

Case Report

Successful treatment of a 104-year severe sepsis patient utilizing percutaneous nephrostomy combined acupuncture treatment

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Abstract: Background: Severe sepsis in elderly is a serious problem. Elderlies are more vulnerable to sepsis than adults due to their hypoimmunity, coagulation abnormalities and organ dysfunction. Acute pyelonephritis (APN) with obstructive uropathy is not uncommon and often causes severe sepsis and septic shock. Acute obstructive pyelonephritis sometimes requires emergency drainage via a ureteral stent or percutaneous nephrostomy. Acupuncture has been proved as an alternative method for renal colic pain control and maybe a potential organ protection function in sepsis. Case report: We report a case of a 104-year-old female centenarian with severe sepsis induced by acute obstructive pyelonephritis. The initial clinical manifestation in the case was atypical, which was misdiagnosed as acute heart failure and pneumonia. The centenarian underwent percutaneous nephrostomy, electro-acupuncture treatment, anti-infective therapy and mechanical ventilation. The patient was achieved successful treatment and discharged from hospital with no sequel. Conclusions: To date, no clinical case report of this nature has been described implicating centenarian with severe sepsis induced by APN. Patient hiding illness state made diagnosis more difficult. The effect of combination traditional Chinese and western medicine was satisfactory, experience was worth reference to improve the diagnosis and treatment of severe sepsis in elderly patients.

Keywords: Centenarian, severe sepsis, acute obstructive pyelonephritis, ureteral drainage, electro-acupuncture (EA)

Introduction

Sepsis is associated with significant morbidity and mortality if not promptly recognized and treated, which is the leading cause of death among patients in noncoronary intensive care units (ICUs). Older people make up a greater proportion (58-65%) of sepsis patients, and both incidence and mortality rates are significantly greater in the aged [1]. It was determined that the incidence of severe sepsis increased more than 100-fold with age and that mortality increased from 10% in children to 26% in patients 60-64 and 38% in those ≥ 85 [2]. Unfortunately, the fastest growing age group is composed up of those aged ≥ 80 years, which is increasing at an assessed 3.8% per year and predicted to stand for 20% of all older persons by 2050 [3]. Accordingly, clinical prevention

and treatment of sepsis in old age is attracting more and more attention and research globally.

Sepsis is a syndrome of an infectious process which is characterized by systemic inflammation with comprehensive tissue lesion. In most previous studies, respiratory, intra-abdominal, urinary tract, and bloodstream infections, represented the major infection foci of sepsis, accounting for > 75% of cases [4]. Acute pyelonephritis (APN) is a common complication of ureteral obstruction caused by urolithiasis. It can progress to sepsis or septic shock and turn to be fatal especially in the elderly. The Surviving Sepsis Campaign Guidelines (SSC), latest version updated in 2012, are now regarded as the international standard for treatment of severe sepsis including urosepsis. Emergency drain-



Figure 1. The patient was diagnosed as acute heart failure and pneumonia initially and treated with Non Invasive Positive Pressure Ventilation (NPPV).

age for acute obstructive was recommend in SSC, however, little information is known about the regimen in very elderly patients, particularly in centenarians. Also, acupuncture has been demonstrated to be an effective adjunct in the management of urinary stone disease and may attenuate acute organ injury in sepsis to a certain extent. We present a case of a centenarian with severe sepsis induced by APN who underwent combined modality therapy successfully including percutaneous nephrostomy and electro-acupuncture (EA) and Non Invasive Positive Pressure Ventilation (NPPV).

Case report

Our patient was a 104-year-old woman who was born in 24th Feb, 1911, who presented to the emergency department with a nine-year history of iterative chest tightness and short breath history, aggravated with dyspnea and fever one day on 2nd Apr 2015. The patient had been diagnosed primary hypertension for eighteen years and nine years previously with coronary heart disease (CHD) and chronic cardiac failure. Her current treatment regimen consisted of diuretic. Also, home oxygen therapy was given intermittently.

