Efficacy and drug resistance of antibacterials in patients' with acute pancreatitis and stress ulcer bleeding

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Abstract: This study was designed to discuss key points regarding the clinical observations and nursing of patients with acute pancreatitis and stress ulcer bleeding. Retrospective analysis of 280 cases admitted to our hospital between January 2010 and January 2015 with acute pancreatitis and stress ulcer bleeding. At the same time, we treated patients with antimicrobial agents based on the epidemiology of sever acute pancreatitis (SAP) infection. According to the results of bacterial culture and drug sensitivity, we analyzed the sequence of pathogenic bacteria and the rate of bacterial resistance. During hospitalization, patients were given omeprazole and other intravenous drip line. Within this group, there was one death. The rest were all cured and discharged. Cases of acute pancreatitis, especially cases combined with biliary stone obstruction, pancreatic abscess, or pancreatic pseudo cyst are likely to show stress ulcer hemorrhage. There is a high risk of bleeding within 7 weeks of onset. The key is good nursing assessment and dynamic observation. Timely and effective anti-shock treatment is crucial to nursing when cooperating in rescues.

Keywords: Antimicrobial agents, drug resistance, acute pancreatitis, clinical observation.

INTRODUCTION

Acute pancreatitis shows acute onset, rapid development, and a number of complications. It is a severe disease that reduces the defensive abilities of the gastrointestinal mucosa, causing acute gastric mucosal lesions and severe hemorrhage; it may even be life threatening. Therefore, clinical observations and nursing are crucial for this condition (Antonova *et al.* 2015; Baikoussis *et al*. 2015). This article offers a retrospective summary of the clinical data and nursing measures in our hospital for 280 cases of acute pancreatitis with stress ulcer bleeding in the past 6 years.

The pancreas is the second largest digestive gland in the body and the organ most powerful for digestion. Acute pancreatitis is an inflammatory reaction that causes pancreatic tissue to undergo self-digestion, edema, bleeding, and even necrosis after activation of pancreatic enzymes in the pancreas (Abu, 2017; Fang *et al*. 2017). According to its pathological changes, the clinical features are divided into mild acute pancreatitis and severe acute pancreatitis (SAP). SAP is a severe acute abdomen with rapid development, complicated disease course, multiple organ failure and secondary infection of pancreatic tissue (Takahashi, 2017), which is the main cause of death of SAP. SAP combined infection is one of the most difficult problems in the course of SAP treatment (Liu *et al.* 2017). It is also the main cause of SAP disease duration, frequent complications and increased mortality. Clinical results show that 40% to 70% of patients with SAP have secondary infection of the pancreas. Therefore, timely and rational use of antimicrobial agents is very important to the prognosis.

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MATERIALS AND METHODS

General information

Our hospital admitted a total of 280 cases of acute pancreatitis with stress ulcer bleeding between January 2010 and January 2015. Patients included 172 men and 108 women, aged 33-72 years, with a median age of 49 years. Among all patients, 6 had mild acute pancreatitis, and the remaining 22 cases had severe acute pancreatitis (fig. 1). Admission assessments found no clear history of gastrointestinal ulcers. All patients were approved by Ethics Committee of our hospital and signed on the informed consent, ethical approval reference number as 531048.

All patients had different degrees of abdominal pain, abdominal distension, nausea, vomiting and peritonitis signs. There were 247 cases of high fever, 132 cases of jaundice and 241 cases of shock. The peripheral blood white blood count was over $10\times10^{9}L^{-1}$ in 276 cases (100%), serum amylase was 500 u/L, 216 cases (83.5%), serum calcium was 2, mmol/L was 265 (97.3%). Of 256 cases, 247 cases were positive (96.5%), and the puncture fluid was slight, bloody or purulent. 264 cases of abdominal ultrasound and CT showed pancreatic enhancement, have different degrees of pancreatic enlargement, with partial or extensive necrosis of dark area, oozing around the pancreas and pancreatic necrosis, gallstone patients see the gallbladder or bile duct, gallbladder enlargement or some associated with biliary tract dilatation, omental bursa and omental adipose degeneration, chest, peritoneal effusion.

Medication method

264 patients were diagnosed as SAP infection patients by possible sampling, then according to the specific condition of SAP infection and bacterial epidemiology analysis of routine antibiotics with, according to the results of bacterial culture and drug sensitivity, given targeted anti infection treatment. The empirical treatment of antimicrobial agents to follow the antibacterial spectrum, mainly gram negative (G) bacteria and anaerobic bacteria, fat soluble, and can effectively pass the three principles of blood pancreatic barrier. All the routes of administration were intravenous drip. The course of treatment was 14~38 D, with an average of 26 D.

