International Journal of Medical Research Professionals
P-ISSN: 2454-6356; E-ISSN: 2454-6364
DOI: 10.21276/ijmrp

IJMRP

Original Research Article

Evaluation of Acute Kidney Injury and Patient Survival Following a Major Neurosurgical Procedure in ICU Patients at a Tertiary Care Hospital

Yerukala Murali Krishna[1], G. Suresh Kumar[2*]

[1]Assistant Professor, Department of Neurosurgery,
Mamata Medical College, Khammam, Telangana, India.
[2*]Associate Professor, Department of Nephrology,
Deccan College of Medical Sciences, Hyderabad, Telangana, India.

ABSTRACT

Background: Acute kidney injury (AKI) remains a significant concern in contemporary clinical practice, affecting approximately 1-5% of hospitalized patients. Hence; the present study was conducted to evaluate acute kidney injury and patient survival following a major neurosurgical procedure in ICU patients.

Materials and Methods: A total of 100 patients who were admitted to a neurological ICU for at least 24 hours after any type of neurosurgical procedure were enrolled. The need for renal replacement therapy (RRT) was recorded for each patient. Assessment of patients was done. Those who met the RIFLE criteria for AKI were classified as "AKI". Renal outcome at the time of discharge was evaluated by comparing the discharge sCr to the baseline sCr.

Results: A total of 100 patients were evaluated. AKI was seen in 10 percent of the patients. Mean age of the patients with and without AKI was 50.7 years and 60.5 years respectively. Among Non-AKI patients, craniotomy, vascular surgery, spine surgery and ICH surgery was done in 17 patients, 22 patients, 28 patients and 23 patients respectively. While among AKI patients, craniotomy, vascular surgery, spine surgery and ICH was done in 4 patients, 4 patients, 1 patient and 1 patient respectively. Patients with AKI were associated with poorer outcome and higher number of complications.

Conclusion: Among discharged post neurosurgery patients with no history of CKD, AKI was associated with an increased long-term risk of complications.

Keywords: Acute Kidney Injury, Neurosurgical.

***Correspondence to:**

Dr. G. Suresh Kumar,
Associate Professor,
Department of Nephrology,
Deccan College of Medical Sciences,
Hyderabad, Telangana, India.

Article History:

Received: 10-02-2017, **Revised:** 27-02-2017, **Accepted:** 19-03-2017

Access this article online	
Website: www.ijmrp.com	Quick Response code
DOI: 10.21276/ijmrp.2017.3.2.106	

INTRODUCTION

Acute renal failure (ARF), defined by a rapid decline in the kidneys' capacity to eliminate waste, concentrate urine, retain electrolytes, and regulate fluid balance, represents a common clinical challenge, particularly within the intensive care unit (ICU), where it is linked to a mortality rate ranging from 50% to 80%. Acute kidney injury (AKI) remains a significant concern in contemporary clinical practice, affecting approximately 1-5% of hospitalized patients. The incidence of AKI escalates notably with the increasing severity of the underlying condition, with up to 50% of ICU patients experiencing AKI, often due to widespread infection or sepsis. Despite advancements in intensive care and dialysis over the past two to three decades, the prognosis for patients with AKI has not seen substantial improvement.[1-3]

In the mid-1970s, the mortality rate for patients suffering from acute kidney injury (AKI) was as high as 70%. This figure saw a moderate decline by the early 1990s, with mortality rates ranging between 30% and 50%, and has since stabilized over the past two decades. The unfavorable prognosis is attributed not only to the underlying conditions that precipitate AKI but also to the complications that arise as a consequence of the injury itself. Therefore, the development of more effective therapeutic strategies continues to be a primary objective within nephrological research.[4-6] AKI is defined as acute deterioration of kidney function, as reflected by a significant increase in serum creatinine. In most patients, urine output is reduced as well. The definition of the syndrome is periodically refined and according to the latest KDIGO-Guidelines, AKI can be diagnosed if the following criteria are fulfilled: (I) a serum creatinine increase of greater than 0.3 mg/dl within 48 hours, or (II) a 1.5-fold serum creatinine increase within seven days (as compared to a known or suspected baseline value), and / or (III) a reduction in urine output to less than 0.5 ml/kg/day for at least 6 hours. [4] It may not be forgotten that serum

creatinine is a poor parameter of renal function since its concentration begins to rise late in AKI, which is if 60% of kidney function are lost. [5]

Hence; the present study was conducted to evaluate acute kidney injury and patient survival following a major neurosurgical procedure in ICU patients.