On physical examination, the patient was observed to have a temperature of 38.5°C, semi-recumbent position, a heart rate of 95 beats/minute, blood pressure of 145/90 mmHg, respiratory rate of 25 beats/minute, oxygen arterial saturation of 90%. Chest examination showed exaggerated breath sound with bilateral crackles. Cardiovascular exam showed normal S₁, S₂ with no apparent pathological murmur. Jugular venous pressure (JVP) was distended. Her peripheries were edematous and cool, but good capillary refill. Abdominal examination shown mild percussion pain on left kidney region, while tenderness and rebound tenderness on ureteral area were unremarkable. The neurological examination was normal. Laboratory investigations revealed the following: white blood cell count (WBC) $18.38 \times 10^9/L$ (83% segmented neutrophils, 10% lymphocytes and 7% monocytes), hematocrit 35.9%, hemoglobin level 112 g/L, platelet count $101 \times 10^9/L$. C-reactive protein (CRP) level 152 mg/L and procalcitonin (PCT) 7.85 ng/ml. And sensitive troponin I (s-TnI) 2.575 mg/L, creatine kinase (CK) 1480 U/L, CK-MB 34 U/L, Brain Natriuretic Peptide (BNP) 734.7 pg/mL; serum creatinine (Scr) 178 mmol/L and estimated glomerular filtration rate (eGFR) was 19.36 mL/min/1.73 m², accompanied with oliguria. Gently impaired coagulation was noted, including prolonged prothrombin time (PT, 15.1 seconds, 1.15 by INR), as well as increased fibrinogen (FIB, 5.92 g/L), the D-dimer level 1520 mg/L FEU. Chest digital radiography shown cardiac enlargement.

Day 1: Noninvasive ventilation with bilevel positive airway pressure (BiPAP) was performed to relieved acute left-sided heart failure, along with diuretic and vasodilatation therapy (**Figure 1**). Intravenous Cefperazone-Sulbactam 4 gram per day was started after sputum culture, mid-stream urine culture and blood culture. As obvious systemic inflammatory response syndrome (SIRS) and infection markers elevated, sepsis was diagnosed. Arterial blood gas analysis (ABG) shown pH 7.434, PO₂ 90 mmHg, PCO₂ 30 mmHg, BE-b -3.2 mmol/L, while FiO₂ was 50%. It was corresponding to severe sepsis diagnosis while oxygenation index (PaO₂/FiO₂) <200 and Scr > 2.0 mg/dL.

Day 2: The laboratory profile fulfilled the diagnostic criteria of pyuria, as urinary sediment

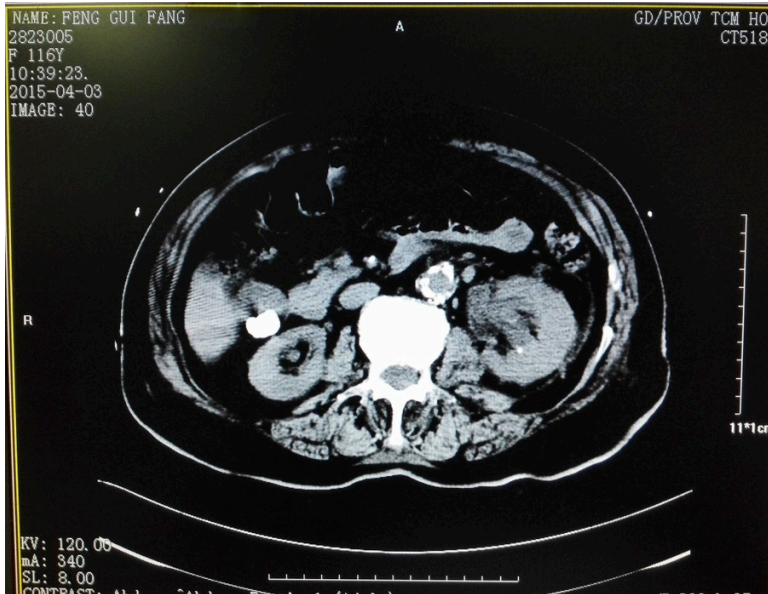


Figure 2. CT scan revealed multiple renal calculi obstructing the calyces of the lowerpole of left kidney, leading to a focal hydronephrosis.



