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Original Research Article

Assessment of Cardiac Function in Sepsis: An Observational Study in a Tertiary Care Hospital

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Abstract

Background: Sepsis is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection. In the setting of severe sepsis and septic shock, myocardial depression is common. According to a few studies, troponins also correlate strongly with myocardial dysfunction. Non-invasiveness and instantaneous diagnostic capability are prominent features of the use of Echocardiography in critical care. Sepsis and septic shock represent complex situations where early hemodynamic assessment and support are among the keys to therapeutic success.

Materials and Methods: The present observational cross sectional study is carried out in Department of General Medicine, Agartala Government Medical College (AGMC & GBPH), Agartala, Tripura for a period of two years from December 2020 to December 2022 among patients diagnosed with sepsis in Medical Intensive Care Unit. CPKMB and Troponin-I determination along with echocardiography was done in all patients diagnosed with sepsis in Medical Intensive Care Unit.

Results: In our study, 68(77.3%) patients were Troponin I positive. 70 (79.5%) patients were CPK MB positive. Left ventricular Systolic dysfunction (LVSD) was found in 55(62.5%) patients whereas Left ventricular diastolic dysfunction (LVDD) was present in 44(50%) patients. In our study 37(42.1%) patients had Right ventricular dysfunction.

Conclusion: We conclude that Sepsis Related Myocardial Dysfunction (SRMD) is very much common. Early assessment of SRMD can be done by doing cardiac biomarkers (Troponin I & CPKMB). Cardiac biomarkers can guide us towards underlying cardiac dysfunction. Early echocardiographic assessment can guide us towards proper management of sepsis patients.

Keywords: Sepsis, SRMD, Troponin I, CPKMB.

Introduction

Sepsis is a life threatening organ dysfunction caused by a dysregulated host response to infection (suggested by The Third International Consensus in the year 2016).[1]Sepsis is one of the leading cause of mortality and critical illness worldwide.[2] Sepsis is associated with multi-organ failure involving respiratory, renal, neurological & hepatic dysfunction. In recent times, there has been an increasing recognition of cardiovascular dysfunction in sepsis.[3]

Septicaemia Related Myocardial Dysfunction (SRMD) leading to septic shock is a transient potentially reversible impairment of biventricular contractility associated with high mortality, if not timely intervened. The present concept of sepsis induced cardiomyopathy is based on the facts that exogenous toxins such as lipoteichoic acid, endotoxin and endogenous cytokines, reactive oxygen species , proinflammatory mediators like TNF-alpha (Tumor Necrosis Factor- alpha), interleukin-1(IL-1), interleukin 6(IL-6) induced direct myocardial depression, microvascular thrombotic injury leading to impaired contractility and focal ischaemia.

This is reflected by non-invasive studies such as cardiac biomarkers, 2D-Echocardiography which can lead to early recognition and management.[4] Tn-I is much more specific for detection of any damage to cardiac myocyte as compared to Tn-T. Cardiac troponins are elevated only when there is an insult to cardiac myocyte.[5] There are 3 isoenzymes of creatine kinase i.e, CK-MM, CK-MB, CK-BB. CPKMB has the highest positive predictive value in comparison to other

biomarkers.[6]Troponin release indicates myocyte damage and loss of cell membrane integrity, and thus gives structural information, whereas BNP reflects wall stress, and thus provides functional information.[7]

Even in patients already monitored invasively, both transthoracic ECHO (TTE) and transesophageal ECHO (TEE) add new relevant information that leads to changes in therapy in more than 50% of cases[8],ECHO seems to be more accurate than the standardized strategy proposed by the Surviving Sepsis Campaign guidelines in the detection of the dominant features of the failing circulation . Indeed, a simplified qualitative approach has demonstrated to be accurate enough.[9]

Echocardiography increasingly is used to provide an assessment that is both rapid and non-invasive. Familiarity with basic echocardiographic techniques and interpretation is now expected in the critical care settings.