Clinical manifestations

All 280 cases in this patient group experienced stress ulcer bleeding in addition to acute pancreatitis. The main clinical manifestations were hematemesis, melena, or drainage of brown or dark red liquid from the gastric tube. Twelve cases also showed symptoms and signs of hemorrhagic shock. The gastroscopy of all patients showed extensive erosions of the gastric mucosa and ulcer bleeding.

STATISTICAL ANALYSIS

SPSS 22.0 statistical software was used for analysis. One-way analysis of variance and LSD method were used respectively to compare the data between groups at different time points. $\alpha=0.05$ and $P<0.05$ showed the difference was statistically significant.

RESULTS

This patient group experienced stress ulcer bleeding between 1 and 50 days after the onset of acute pancreatitis. The medical history of this group showed that 24 cases had complicating biliary stone obstruction, 36 cases had pancreatic cysts and 1 death during hospitalization occurred from hemorrhagic shock. The remaining patients were cured and discharged. An endoscopy at the time of discharge showed that the mucosal ulcer healed well.

The findings showed that 264 patients with SAP had varying degrees of pancreatic, peripancreatic or peritoneal infection. In addition, there were 42 cases of lung infection, 37 cases of blood infection, 15 cases of urinary system infection, 31 cases of multiple infections, 14 cases of mixed infection, 5 cases of double infection. Pancreatic or peripancreatic infection aspirate specimen culture positive in 132 cases, infection of abdominal cavity effusion specimen culture positive in 146 cases, 42 cases had positive blood culture, sputum culture positive in 49 cases, 15 cases had positive urine culture. A total of 252 strains of pathogenic bacteria were isolated, isolated and identified from 5 kinds of specimens. Among them, there were 213 strains of G-bacilli (80.6%). The main pathogenic bacteria are G and anaerobic bacteria, followed by *Enterococcus, Staphylococcus*, fungi and so on. Among them, 11 strains of *Enterococci* were resistant to penicillin, ampicillin, gentamicin and ciprofloxacin, and more than 80% were resistant to vancomycin. Methicillin resistant *Staphylococcus aureus* 7 strains in 6 strains (85.7%), 6 strains of methicillin resistant *Staphylococcus aureus* (MRSA) resistant to clindamycin, ciprofloxacin and aminoglycosides rate is over 85%, but remained sensitive to vancomycin 100%. The statistics of 252 strains of pathogens and the specific resistance rates of 213 strains of G-bacillus are shown in table 2 and table 3.

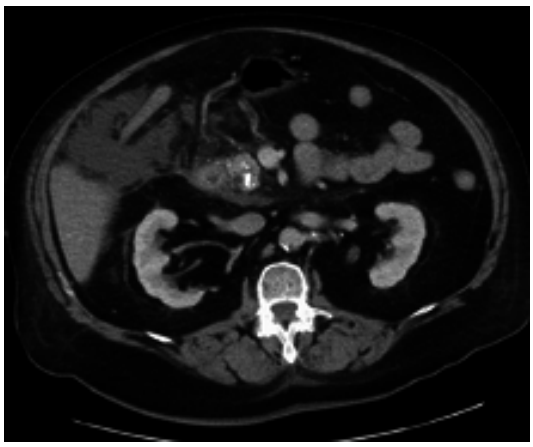

Fig. 1: Calcified pancreatic duct stones with some free intraabdominal fluid.

Table 1: Characteristics of these patients

Variables	Patients
Number	280
Time	1~50 days
Medical history	
Biliary stone obstruction	24
Pancreatic cysts	36
Death	1

DISCUSSION

SAP due to excessive activation of various inflammatory mediators and enzymes, can lead to alveolar epithelial and endothelial cell injury; at the same time, the immune defense mechanism of organism suffered serious damage, the pathogenic bacteria in the lungs caused by infection is easy to breed; SAP patients with severe illness, more complications, longer course of disease, often need to accept a variety of long-term operation treatment. Destroy the integrity and stability of the inner environment of the body, leading to decreased immunity, more susceptible to pulmonary infection. Antimicrobial drugs into the pancreatic tissues from the blood, in turn through the acini capillary endothelial cell layer, basal layer, acinar cell

