

Role of CytoSorb® in Optimization of Vasopressors and Reduction of Sepsis scores: A Case Series

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INTRODUCTION

- Septic shock is a significant cause of mortality in the intensive care units (ICUs) with around 60% reported deaths (1).
- Septic shock results in hemodynamic instability which in turn leads to a state of circulatory failure that persists despite fluid resuscitation (2).
- Vasopressor agents are critical and are prescribed in septic shock to achieve and maintain adequate blood pressure and organ perfusion when fluid resuscitation fails (3).
- Though potent, vasopressors have substantial adverse effect profiles like increased vasoconstriction and arrhythmic events (4, 5). Thus, their optimized use is crucial.
- CytoSorb® (CytoSorbents Corporation, USA), a novel Extracorporeal Cytokine Adsorption Device (ECAD) prevents Multi Organ Dysfunction Syndrome (MODS) by targeting cytokines, and modulating immune response.
- CytoSorb® has shown good tolerability in various pre-clinical and clinical studies (6-8).
- In this study, we evaluated whether CytoSorb® plays role in optimization of vasopressors and reduction of sepsis scores.

METHODS

- A retrospective evaluation of patients admitted to tertiary ICU and treated with ECAD (CytoSorb®) was done to analyze number of vasopressors used in patients before and after therapy and dosing of each vasopressor before and after therapy; sepsis scores (APACHE II and SOFA) of patients before and after therapy and survival to discharge.
- Information on files were used to collect the data from hospital records of patients.
- Discharge summaries of the patients were also used to collect relevant information.
- Vitals (heart rate, blood pressure, respiratory rate and temperature), APACHE II and SOFA scores were measured before and after the application of ECAD (CytoSorb®).

RESULTS

Study Population

- A total of 10 ICU patients (5 men, 5 women) aged 23-75 years were included in the study.
- The patients were treated with SOC (antibiotics, vasopressors, intravenous (IV) fluids, and sepsis dosed steroids) and ECAD (CytoSorb® ; total devices-31) as an adjuvant therapy.
- The patients were administered standard antibiotics that included meropenem, teicoplanin, clarithromycin, doripenem, fluconazole, metronidazole etc.
- IV fluids (500 to 1000 mL) that included normal saline (NS), Ringer lactate (RL), Dextrose and Sodium Chloride (DNS), dextrose 25% and sepsis dosed steroids (Hydrocortisone 50mg IV QID) were given.
- Vasopressors administered included norepinephrine (0.02-1.0 µg/kg/min), vasopressin (0.02-0.06 units/hr), adrenaline (0.02-0.6 µg/kg/min), dobutamine (up to 20 mcg/kg/min) and dopamine (low range dose: 0-15 µg/kg/min).
- All the patients had APACHE II ≥ 15, SOFA score ≥ 12 The patient characteristics are presented in Table 1.

Outcome:

- Overall, 5 ECAD were used in 2 patients, 3 ECAD (CytoSorb®) were used in 5 patients and 2 ECAD and a single ECAD were used in one patient each. Duration of ECAD (CytoSorb®) therapy was 6-24 hr (Table 1).
- There was an overall decrease in the APACHE II score and SOFA score of patients after the ECAD (CytoSorb®) application (Figure 1a and Figure 1b).
- After the ECAD (CytoSorb®) application, of 10 patients who were on high dose of norepinephrine, 7 of them required low dose (i.e. ≤ 0.1 µg/kg/min), 2 were completely weaned of norepinephrine, except 1 patient continued on the same dose as before therapy.
- Of the 9 patients who were given vasopressin, 6 were weaned off vasopressin, 2 had a reduced dose and 2 were on the same dose as before.
- Both the patients on adrenaline before ECAD application were weaned off adrenaline.
- There was no significant change in the dose in 2 patients who were on dobutamine.