Aim of Study

Aim of study is to find out various cardiac manifestations among patients diagnosed with sepsis in medical Intensive Care Unit.

Objectives of Study

- To estimate the proportion of cardiac dysfunction in sepsis patients.
- To study the pattern of cardiac manifestations in sepsis in the study population in medical Intensive Care Unit.

Materials and Methods

The present observational cross sectional study is carried out in Department of General Medicine, Agartala Government Medical College (AGMC & GBPH), Agartala, Tripura for a period of two years from December 2020 to December 2022 among patients diagnosed with sepsis in Medical Intensive Care Unit, at Agartala Government Medical College. CPK MB and troponin-I were determined in all patients diagnosed with sepsis in Medical Intensive Care Unit. An echocardiography was also performed for the said patients.

Inclusion Criteria: All patients diagnosed with sepsis admitted in Medical Intensive Care Unit, was included in the study.

Exclusion Criteria: Patients with Pre-existing valvular /structural heart disease, ischemic heart disease, chronic kidney disease, alcoholic liver disease, Pre-existing chronic respiratory ailments, Patients in fluid overload states like in pregnancy, severe anaemia, Patients with cerebro-vascular accident were excluded from study .

Results

Table 1: Age Distribution

Age Group	Number	Percentage
≤30	6	6.8
31-50	33	37.5
51-70	36	40.9
>70	13	14.8
Total	88	100.0

In our study,6(6.8%)patients were ≤ 30 years,33(37.5%) patients were 31-50 years age group,36 (40.9%) patients were 51-70 years age group,13(14.8%) patients were >70 years age group. In our study the mean age of the patients was 53±15.8 years.

Table 2: Troponin I

Troponin I	Number	Percentage
Positive	68	77.3
Negative	20	22.7
Total	88	100.0

In our study, 68 (77.3%) patients were Troponin I positive and 20(22.7%) patients were Troponin I negative.

Table 3: CPK-MB

CPK-MB	Number	Percentage
Negative(<25)	18	20.5
Positive(≥25)	70	79.5
Total	88	100.0

In our study 70 (79.5%) patients were CPK MB positive, 18(20.5%) patients were CPKMB negative.

Table 4: Left Ventricular Systolic Function

Ejection fraction	Number	Percentage
Normal(≥50)	33	37.5
Abnormal(<50)	55	62.5
Total	88	100.0

In our study, Left ventricular systolic function was normal in 33(37.5%) patients. Whereas Left ventricular Systolic function was abnormal (LVSD) in 55(62.5%) patients.

Table 5: Left Ventricular Diastolic Function

E/A	Number	Percentage
normal (0.8-1.5)	44	50.0
Abnormal (<0.8 or >1.5)	44	50.0
Total	88	100.0

Table 6:

Septal e'(>8cm/sec)	Number	Percentage
Abnormal(<8)	44	50.0
Normal(>8)	44	50.0
Total	88	100.0

In our study, left ventricular diastolic function was normal in 44(50%) patients, whereas Left ventricular diastolic dysfunction (LVDD) was present in 44(50%) patients.

Table 7: Right Ventricular Function

TAPSE	Number	Percentage
Normal (≥1.7)	51	57.9
Abnormal (<1.7)	37	42.1
Total	88	100.0

In our study, 51(57.9%) patients had normal Right ventricular function, whereas 37(42.1%) patients had Right ventricular dysfunction.

Discussion

Sepsis is a life-threatening condition and a global disease burden. This study is conducted in AGMC & GBP hospital to assess cardiac functions among sepsis patients in Medicine ICU. In our study, 68(77.3%) patients were Troponin I positive, 70 (79.5%) patients were CPK MB positive, which shows similarity with the study done by P Priyank et al.