Figure 3. Percutaneous nephrostomy (PCN) was performed after sonographically guided renal puncture under local anesthesia, 8.5 Fr pigtail catheter placement were achieved by fluoroscopy.

WBC 1202/ul, urinary red blood cell 22/ul in examination of the urine. While infection marking rose further as WBC $27.6 \times 10^9/L$ (90.6% segmented neutrophils) and PCT 55.82 ng/ml,

image examinations were imperative. Computed tomography (CT) scan revealed cholecystolithiasis and nephrolithiasis, multiple renal calculi obstructing the calyces of the lowerpole of left kidney, leading to a focal hydronephrosis (dilation of the collecting system) (**Figure 2**). And color Doppler ultrasound of urinary system also presented calculi and uronephrosis audio-visual. Then it was clear that severe sepsis was caused by acute pyelonephritis and obstructive nephropathy. The APACHE-II score was 23 (APS 13, AGE 5, CPS 5) and SOFA score was 7 (Respiration 3, Coagulation 1, Renal 3). Imipenem and Cilastatin Sodium (Tienam) 1 gram q12 h was

instead of Cefperazone-Sulbactam to anti-infection. Intensive care unit, invasive technology department and urology held a consultation to decide whether an operation was necessary. Emergency drainage for the decompression of the renal collecting system was reckoned to be principal. Percutaneous nephrostomy (PCN) was performed after sonographically guided renal puncture under local anesthesia. A guidewire insertion, fascial dilation, and 8.5 Fr pigtail catheter placement were achieved by fluoroscopy. Pyuria was drained and cultivated, and antimicrobial susceptibility test also was examined (**Figures 3, 4**).

Day 3-6: After the drainage, the patient defervesced gradually but complained lumbago and nausea. We combined with electro-acupuncture (EA) treatment from the 3rd day. Zusanli (ST 36) and Neiguan (CP 6) were electrically stimulated (3 Hz) half an hour once a day. The centenarian went into remission gradually, short breath ameliorated to ventilator weaning in day 6.

Day 7: The infection markings descended to normal value: WBC $7.7 \times 10^9/L$ (71% segmented neutrophils), PCT 1.25 ng/mL. Also, accompany by improved organ function, urine volume of the patient returned to normal and was given nasal catheter oxygen inhalation, ABG and blood biochemistry indicating PO_2 130 mmHg



Figure 4. The pyuria was drained and cultivated.

(oxygenation index 430), Scr 97 mmol/L and BNP 156.6 pg/mL. And the smear of perirenal drainage found gram-negative bacteria, while the cultivation of which was *Escherichia coli*, positive strains for extended spectrum β -lactamase (ESBL), and being sensitive to Tienam. The result of blood culture was negative. The patient reviewed an abdominal CT scan, which revealed reduction of the hydronephrosis and alleviation of ureterectasia (**Figure 5**).

When the sepsis was alleviated, an ureteroscopy was advised to performance on the centenarian. However, her family members refused the operation as senility. Then, she was transferred to Urology, EA treatment was maintained and Chinese herb decoction was given to nourish qi and remove urinary calculus. For clinical manifestation of SIRS regression and urine drained from the indwelling urinary catheter

clarification, CT scan was performed that displayed hydronephrosis disappearing and ureterectasia lessening (**Figure 6**). Impressively, we celebrated her 104-year-old birthday of lunar calendar with her in ICU on 12th Apr (**Figure 7**). The nephrostomy tube was removed successfully in 40th day of hospitalization. This lovely centenarian discharged from hospital to home with normal kidney function (Scr 74 $\mu\text{mol/L}$, eGFR 55.78 mL/min/1.73 m²), and followed up so far no sequel.