Table 2: Sequence of pathogenic bacteria in patients with secondary infection of SAP

sort	pathogenic bacteria	number	Proportion
1	*Escherichia coli*	55	20.3
2	*Pseudomonas aeruginosa*	47	17.5
3	*Enterobacter cloacae*	35	13.2
4	*Klebsiella pneumoniae*	31	11.9
5	*Enterobacter cloacae*	28	10.3
6	*Anaerobe*	22	8.2
7	*Acinetobacter bauman*	15	6.7
8	*Enterococcus*	11	3.9
9	*Staphylococcus aureus*	8	2.9

Table 3: Antimicrobial resistance Statistics (%)

Pathogenic strain	No.	Cefotaxime	Ceftazidime	Ciprofloxacin	Amikacin	Cefoperazone / sulbactam	Piperacillin / tazobactam	Imipenem
Escherichia coli	55	53(95.6)	51(92.3)	42(76.5)	18(31.7)	15(26.5)	11(20.0)	0(0)
Klebsiella pneumoniae	41	36(89.2)	36(89.2)	33(80.6)	16(38.9)	13(29.5)	11(27.3)	0(0)
Pseudomonas aeruginosa	32	31(96.1)	19(61.5)	24(78.3)	14(42.6)	12(38.7)	10(31.5)	0(0)
Enterobacter cloacae	29	21(72.4)	23(75.7)	17(58.2)	11(36.5)	7(24.2)	9(31.7)	3(10.3)
Enterobacter cloacae	26	19(71.2)	21(80.6)	18(69.3)	12(46.5)	8(30.7)	10(37.5)	0(0)
Acinetobacter bauman	24	21(87.5)	22(85.0)	19(78.6)	8(33.3)	5(20.8)	8(33.3)	6(25.0)

layer, centroacinar cell layer, GUI tube structure. Because the cell membrane components contain more lipid, it is less polar and lipid soluble antibacterial drugs are easy to penetrate the blood pancreatic barrier. For patients with SAP who are infected with pancreatic necrosis, they must be selected from antimicrobials that are effective against pancreatic infection. According to the animal experiment and clinical research, the antibacterial drugs can effectively through blood pancreatic barrier, there is an ideal sterilization index, which can be used as a candidate drug for prevention and treatment of pancreatic infection: cephalosporins (third generation cephalosporins), fluoroquinolones, carbapenems (such as imipenem), broad-spectrum ureidopenicillins (such as piperacillin mezlocillin, etc.), nitro imidazole (such as metronidazole and Tinidazole).

Past research studies have shown that stress ulcers might be related to neuroendocrine secretion, cytokines, or inflammatory mediators (Dagher *et al.* 2016; Dobson *et al.* 2015). Effective treatment of the primary illness is the most important factor in preventing and treating stress ulcers (Duzagac *et al*., 2015; Gao *et al.,* 2015; Han *et al.,* 2015). Upon a confirmed diagnosis of acute pancreatitis, routine treatment with gastric acid suppressants and somatostatin should be applied. They are especially effective in preventing stress ulcers in patients after surgery, in the early stages of pancreatic abscess formation, or in those experiencing septic shock (Hase *et al.* 2016; Jia *et al.* 2015). The mortality in this group was 3.6%. A foreign study has reported that the mortality rate among patients with acute pancreatitis with stress ulcer bleeding is 1.2%–14.5%, which is basically similar to the results found in this study (Leeet *et al.* 2015; Liapis *et al.* 2015).

Nursing assessment, which includes information collection and analysis, is the basis for the overall nursing process. The aim is to identify nursing problems that need to be resolved (Manzat *et al.* 2015; Ostojic *et al.,* 2015). Collecting accurate patient information and learning about the patient's medical history are important in the diagnosis, treatment and nursing of their illnesses. Patients with acute pancreatitis combined with biliary stone obstruction, pancreatitis abscess, and pancreatic pseudocyst have a much higher risk of stress ulcer bleeding after surgery (Pistevou *et al.* 2015; Saglam *et al.,* 2015). When performing nursing evaluation of these patients, nurses can categorize them as a high-risk group for acute pancreatitis with ulcer bleeding. Hence, the nursing plans for these patients should emphasize more inspections and more observations for prodromal symptoms of gastrointestinal bleeding (Tsiambas *et al.,* 2015; Tsoucalas *et al.,* 2015; Vekov *et al.,* 2015).