Furian T et al in 2011 conducted a study which was concluded as Both LV and RV systolic dysfunctions are prevalent in severe sepsis, being directly associated with markers of endothelial dysfunction. Left ventricular non dilation, RV dysfunction, and diastolic dysfunction seem related to poor prognosis in this scenario.[10]

In our study, Left ventricular Systolic dysfunction (LVSD) was found in 55(62.5%) patients. Left ventricular diastolic dysfunction (LVDD) was present in 44(50%) patients. Bendary A et al in 2022 conducted a study in which they found that almost half of study population (48.4%) had evidence of RV dysfunction (in isolation or with LV dysfunction), with 25.4% showing evidence of isolated RV dysfunction.[11] In our study 37(42.1%) patients had Right ventricular dysfunction.

Conclusion

The early diagnosis of myocardial dysfunction due to sepsis is critical in management of sepsis patients for favourable outcome. Various studies were previously done to find out different cardiac manifestations in sepsis. We found that Left ventricular systolic and diastolic dysfunction (LVSD & LVDD) along with Right ventricular dysfunction (RVD) are very much common.

We conclude that Sepsis Related Myocardial Dysfunction (SRMD) is very much common. Early assessment of SRMD can be done by doing cardiac biomarkers (Troponin I & CPKMB). Cardiac biomarkers can guide us towards underlying cardiac dysfunction.

Early echocardiographic assessment can guide us towards proper management of sepsis patients. This study will help further in future management of cardiac abnormalities in patients of sepsis.

References

1. Vallabhajosyula S, Pruthi S, Shah S, Wiley B.M, Mankad S.V, Jentzer J.C et al. Basic and advanced echocardiographic evaluation of

myocardial dysfunction in sepsis and septic shock. J Ana Int Care. 2018; 46(1):13-24.
2. Campista MDS, Martins W, Guedes M, Jorge A. From echocardiographic evaluation to biomarkers measurement: The role of myocardial dysfunction in mortality associated with sepsis. Int J Cardiovasc Sci. 2018; 31(6): 643-51
3. Vallabhajosyula S, Ahmed A, Sundaragiri P. Role of echocardiography in sepsis and septic shock. Ann Transl Med. 2020; 8(5): 150-54.
4. P Priyanka, Kumar D, Gupta A, S Neha, Ram S, Gupta R et al. The study of cardiac biomarkers and 2D echocardiography in cases of septicaemia. Nat J Med and Dent Res. 2016; 4(4): 274-79.
5. Hussain N. Elevated cardiac troponins in setting of systemic inflammatory response syndrome, sepsis and septic shock. ISRN Cardiol. 2013; 2013: 723435.
6. Raja D, Mehrota S, Agrawal A, Singh A, Sawlani K. Cardiac biomarkers and myocardial dysfunction in septicaemia. J Asso Phy India. 2017; 65(12):14-19
7. Raja DC, Mehrotra S, Agrawal A, Singh A, Sawlani KK. Cardiac Biomarkers and Myocardial Dysfunction in Septicemia. J Assoc Physicians India. 2017 Dec; 65(12):14-19. PMID: 29327516.
8. Marik PE. Obituary: pulmonary artery catheter 1970 to 2013. Ann Intensive Care 2013; 3:38.
9. Lan P, Wang TT, Li HY, et al. Utilization of echocardiography during septic shock was associated with decreased 28-day mortality: a propensity score-matched analysis of the MIMIC-III database. Ann Transl Med 2019; 7:662.
10. Furian T, Aguiar C, Prado K, Ribeiro RV, Becker L, Martinelli N, Clausell N, Rohde LE, Biolo A. Ventricular dysfunction and dilation in severe sepsis and septic shock: relation to endothelial function and mortality. J Crit Care. 2012 Jun; 27(3):319.e9-15.
11. Bendary A, Said H, Elemary M, Mahrous M. Right ventricular function as a predictor of short-term mortality in patients with sepsis and septic shock: an observational study. Egypt Heart J. 2022 Oct 20; 74(1):78.