Discussion

Sepsis predominantly affects older population, a significant majority of the patients with severe sepsis belonged to age group of more than 60 years. Age is an independent predictor of mortality due to sepsis. Elderly individuals have an increased risk of developing sepsis, because of frequent comorbidities, institutionalization, declining performance status, immunosuppression and malnutrition. Moreover, older adult non-survivors tend to die earlier during hospitalization and older adult survivors more frequently require skilled nursing or rehabilitation after hospitalization [1]. Moreover, the clinical presentation of older patients with sepsis was often atypical, leading to a difficult and delayed diagnosis. There was an increased need for organ support in the elderly and very elderly population as compared to the younger population. In a prospective observational study, there was a significantly increased need for mechanical ventilation in the very old age group of patients among three age groups (young, old and very old) [5]. In our case, the patient manifested shortness of breath and elevating of cardiac biomarkers initially, acute left heart failure and pneumonia was first diagnosis in emergency room. Without chief complain of typical frequent micturition, urgent micturition and pain in urination, the granny confessed that she had hidden the lumbago for fear of surgery. The laboratory findings showed features characteristic of acute kidney injury (AKI) and sepsis-induced myocardial dysfunction (SIMD) on day 2 of hospitalization. NPPV was crucial in this patient as cardiac insufficiency and low oxygenation index. The patient concealing the truth initially made diagnosis more difficult. Although increasing age appears to confer a high risk of death due to severe sepsis, recent evidence showed that

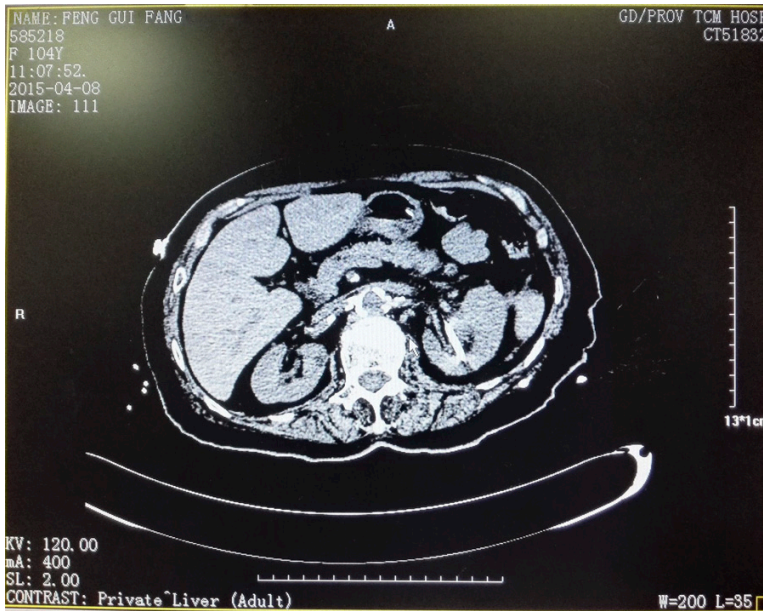


Figure 5. Reviewed CT scan, revealing reduction of the hydronephrosis and alleviation of ureterectasia.

