

Objective

The aim of this study is to compare the outcomes of patients with emphysematous pyelonephritis (EPN) using the Wan classification¹, Huang and Tseng classification² (H&T) and the Sequential Organ Failure Assessment score³ (SOFA), evaluating the prognostic values of each classification

Methods

A retrospective review of patients with EPN between 1st January 2014 to 31st December 2021 in National University Hospital was performed. Data retrieved included clinical demographics, and outcomes.

Classification	Staging
Wan <i>et al.</i> ¹	Type I. Presence of streaky or mottled gas pattern but no fluid (dry type) Type II. Presence of fluid with bubbly or loculated gas pattern
Huang and Tseng ²	Class 1. Gas in collecting system only Class 2. Gas confined to the renal parenchyma Class 3A. Extension of gas into perinephric space Class 3B. Extension of gas into pararenal space (beyond the Gerota's fascia) Class 4. EPN in solitary kidney or bilateral disease

Sequential Organ Failure Assessment score³

System	Score				
	0	1	2	3	4
Respiration PaO ₂ /FIO ₂ mmHg (kPa)	≥400 (53.3)	<400 (53.3)	<300 (40)	<200 (26.7) with respiratory support	<100 (13.3) with respiratory support
Coagulation Platelets (x10 ³ /μL)	≥150	<150	<100	<50	<20
Liver Bilirubin μmol/L (mg/dL)	<20 (1.2)	20-32 (1.2 - 1.9)	33-101 (2.0 - 5.9)	102-204 (6.0 - 11.9)	>204 (12.0)
Cardiovascular (catecholamine doses in μg/kg/min for at least 1 hour)	MAP ≥70 mmHg	MAP <70 mmHg	Dopamine <5 or dobutamine (any dose)	Dopamine 5.1-15 or adrenaline ≤0.1 or noradrenaline ≤0.1	Dopamine >15 or adrenaline >0.1 or noradrenaline >0.1
Central nervous system Glasgow Coma Scale score	15	13-14	10-12	6-9	<6
Renal Creatinine μmol/L (mg/dL)	<110 (1.2)	110-170 (1.2 - 1.9)	171-299 (2.0 - 3.4)	300-440 (3.5 - 4.9)	>440 (5.0)
Urine output (mL/day)				<500	<200

Results

Eight patients were diagnosed with EPN. Mean age of the patients was 66 years old. Seven out of eight (87.5%) were females, diabetic and had positive urine cultures. Two (25%) had urinary obstruction. There was 1 death (25%). In classes 1 and 2 of H&T, 1 required medical management and 3 patients needed urinary diversion. In classes 3A and 3B (more fulminant); 3 required urinary diversion and 1 requiring nephrectomy.

In Class 1 (more fulminant) of Wan, 1 required medical management, 2 needed urinary diversion and 1 needed nephrectomy. Four Class 2 patients needed urinary diversion.

Based on SOFA; 5 patients scored 7 or less. One received medical management whilst 4 others needed urinary diversion. One patient scored between 8-9 and required nephrectomy. Two patients scored 10-11 and needed urinary diversion. The single death in our data set had a H&T class of 1, Wan class of 1 and a SOFA 11.

Results

Table 1: Patients' Demographics

	Number	(%)
Age, Mean (range)	65.9 (58-78)	
Gender		
Male	1	12.5
Female	7	87.5
DM		
Yes	7	87.5
No	1	12.5
Urinary Obstruction		
Yes	2	25
No	6	75
Urine Culture positive		
Yes	7	87.5
No	1	12.5
Mortality		
Survived	7	87.5
Dead	1	12.5

Table 2: Management Strategies based on Classification

Classification	Treatment		
	Medical management only	Medical management with PCN or DJ Stent only	Nephrectomy
Huang & Tseng			
1,2	1	3	0
3A,3B	0	3	1
4	0	0	0
Wan			
1	1	2	1
2	0	4	0
SOFA Score			
1 to 7	1	4	0
8 to 9	0	0	1
10 to 11	0	2	0
12 to 24	0	0	0

Table 3: Mortality based on based on Classifications

Classification	Survived	Dead
Huang & Tseng		
1,2	3	1
3A,3B	4	0
4	0	0
Wan		
1	4	0
2	3	1
SOFA Score		
1 to 7	5	0
8 to 9	1	0
10 to 11	1	1

Conclusion

This study suggests that the H&T may be better suited for consideration of appropriate treatment strategies but the SOFA may be preferred for predicting prognosis.

Reference

1. Wan YL, Lee TY, Bullard MJ, Tsai CC. Acute gas-producing bacterial renal infection: Correlation between imaging findings and clinical outcome. *Radiology* 1996;198:433-8
2. Huang JJ, Tseng CC. Emphysematous pyelonephritis: Clinicoradiological classification, management, prognosis, and pathogenesis. *Arch Intern Med* 2000;160:797-805
3. Singer, Mervyn; et al. (23 February 2016). "The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)". *JAMA*. **315** (8): 801–10. doi:10.1001/jama.2016.0287