



## Case Report

**Electrical Cardioversion of Supraventricular Arrhythmia Patient with Septic Shock**A. Pramitha<sup>1,\*</sup><sup>1</sup>Brawijaya University, Malang, Indonesia

## ARTICLE INFO

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## ABSTRACT

Supraventricular arrhythmia (SVA) is a very common cardiac rhythm problem experienced by patients in intensive care unit (ICU), which both pharmacological and non-pharmacological treatment could treat. Recently, electrical cardioversion has been proven in improving haemodynamic and functional status. We report a case of 59 years old female patient with VA and septic shock with unstable haemodynamic that was immediately improved after electrical cardioversion. The electrical cardioversion (preferably biphasic) is identified in the patient with an absence of oppositions and is more suitable in combination with antiarrhythmic agent.

**Introduction**

The characteristics of septic shock is the afterload that is reduced, unstable filling conditions, catecholamine surge, chronotropic dysregulation, and left ventricle (LV) diastolic and systolic dysfunction; all of them could lead to rhythmic disorders <sup>[1]</sup>. The occurrence of supraventricular arrhythmias is associated with a less favourable prognoses in septic shock <sup>[2]</sup>. Among the general residents of ICU, the occurrence of SVA mostly occurred in septic shock patients. Maintenance of diastolic ventricular filling and sinus rhythm are the priorities for those in critical condition. <sup>[2]</sup>

Due to limited studies concerning electrical cardioversion for SVA in septic shock patients, this paper aims to report one case that overviews the efficacy and safety of electrical cardioversion for SVA in septic shock patients.

**Case Presentation**

A 59-year-old woman experienced her consciousness fluttering since 6 hours before she was admitted to the hospital. She complained her abdomen had been hurting for 3 days. We assessed her with gastric perforation and generalized peritonitis. The worsening condition of patient leads into septic shock that is characterized by decrease of consciousness, weak blood pressure, tachypneu, and progressive palpitations since 12 hours before. Physical examination revealed heart rate of 200 beats/min. The blood pressure (BP) was 85/palpation mmHg without peripheral edema. Auscultation of heart showed tachycardia. Anaemia and hyperthyroidism were excluded. The electrocardiography (ECG) showed supraventricular tachycardia (SVT) with ventricular rate about 200 beats/min. She was treated with two liters of normal saline and 200 nano/kgBW of vasopressor. However, they do not improve the patient's haemodynamic.

In addition, electrical cardioversion (ECV) 50 J was applied immediately and it was successful. Sinus rhythm (SR) was shown from ECG. The patient's condition was monitored, and there is no adverse effect. Then, the patient was also treated by abdomen external drainage and was monitored in ICU. There were no significant complications.

## Discussion

Because of the non-responsive hypotension to the preload correction, septic shock diagnosis is conducted according to the conditions set for systemic inflammatory syndrome (SIRS). It is found to be related to the data of cardiac arrhythmias in patients with critical conditions [3]. Previous studies showed that there is greater likelihood of various cardiac arrhythmia exhibition in patients having moderate to severe sepsis [4]. The majority of this study was focused on the management and outcomes of SVA in septic shock patient population. Amongst the population of general ICU, the SVA incident had significant increase in the septic shock patients, and it tends to be connected with both prognoses of both short and long-term worsening condition. [1]

There are approximately 33.5% septic shock patients that has responded to the antiarrhythmic therapy, and 43.6% for the 28 day of mortality, according to the report regarding the mortality rate of ICU patients with septic shock. Despite the treatment, according to the data, around 30–35% of the patients remain in NOAF. Their information regarding ICU and 28-day mortality was between 45% and 56%, respectively. These measurements did not reach meaningful significance in comparison to patients undergone cardioversion. Moreover, the adjustment of age, alongwith noradrenaline dosage, score of SOFA and CRRT presence; the significance was unconfirmed (HR 0.67, P = 0.113). [6]

The inducing factors of arrhythmia in septic patients are recorded in the medical history, in particular regarding heart disease and medication. Similarly, there is a possibility of genetic predispositions or subclinical ischemic heart disease manifesting in patients who are stressed and low on metabolism. Pathogenic factors could also be related to the occurrence of arrhythmia. Exotoxins, such as streptolysin O or pneumolysin with cardiotoxic potential, could induce septic cardiomyopathy into arrhythmias [7]. In pneumococcal infections, the activation of the receptor inducing platelet-activating factor that was done by the bacterial cell serves similar role [8]. Endotoxins, such as lipopolysaccharide of Gram-negative bacteria may help in contributing to the arrhythmia onset, which is probable to be caused by the Toll-like receptor mediated action it has [9]. SIRS could cause the increase in demand of metabolism and intracellular derangement, including dysfunction of mitochondria. Cardiac arrhythmias could be promoted through the effects of inflammatory mediators.