Table 1: Characteristics of Patients Treated with CytoSorb® Therapy

Pt No.	Age, Sex	Diagnosis	No. of ECAD used	APACHE 2		SOFA		Serum Lactate		Outcome
				Before Therapy	After Therapy	Before Therapy	After Therapy	Before Therapy	After Therapy	
1	35, M	Emphysematous pyelonephritis with horse shoe kidney with septic shock and MODS	3	23	13	16	11	2.2	2.4	Survived
2	53, F	Acute pyelonephritis with septic shock and MODS	2	24	11	17	10	2.7	1.7	Survived
3	69, M	Infected diabetic foot, MRSA septicemia, septic shock with MODS	5	29	28	17	15	3.3	1.4	Death
4	46, M	Acute intestinal obstruction with perforation peritonitis (operated) with septic shock and MODS	3	26	12	12	9	4.2	1.5	Survived
5	75, F	Bronchial asthma with hospital acquired pneumonia, primary ARDS and septic shock	3	17	11	16	9	6.0	1.9	Survived
6	23, F	Fever with thrombocytopenia (scrub typhus) with septic shock and MODS in post partum patient	3	15	10	10	7	1.6	1.4	Survived
7	34, F	Ca tongue (treated) with pneumonia septic shock and MODS	3	28	26	16	12	5.2	2.4	Death
8	51, M	Burst appendix with peritonitis with septic shock and MODS	1	30	24	16	12	2.3	2.2	Death
9	42, M	Acute necrotising pancreatitis with MODS	5	23	10	15	14	4.2	2.2	Death
10	36, F	Urosepsis with septic shock and MODS, morbid obesity, hypothyroidism, diabetes mellitus	3	30	7	15	4	4.4	0.7	Survived

