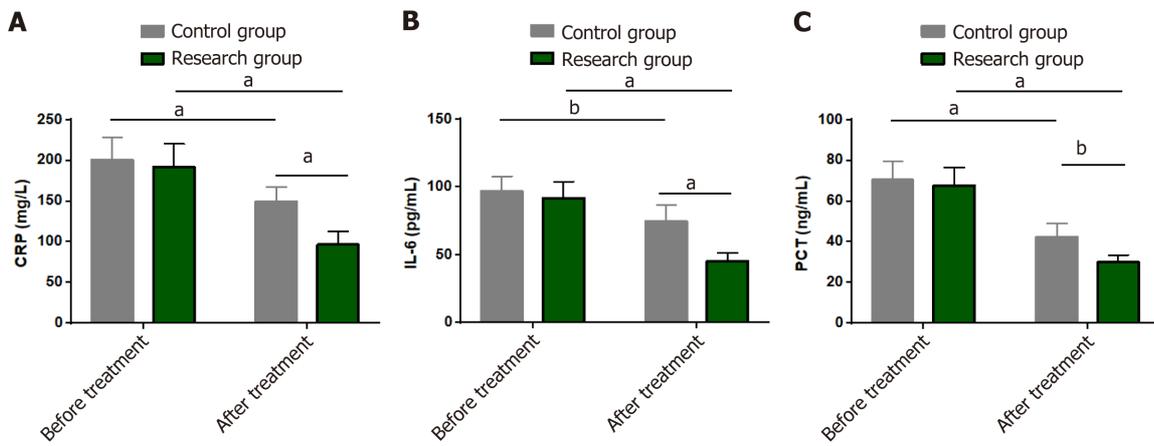
APACHE-II scores in the two groups

The APACHE-II score was tested in both groups to compare the effects of the two treatment modalities on disease severity in SAP patients. The pretreatment APACHE-II score was similar between the two groups ($P > 0.05$). A marked reduction in the APACHE-II score was observed in both groups after treatment ($P < 0.05$), with an even lower score in the research group ($P < 0.05$) (Figure 3).



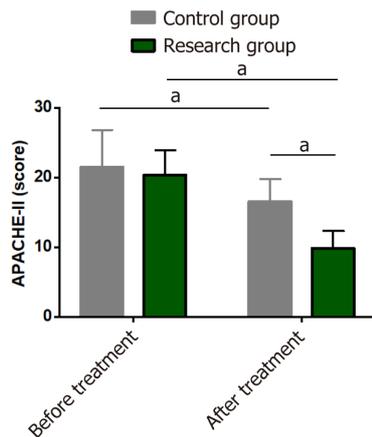
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Figure 1 Abdominal bloating and pain relief time, bowel recovery time, and hospital stay of the two groups. A: Abdominal bloating and pain relief time in the two groups; B: Bowel recovery time in the two groups; C: Hospital stay in the two groups. ^a*P* < 0.01.



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Figure 2 Inflammation indices of the two groups. A: C-reactive protein in both groups; B: Interleukin-6 in both groups; C: Procalcitonin in both groups. ^a*P* < 0.01; ^b*P* < 0.05. CRP: C-reactive protein; IL-6: Interleukin-6; PCT: Procalcitonin.



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Figure 3 Acute Physiology and Chronic Health Evaluation-II scores of the two groups. ^a*P* < 0.01. APACHE: Acute Physiology and Chronic Health Evaluation.

DISCUSSION

Pancreatitis, a condition in which the pancreas itself digests abnormally, is mainly manifested by damage to the pancreatic tissue by trypsin, causing dysfunction of glands and distal organs and systems[16]. SAP is a severe acute manifestation of pancreatitis that causes rapid and serious harm to the body once it breaks out[17]. The pathological process of SAP has been shown to involve intestinal barrier dysfunction, which in turn leads to the accelerated development of local and systemic infectious complications[18,19]. Therefore, an effective and safe intervention method is urgently needed to optimize the management of SAP patients.