In patients with septic conditions, the associated diastolic dysfunction occurred frequently (up to 61.8%) [8]. Compared to systolic dysfunction, diastolic dysfunction is a predictor of mortality that is independent. There is a surging risk of massive fluid resuscitation and worsening of tissue edema and hypoperfusion, or in other words, inadequate expansion volume in suffering severe diastolic dysfunction that exist before admission. [2]

In order to fix the low resistance of vascular in septic shock, the administration of catecholamine is proarrhythmogenic. Multivariate analysis had been reported to show insignificant 12-month benefit in cardioverting septic shock patients to sinus rhythm (HR 0.67, P = 0.113). Arrhythmia is close in relation to sepsis rather than parallel to the correction of the previous preload. It is also closely related to

pressure of targeted perfusion. Although the initiation of vasopressors in septic shock with profound hypotension early is suggested <sup>[10]</sup>, this has to be done with adequate parallel preload examination <sup>[11]</sup>. The correct administration time of vasopressin to lower a high dosage of vasopressors could tamper with the predisposition to arrhythmias in septic shock <sup>[12]</sup>. Thus, careful and repetitive echocardiographic examination of either cardiac function and the status of intravascular volume could be considerable approach.

However, it has to be noted that the replacement of suboptimal volume could lead to a higher sympathetic tone, which also leads to greater endogenous adrenergic stimulation, along with the urgent necessity for exogenous catecholamines. Both states, such as fluid overload and hypovolaemia, are the factors triggering the development of arrhythmias.

The routine of ICU is affected by gradual haemodynamic monitoring incorporating echocardiography. Echocardiography also helps in deciding whether a patient having unknown history of arrhythmia is to be cardioverted. If echocardiography is not used, findings of ECG of a structural heart disease, for example the low R waves in precordial leads, profound ischaemic changes or atrioventricular blockade is found. <sup>[2]</sup>

It should be understood that most of patients had atrial fibrillation and could be easier to be cardioverted electrically, in the meantime, re-entrant SV tachycardia might be cardioverted by vagal manoeuvres similar to carotid sinus massage. It is more likely to miss some patients with SV arrhythmias, such as flutter, who were electrically cardioverted instead of administration of antiarrhythmics—that is if we search according to the medical history of antiarrhythmic medication <sup>[6]</sup>. In the long term medication, the repetition effects of

antiarrhythmics have been reported to lead into the tendency to provide rate control rather than therapy of rhythmic control.

Nevertheless, the overlap between rhythm and rate control may be an important point as proved in the recent study on perioperative AF, where the same antiarrhythmic agents are included by the two modalities and similar percentage of electrical cardioversion in 25% of the patients is presented <sup>[13]</sup>. The median age in an adult patient in the ICU varies from 55 to 65 years with a notable custom of coronary artery disease and hypertension. This suggests a big dependency on ventricular filling of atrial systole, which suggests a potential benefit of rhythmic control. The NOAF prevalence and a wide spectrum of potentially reversible triggers in the patients with critical condition propose a better chance for electrical cardioversion and the sinus rhythm preservation in carefully monitored patients rather than in outpatients of cardiology. <sup>[2]</sup>

## Conclusion

Patients suffering worse sepsis have higher risk of having atrial and ventricular arrhythmias. Although that existence is possible in becoming the pointer of the increase in the pre-existing illness intensity, arrhythmias is possible in independently increasing mortality of patients suffering septic. Actively chasing for SR and cardioverting patients may contribute to the diastolic dysfunction treatment with good effect on mortality. Further studies that identify SVA mechanisms and predictors intense sepsis will help to decide methods of prevention and treatment.

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