MATERIALS AND METHODS

The present study was conducted to evaluate acute kidney injury and patient survival following a major neurosurgical procedure in ICU patients. A total of 100 patients who were admitted to a neurological ICU for at least 24 hours after any type of neurosurgical procedure were enrolled. The need for renal replacement therapy (RRT) was recorded for each patient. Assessment of patients was done. Those who met the RIFLE criteria for AKI were classified as "AKI". Renal outcome at the time of discharge was evaluated by comparing the discharge sCr to the baseline sCr. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

RESULTS

A total of 100 patients were evaluated. AKI was seen in 10 percent of the patients. Mean age of the patients with and without AKI was 50.7 years and 60.5 years respectively. Among Non-AKI patients, craniotomy, vascular surgery, spine surgery and ICH surgery was done in 17 patients, 22 patients, 28 patients and 23 patients respectively. While among AKI patients, craniotomy, vascular surgery, spine surgery and ICH was done in 4 patients, 4 patients, 1 patient and 1 patient respectively. Patients with AKI were associated with poorer outcome and higher number of complications.

Table 1: Demographic and clinical data

Variable	No AKI (n=90)	With AKI (n=10)	p-value
Mean age (years)	60.5	50.7	0.001 (Significant)
Males	51	6	0.125
Females	39	4	
Diabetes	23	3	0.842
Hypertension	33	4	0.667
Other comorbidities	12	2	0.721

Table 2: Correlation of AKI and type of surgery

Type of surgery	No AKI (n=90)	With AKI (n=10)	p-value
Craniotomy	17	4	0.002 (Significant)
Vascular surgery	22	4	
Spine surgery	28	1	
ICH	23	1	

Table 3: Outcome

Outcome	No AKI (n=90)	With AKI (n=10)	p-value
Acute Anemia	19	3	0.001 (Significant)
Mechanical ventilation	3	3	0.002 (Significant)
Sepsis	5	4	0.000 (Significant)
Renal replacement therapy	-	1	-
No recovery	-	1	-
Complete recovery	-	7	
Partial recovery	-	2	

DISCUSSION

Perioperative acute kidney injury (AKI), characterized by persistent oliguria and/or an increase in serum creatinine levels, is a common perioperative complication and is associated with up to a tenfold increase in hospital cost and mortality, decreased long-term survival and an increased risk for chronic kidney disease (CKD) and hemodialysis after discharge.[6-8]

Depending upon the type of surgical procedure that a patient undergoes, AKI complicates the perioperative hospital stay for up to 50% of surgical patients.[9,10] Yet AKI remains among the most underdiagnosed postoperative complications despite increasing understanding of its epidemiology and outcomes. Considering the high prevalence of AKI and the deleterious effect when it occurs,

our effort must focus on AKI prevention, mitigation of further injury when AKI has already occurred, treatment of negative effects on other organs, and facilitation of renal recovery in patients with established AKI.[11]

A total of 100 patients were evaluated. AKI was seen in 10 percent of the patients. Mean age of the patients with and without AKI was 50.7 years and 60.5 years respectively. Among Non-AKI patients, craniotomy, vascular surgery, spine surgery and ICH surgery was done in 17 patients, 22 patients, 28 patients and 23 patients respectively. While among AKI patients, craniotomy, vascular surgery, spine surgery and ICH was done in 4 patients, 4 patients, 1 patient and 1 patient respectively. Patients with AKI were associated with poorer outcome and higher number of complications. Bihorac A et al[11] determined the relationship between long-term mortality and acute kidney injury (AKI) during hospitalization after major surgery. AKI is associated with a risk of short-term mortality that is proportional to its severity; however, the long-term survival of patients with AKI is poorly studied. This is a retrospective cohort study of 10,518 patients with no history of chronic kidney disease who were discharged after a major surgery between 1992 and 2002. AKI was defined by the RIFLE (Risk, Injury, Failure, Loss, and End-stage Kidney) classification, which requires at least a 50% increase in serum creatinine (sCr) and stratifies patients into 3 severity stages: risk, injury, and failure. Patient survival was determined through the National Social Security Death Index. Long-term survival was analyzed using a risk-adjusted Cox proportional hazards regression model. In the risk-adjusted model, survival was worse among patients with AKI and was proportional to its severity with an adjusted hazard ratio of 1.18 (95% confidence interval [CI], 1.08-1.29) for the RIFLE-Risk class and 1.57 (95% CI, 1.40-1.75) for the RIFLE-Failure class, compared with patients without AKI ($P < 0.001$). Patients with complete renal recovery after AKI still had an increased adjusted hazard ratio for death of 1.20 (95% CI, 1.10-1.31) compared with patients without AKI ($P < 0.001$). In a large single-center cohort of patients discharged after major surgery, AKI with even small changes in sCr level during hospitalization was associated with an independent long-term risk of death. Tsagalis G et al[12] studied the incidence, predictors, and effect of AKI on long-term overall mortality and cardiovascular events after stroke. This was a prospective outcome study of 2155 patients who sustained an acute first-ever stroke and were followed for 10 yr. Patients were divided in two groups: (1) Those with an acute increase (over 48 h) in serum creatinine ≥0.3 mg/dl or a percentage increase of ≥50% and (2) those with a change <0.3 mg/dl, no change at all, or even a reduction. Twenty-seven percent of patients developed AKI after acute stroke. Stroke severity, baseline estimated GFR, heart failure, and stroke subtype predict the occurrence of AKI. The probability of 10-yr mortality for patients with AKI was 75.9 and 57.7 in the patients without AKI (log rank test 45.0; $P = 0.001$). When patients with AKI were subdivided into three groups according to AKI severity, the probability of 10-yr mortality increased: 73.7, 86.5, and 89.2 in stages 1, 2, and 3, respectively. In Cox proportional hazard analysis, AKI was an independent predictor of 10-yr mortality ($P < 0.01$) and for the occurrence of new composite cardiovascular events ($P < 0.05$) after adjustment for available confounding variables. AKI after stroke is a powerful and independent predictor of 10-yr mortality and new composite cardiovascular events.[12]

