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PREDICTIVE POTENTIAL OF SOFA SCORE IN EFFECTIVE CONSERVATIVE MANAGEMENT OF EMPHYSEMATOUS PYELONEPHRITIS

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Abstract

Background: Urinary tract infections (UTIs) acquired in the community or hospital are a common cause of urosepsis, which develops in 20% to 30% of sepsis patients. The SOFA score evaluates and rates the dysfunction of six different organ systems, including the respiratory system (including partial arterial oxygen pressure, fraction of inspired oxygen, and respiratory support), coagulation, platelet count, liver, cardiovascular, neurological, and renal systems (including creatinine and urine output).

Methadology: A prospective analysis including 55 patients admitted with a diagnosis of emphysematous pyelonephritis based on a CT scan was carried out in Shaikh Zayed Hospital, Lahore, from 2021 to 2022. Clinical information was acquired on patients who had a history of upper urinary tract blockage based on a CT scan and who were treated conservatively. Patients who had no prior history of organ failure at the time of presentation were given a SOFA score of 0, and the SOFA score is then assessed for all patients who were treated primarily with medications, ureteric stenting, and percutaneous drainage.

Results: Upper ureteric tract blockage (0.0204) and conservative management techniques such medications, ureteric stents, or PCD (0.001) are strongly related to changes in SOFA scores in patients with emphysematous pyelonephritis.

Conclusion: A decline in SOFA score corresponds to obstruction of the upper ureteric tract.In emphysematous pyelonephritis, percutaneous catheter drainage is far more effective than retrograde ureteric stenting at preventing the deterioration of the SOFA score.

Introduction

Approximately 25% of sepsis cases are due to urosepsis, which can result from a nosocomial or community-acquired UTI. Nearly always, the underlying UTI is complex and involves parenchymatous urogenital organs (such as the kidneys and prostate). The severity of sepsis in urosepsis, like other forms, largely depends on the host reaction. There are four main components to the therapy of urosepsis: Early goal-directed treatment, early antibiotic exposure that maximizes

pharmacodynamic effects, early management of the complicating factor in the urinary system, and early specialised sepsis treatment[1]. The incidence of sepsis is growing annually in the United States, at a rate of around 8.7%, with urosepsis accounting for roughly 8.6-30.6% of this growth, and the death rate is between 20 and 40% [6].Urinary tract infections (UTIs) acquired in the community or hospital are a common cause of urosepsis, which develops in 20% to 30% of sepsis patients[2]. The SOFA score evaluates and rates the dysfunction of six different organ systems, including the respiratory system (including partial arterial oxygen pressure, fraction of inspired oxygen, and respiratory support), coagulation, platelet count, liver, cardiovascular, neurological, and renal systems (including creatinine and urine output).[4]. It has been suggested that the SOFA score changes during critical illness to reflect the advantages or disadvantages of the targeted intervention. Compared to mortality, the SOFA score, is probably more responsive to the effects of an intervention. However, until all of its components have equivalent weights as indicators of the severity of organ dysfunction, the overall SOFA score cannot be an objective trial goal[5].Urinary stones (65%), tumors (21%), pregnancies (5%), urinary tract malformations (5%), and surgery (4%) are possible causes of emphysematous pyelonephritis that is brought on by obstructive illnesses[1]. A life-threatening kidney infection called emphysematous pyelonephritis (EPN) is linked to extremely high rates of renal loss and mortality. EPN is an acute necrotizing infection that affects the tissues around the kidney's parenchyma. Gas may be present in the perinephric fat, collecting system, or renal parenchyma[3]. Over time, the range of EPN treatment choices has expanded, from invasive procedures to more conservative therapy modalities that mainly involve drainage and drugs[7].

Objective

To analyze the predictive role of SOFA score in management of urosepsis secondary to emphysematous pyelonephritis

Materials and Methods

After receiving the Institutional Review Board's informed consent, a prospective analysis including 55 patients admitted with a diagnosis of emphysematous pyelonephritis based on a CT scan was carried out in Shaikh Zayed Hospital, Lahore, from 2021 to 2022.Patients who were enrolled provided their informed permission. Age, gender, a history of diabetes mellitus and hypertension were presented among the demographic details. Clinical information was acquired on patients who had a history of upper urinary tract blockage based on a CT scan and who were treated conservatively. At admission, the SOFA score is determined for each patient after the necessary data have been gathered. Patients who had no prior history of organ failure at the time of presentation were given a SOFA score of 0, and the SOFA score is then assessed for all patients who are treated primarily with medications, ureteric stenting, and percutaneous drainage.