Our research results showed a significantly higher total effective rate in the research group (90.91%) compared with the control group (65.00%), suggesting that SS plus CT-TPPCD is beneficial for therapeutic effect enhancement. The therapeutic mechanism of SS in SAP is related to its inhibition of insulin and glucagon secretion, which reduces the secretion of the pancreas and gallbladder and favors gastrointestinal absorption and nutritional function[20,21]. After statistical analysis of the incidence of PF, IAH, sepsis and organ dysfunction, the total incidence of the above adverse events was found to be markedly lower in the research group (22.73%) than in the control group (55.00%), indicating that SS plus CT-TPPCD can better guarantee the postoperative safety of SAP patients. Ai *et al*[22] reported that CT-TPPCD reduced mortality and the risk of inflammation-related complications in SAP patients, similar to our research results. In the study by Ganaie *et al*[23], CT-TPPCD is also shown to be clinically effective and safe for SAP pancreatic effusion management, both in patients with coinfection and symptomatic pancreatic effusion. The effects of the two treatments on patient postoperative recovery were evaluated from the aspects of abdominal bloating and pain relief time, bowel recovery time, and hospital stay. It was found that the research group had significantly better performance in the above aspects, suggesting that SS plus CT-TPPCD is conducive to promoting postoperative recovery in SAP patients. On the other hand, CRP is a protein that reflects the acute stage of a disease and is abnormally elevated in the setting of infection, tissue damage, *etc*[24]. IL-6, as an acute-phase reactive lymphocyte factor, not only activates the body's defense response and immunosuppression but also predicts the severity of SAP[25]. While PCT, an inflammatory factor closely related to secondary organ injury, is also associated with systemic inflammatory response syndrome[26]. Therefore, the above three inflammatory indices were detected to evaluate the influence of the two treatments on SAP patients. The research group showed markedly reduced- posttreatment CRP, IL-6, and PCT levels that were lower than the pretreatment levels and those of the control group, demonstrating the ability of SS plus CT-TPPCD to effectively inhibit serum inflammatory reactions in SAP patients. Previous evidence has shown that the downregulation of CRP, IL-6 and PCT levels can reflect treatment effectiveness in SAP patients, consistent with our findings[27]. Huang *et al*[28] also pointed out that lowering IL-6 levels was helpful to prevent SAP. Finally, the APACHE-II score of the research group decreased significantly after treatment and was lower than that of the control group, indicating that SS plus CT-TPPCD can significantly inhibit disease severity in SAP patients.

CONCLUSION

In summary, CT-TPPCD combined with SS is effective and safe in the treatment of SAP, which not only accelerates postoperative abdominal bloating and pain relief and intestinal recovery but also inhibits disease progression and improves patient health by reducing the levels of inflammatory indicators such as CRP, IL-6 and PCT. Our findings can provide a new choice for the clinical management optimization of SAP patients.

ARTICLE HIGHLIGHTS

Research background

Severe acute pancreatitis (SAP) accounts for 20% of all acute pancreatitis cases and poses a more serious threat to human health, so it is necessary to provide timely intervention to patients to improve their outcomes and ensure a certain therapeutic effect.

Research motivation

In view of the limited studies on the efficacy and safety of somatostatin (SS) combined with computerized tomography-guided therapeutic percutaneous puncture catheter drainage (CT-TPPCD) in the treatment of SAP, this study aims to supplement the gaps in this area and provide reliable clinical guidance.

Research objectives

To analyze the efficacy and safety of CT-TPPCD combined with SS in the treatment of SAP.

Research methods

Forty-two SAP patients were included, including 20 cases (control group) treated with SS intervention and 22 cases (research group) with CT-TPPCD + SS intervention. Comparative analyses were conducted from the following perspectives: Efficacy, safety (pancreatic fistula, intraperitoneal hemorrhage, sepsis, and organ dysfunction syndrome), abdominal bloating and pain relief time, intestinal recovery time, length of hospital stay, inflammatory indicators (C-

reactive protein, interleukin-6, and procalcitonin), and Acute Physiology and Chronic Health Evaluation (APACHE) II score.

Research results

The research group showed a higher total effective rate than the control group, with faster relief of abdominal bloating and pain and intestinal recovery, shorter length of hospital stay, and fewer adverse events, all with statistical significance. In addition, lower levels of inflammation indexes and APACHE II scores were determined in the research group after treatment, significantly lower than the baseline and those of the control group.

Research conclusions

CT-TPPCD plus SS is highly effective and safe in the treatment of SAP patients, contributing to fast inhibition of patients' disease and effective alleviation of serum inflammatory responses, which is worthy of clinical promotion.

Research perspectives

The negative impact of SAP on patients should not be underestimated, and it is necessary to improve clinical efficacy from the perspective of treatment optimization. This study proposes that SS combined with CT-TPPCD is significantly superior to SS alone in the treatment of SAP, which is of great significance for improving the clinical outcome of SAP patients and provides new clinical basis and insights.

FOOTNOTES

Author contributions: Zheng XL, and Huang TL designed the research and wrote the first manuscript; Zheng XL, Li WL, Lin YP, and Huang TL contributed to conceiving the research and analyzing data, conducted the analysis and provided guidance for the research; all authors reviewed and approved the final manuscript.

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