CONCLUSION

Among discharged post neurosurgery patients with no history of CKD, AKI was associated with an increased long-term risk of complications.

REFERENCES

1. Schrier RW, Wang W, Poole B, Mitra A. Acute renal failure: definitions, diagnosis, pathogenesis, and therapy. J Clin Invest. 2004 Jul;114(1):5-14.
2. Kribben A, Herget-Rosenthal S, Pietruck F, Philipp T. [Acute renal failure--an review]. Dtsch Med Wochenschr. 2003 May 30;128(22):1231–6.
3. Srisawat N, Kellum JA. Acute kidney injury: definition, epidemiology, and outcome. Curr Opin Crit Care. 2011 Dec;17(6):548–55.
4. Palevsky PM, Liu KD, Brophy PD, Chawla LS, Parikh CR, Thakar CV, et al. KDOQI US commentary on the 2012 KDIGO clinical practice guideline for acute kidney injury. Am J Kidney Dis. 2013 May;61(5):649–72.
5. Bienholz A, Kribben A, Feldkamp T. [Acute kidney injury: new insights from diagnostics and treatment]. Dtsch Med Wochenschr. 2012 Mar;137(13):652–5.
6. Hobson C, Ozrazgat-Baslanti T, Kuxhausen A, et al. Cost and Morality Associated With Postoperative Acute Kidney Injury. Ann Surg. 2014.
7. Bihorac A, Delano MJ, Schold JD, et al. Incidence, clinical predictors, genomics, and outcome of acute kidney injury among trauma patients. Ann Surg. 2010;252:158–65.
8. Hobson CE, Yavas S, Segal MS, et al. Acute kidney injury is associated with increased long-term mortality after cardiothoracic surgery. Circulation. 2009;119:2444–53.
9. Bihorac A, Yavas S, Subbiah S, et al. Long-term risk of morality and acute kidney injury during hospitalization after major surgery. Ann Surg. 2009;249:851–8.
10. Wald R, Quin R, Luo J. Chronic dialysis and death among survivors of acute kidney injury requiring dialysis. JAMA. 2009;302:1179–85.
11. van Kuijk JP, Flu WJ et al. Temporary perioperative decline of renal function is an independent predictor for chronic kidney disease. Clin J Am Soc Nephrol. 2010;5:1198–204.
12. Bihorac A, Yavas S, Subbiah S, Hobson CE, Schold JD, Gabrielli A, Layon AJ, Segal MS. Long-term risk of mortality and acute kidney injury during hospitalization after major surgery. Ann Surg. 2009 May;249(5):851-8.

Source of Support: Nil. **Conflict of Interest:** None Declared.

Cite this article as: Yerukala Murali Krishna, G. Suresh Kumar. Evaluation of Acute Kidney Injury and Patient Survival Following a Major Neurosurgical Procedure in ICU Patients at a Tertiary Care Hospital. Int J Med Res Prof. 2017; 3(2): 485-87.
DOI: 10.21276/ijmrp.2017.3.2.106