Results

The current study included 55 participants in total. The ratio of female to men was 11:1.The majority of the patients had diabetes mellitus and were younger than 65. Age (0.205), gender (0.246), diabetes mellitus (0.306), hypertension (0.256) and polymicrobial infection (0.125) had little impact on how the SOFA score changes in individuals with emphysematous pyelonephritis. However, upper ureteric tract blockage (0.204) and conservative management techniques such medications, ureteric stents, or PCD (0.003) are strongly related to changes in SOFA scores in patients with emphysematous pyelonephritis **(Table 1)**

Table 1. Effect of demographic and clinicopathological profile on SOFA score

Factors	Change in SOFA score		P
	Deterioration	No Deterioration	
Age			
>60 years Old	17	5	0.205
<60 years Old	23	10	
Gender			
Male	2	3	0.246
Female	40	10	
Diabetes mellitus			
Yes	28	10	0.306
No	02	15	
Hypertension			
Yes	18	12	0.256
No	11	14	
Polymicrobial infection			
Yes	13	17	0.125
No	10	15	
Obstruction of upper ureteric tract			
Yes	37	10	0.024
No	3	5	
Drainage			
Only medication	8	2	0.001
Ureteric stenting	12	20	
Percutaneous drainage	2	11	

Discussion:

Patients with the clinical traits of EPN in the current investigation were primarily men, younger than middle age (60 years), and had diabetes mellitus as comorbidity. No matter how they were classified by the EPN, the majority of patients were successfully treated with conservative therapy such antibiotics, ureteric stenting, or percutaneous nephrostomy.78.7% patients of emphysematous pyelonephritis has deterioration of SOFA score secondary to upper urinary tract obstruction. Obstruction of upper urinary tract is associated with decrease in renal plasma blood flow, increase creatinine, blood urea nitrogem and accumulation of bacterial debris and renal dead parenchyma that eventually disturbs SOFA score. Removal of obstruction can lead to reversal of these changes and decline in SOFA score[8].Acute Pyelonephritis with an obstructed urinary tract ,such as one caused by stone, can readily develop into urosepsis and particularly severe or inadequately treated cases can lead to septic shock and disseminated intravascular coagulation[9].These changes can ultimately worsen SOFA score. Similar to our study, another one by Reyner et al, prospectively compared UTI patients between those with or without urinary obstruction [10].In this study, patients with urinary obstruction had a greater mortality rate than patients without obstruction. It has been discovered that a change in the SOFA score has a high degree of progressive validity and accuracy for in-hospital mortality in the setting of intensive care unit[11][12].Urinary obstruction induced by stricture, stones or tumor can sometimes lead to urinary tract infections challenging. In stable instances, treatment to relieve obstruction may be postponed; nevertheless in severely ill patients, immediately drainage is necessary to control infection source [13][14].

Our study has shown how different conservative therapy strategies for emphysematous pyelonephritis affect SOFA score. According to current study, percutaneous nephrostomy prevents SOFA score progression better than ureteric stenting. According to the typical theory, RUS aids in drainage, but the stent inhibits the ureterovesical junction (UVJ) from entirely closing, leading to

reflux and elevated renal pelvis pressure. The pressure in the renal pelvis dramatically rises while urinating in patients who had RUS. Renal reflux, bacterial spread in the renal parenchyma, an exacerbation of the inflammatory response, and kidney injury can all result from the elevated pressure. The risk of urine reflux and reinfection can both be decreased by continuing catheterization. However, an indwelling fistula is helpful in lowering renal pelvis pressure and protecting the kidney after PCN surgery. Patients with urosepsis have a four times higher rate of postoperative infection following emergency draining by RUS than patients without urosepsis . The risk of colonization during the RUS process may be increased in urosepsis patients due to their high urine bacterial burden. The likelihood of bacterial colonization rises with the introduction of foreign material into the urinary system. However, due to the procedure's requirement for the placement and lengthy retention of a stent in the ureter, this cannot be avoided. Patients undergoing RUS also experience more discomfort than normal. Their quality of life is impacted by this pain, leading to the need for medical intervention[14-19]. Patients may benefit from draining abnormal gas from the body with an indwelling catheter if it reduces intrapelvic pressure and clears microbial buildup from the kidney collecting systems[20]. Due to its lower mortality rate compared to emergency nephrectomy or medical care alone, PCD's therapeutic efficacy has drawn particular focus. According to research by Somani, B. K. et al, medical management alone resulted in a mortality rate of 50%, emergency nephrectomy and medical management resulted in a mortality rate of 25%, and medical management and percutaneous drainage resulted in a mortality rate of 13.5%. His findings are consistent with our findings in that mortality was much lower in those receiving percutaneous drainage compared to those receiving alternative treatments[21].Our findings are consistent with those of Borofsky MS et al, who demonstrate that antibiotics alone are ineffective in treating EPN. They further demonstrated that the mortality risk was higher in patients who received only antibiotic treatment (19%) compared to those who received adequate drainage through the insertion of a ureteral stent or a percutaneous nephrostomy tube (PCN), which was reported to be effective in treating EPN in early reports (9%) [22].

Conclusion

A decline in SOFA score corresponds to obstruction of the upper ureteric tract. In emphysematous pyelonephritis, percutaneous catheter drainage is far more effective than retrograde ureteric stenting at preventing the deterioration of the SOFA score.

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