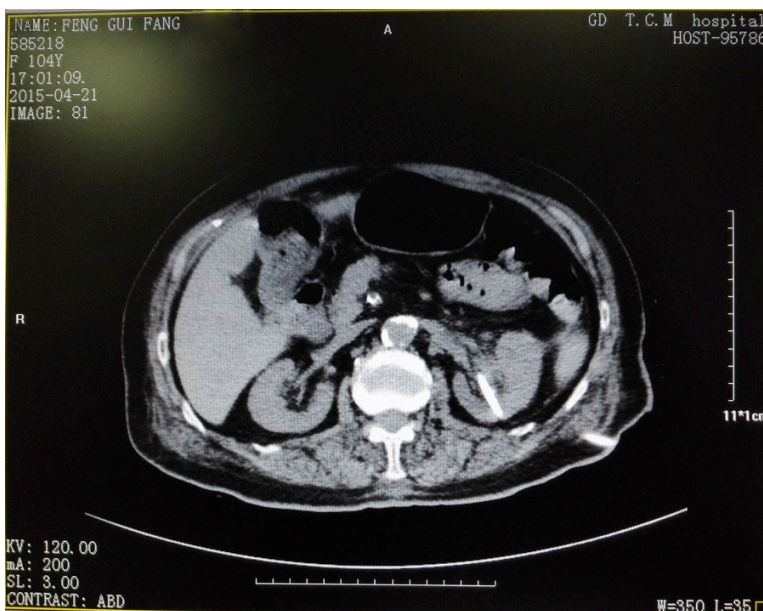


Figure 6. Reviewed CT scan before discharging, hydronephrosis and ureterectasia practically vanished.

many older patients responded well to selected interventions when the interventions were initiated in a timely fashion.

Urosepsis accounts for 20-30% of all septic patients, and frequent causes of it are obstructive disease of the urinary tract, such as urinary

stones, stenosis, and tumor [6]. According to the latest SSC guidelines, source control and timely administration of antibiotics were two linchpins of management of sepsis [7]. APN represents the most severe form of urinary tract infection (UTI) and is associated with significant morbidity and even mortality. Study had identified certain risk factors for prediction of poor outcome, including urinary tract abnormality, general debility, and properties of microorganisms [8]. Four risk factors bacteraemia, shock, need for intensive care, and suppurative pyelonephritis were associated with hospital stay of longer than 14 days [9]. The therapy bundle of severe APN included support of intensive care, early recognition of urinary tract obstruction and timely drainage. Further multivariate analysis revealed that age, the presence of paralysis thrombocytopenia and positive blood culture were independent risk factors for septic shock in acute obstructive pyelonephritis requiring emergency drainage [10]. Our centenarian received urgent percutaneous puncture and drainage after diagnosed APN. For blood platelet count being critical value of thrombocytopenia and showing downward trend, allowed for her age and severe sepsis state, drainage was perilous but necessary. Percutaneous nephrostomy was a safe and effective inter-

ventional method with simple operation and minimal invasion. The puncture drainage relieved severe sepsis effectively, but what about the follow-up care? The guidelines recommend that the pyelonephritis be treated first by drainage, followed by stone removal using ureteral stents or nephrostomy [11]. The ure-



Figure 7. The centenarian got better to ventilator weaning and we celebrated her 104-year-old birthday of lunar calendar with her in ICU.

teroscopy (URS) and extracorporeal shock wave lithotripsy (ESWL) were two chief procedures for active stone removal of ureteral stones.

In our case, URS was advised to perform on the patient by urologists, whereas, her family members refused the operation out of age and anesthesia risk concerns. Traditional Chinese Medicine therapy rather than surgical therapy was chosen on this very old female, including EA treatment, Yiqi and dredging stranguria Chinese herb.

Electro-acupuncture at Zusanli (ST 36) and Neiguan (CP 6) was essential throughout the treatment in this very old female. Acupuncture has been demonstrated to be an effective adjunct in stone disease treatment both as an analgesic during renal colic or surgical therapy and for reducing pre-treatment anxiety [12]. Recently, acupuncture demonstrated benefits in pyelonephritis and protection of organ function in sepsis [13, 14]. The clinical effects were favorable as renal function and urine volume recovered to normal, hydronephrosis disappeared basically and ureter obstruction relived. After 2 months follow-up, the centenarian was found no complication and basically provided for herself at home.

Conclusions

In this report, we described successful treatment on a female centenarian with severe sep-

sis induced by acute obstructive pyelonephritis. It was an infrequent case in the literature of a patient over 100 years old with sepsis who underwent PCN and received EA treatment. The initial manifestations was atypical, nearly misdiagnosed, clinical thinking was crucial in this case. The effect was satisfactory and experience was worth reference. This case should remind us of the clinical value of acupuncture in patients with sepsis, which was a safe supplement therapy. The definitive benefits need to be further determined.

Disclosure of conflict of interest

None.

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