There is a high risk of ulcer bleeding within 8 weeks of the onset of acute pancreatitis. Therefore, dynamic observations of condition changes and prompt detection

of prodromal symptoms of bleeding are crucial to limiting blood loss and reducing mortality (Yazilitas *et al.,* 2015; Wang *et al.,* 2015; Wu *et al.,* 2015). Nursing staff should have a solid grasp on the clinical manifestations of prodromal symptoms for gastrointestinal bleeding, and closely observe condition changes to provide timely and accurate information to doctors. These should include monitoring vital signs, asking about bowel movements and the color and properties of drainage fluids, and conducting routine blood tests and liver and kidney function examinations dynamically as prescribed by doctors. When there is gastrointestinal bleeding, nursing staff should take effective nursing measures in cooperation with the doctors.

Eight patients in this group had hemorrhagic shock, which manifested as nervousness, irritability, pale complexion, clammy extremities, rapid pulse, decreased systolic pressure, and decreased urine output (Wojtukiewicz *et al.,* 2015; Yamada *et al.,* 2015). Upon detecting the above-mentioned symptoms, nursing staff should remain calm, inform the doctors, and help carry out the following emergency measures (Abu 2017; Fang 2017; Liu *et al.,* 2017; Takahashi, 2017): (1) place the patient in the shock position, and (2) quickly establish intravenous access. The 8 cases in this group received subclavian catheter placement. Complete infusion treatment to increase blood volume was performed as ordered by the doctors. Attention should be paid while carrying out infusions in a reasonable order: Rapidly infuse crystalloid solution first and then colloidal solution should be infused to maintain the osmotic pressure; after this, the alkaline solution should be infused quickly when metabolic acidosis occurs. During fluid resuscitation, liquids can be infused through two channels simultaneously. Our 8 cases were treated with one-channel deep intravenous rapid infusion while measuring central venous pressure; the other channel was through peripheral intravenous catheters, to infuse medications that require control over the drip rate, such as vasoactive drugs. Both veins should remain clear, and the rate of infusion should be adjusted based on central venous pressure, blood pressure, and urine output. (3) Electrocardiogram monitoring and closely monitoring the vital signs and change in consciousness needs to be performed. Monitoring should be done every half an hour with close observation of any changes in respiratory rate. (4) Nursing of the respiratory tract is also important. All tissues in the body will experience hypoxia during shock, and the goal is to increase arterial oxygen content with 6 L/min–8 L/min oxygen flow rate. Promptly clean out any oropharyngeal secretions to keep the airway open. When necessary, carry out tracheal intubation or tracheotomy to assist breathing with a mechanical ventilator. Attention should be paid to respiratory humidification. (5) Maintain normal body temperature. Monitor changes in the body temperature. Offer appropriate insulation measures to improve microcirculation and tissue perfusion, such as maintaining the room temperature at around 20°C and providing additional blankets. Body surface warming should be prohibited in order to avoid increasing local oxygen consumption and worsening tissue hypoxia. (6) During the rescue, attention should be paid to professionalism and adherence to sterilization and standard operating procedures, in order to avoid iatrogenic infection.

CONCLUSION

Stress ulcer bleeding is a relatively common complication in acute pancreatitis. Without timely and proper treatment upon detection, it might lead to mortality rates no lower than other severe complications. In the past 6 years, our hospital has applied a systematic procedure of diagnosis, treatment, and nursing to our clinical practice, and has concluded the following clinical observations and key points on nursing: (1) Comprehensive nursing assessment is crucial. Objective and genuine medical history laid the foundation for preventing bleeding. Elderly patients (70 years or older) or patients with biliary stone obstruction, pancreatitis abscess, or pancreatitis pseudocyst are high-risk groups for ulcer bleeding after surgery. Patients with these risk factors should receive closer observation and nursing. (2) Dynamic observation of illness and prompt detection of prodromal symptoms for bleeding are crucial to limiting blood loss and reducing the mortality rate. Doctors should be promptly informed of any abnormalities. Key points for observation are vital signs, change in consciousness and the color, properties, and amount of vomit, excrement, or lumen drainage. (3) When hemorrhage and hemorrhagic shock occur, the key is to remain calm in assisting with the rescue. It is important to have a solid grasp of emergency rescue measures for gastrointestinal hemorrhage and hemorrhagic shock. Be fast yet calm in assisting the doctor in carrying out all rescue measures, and in providing detailed nursing and psychological guidance in order to increase the success rates of the rescue.

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