Figure 1a: APACHE 2 Scores

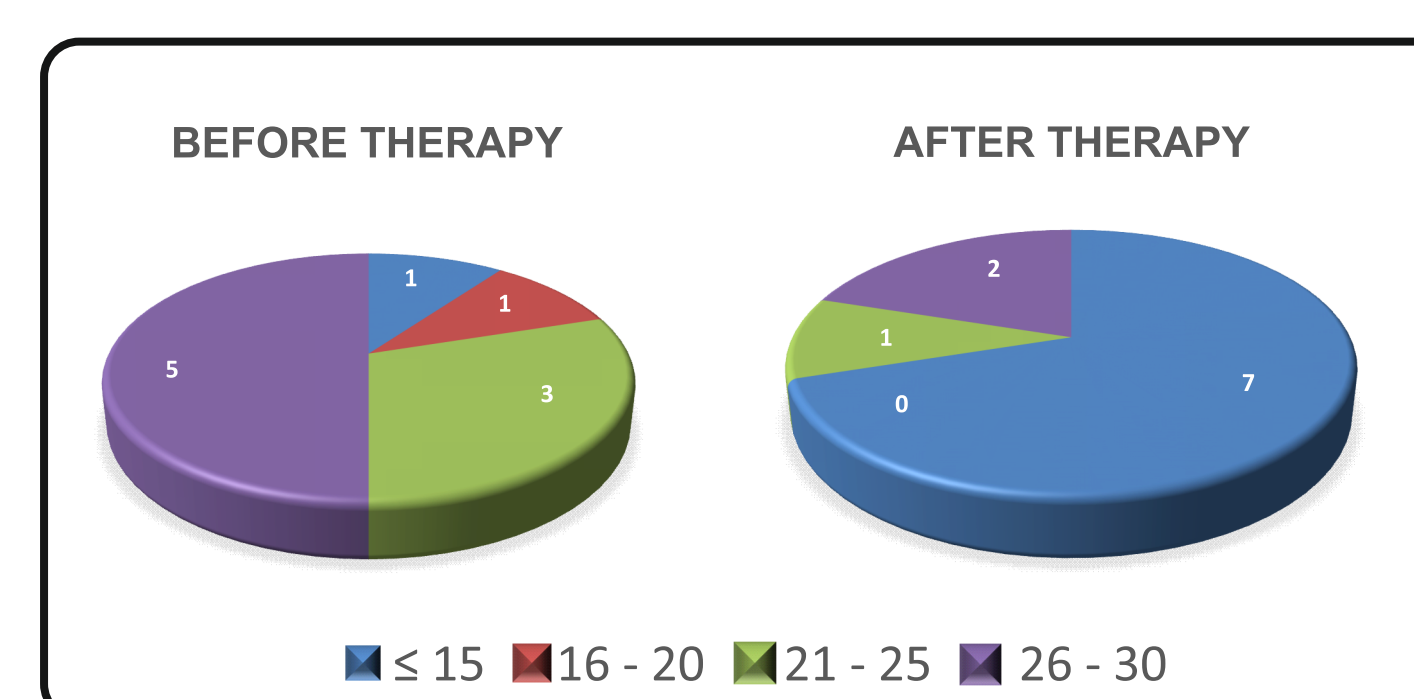


Figure 1b: SOFA Scores

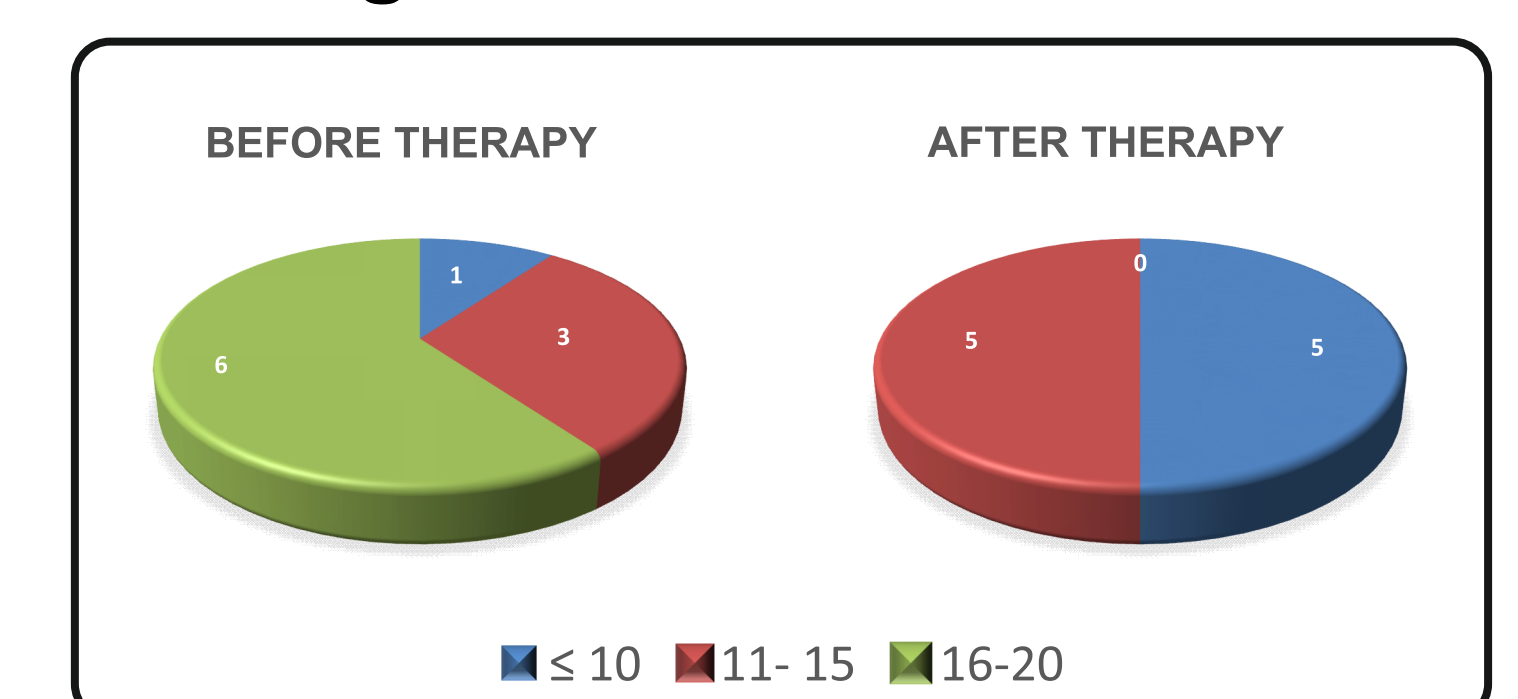
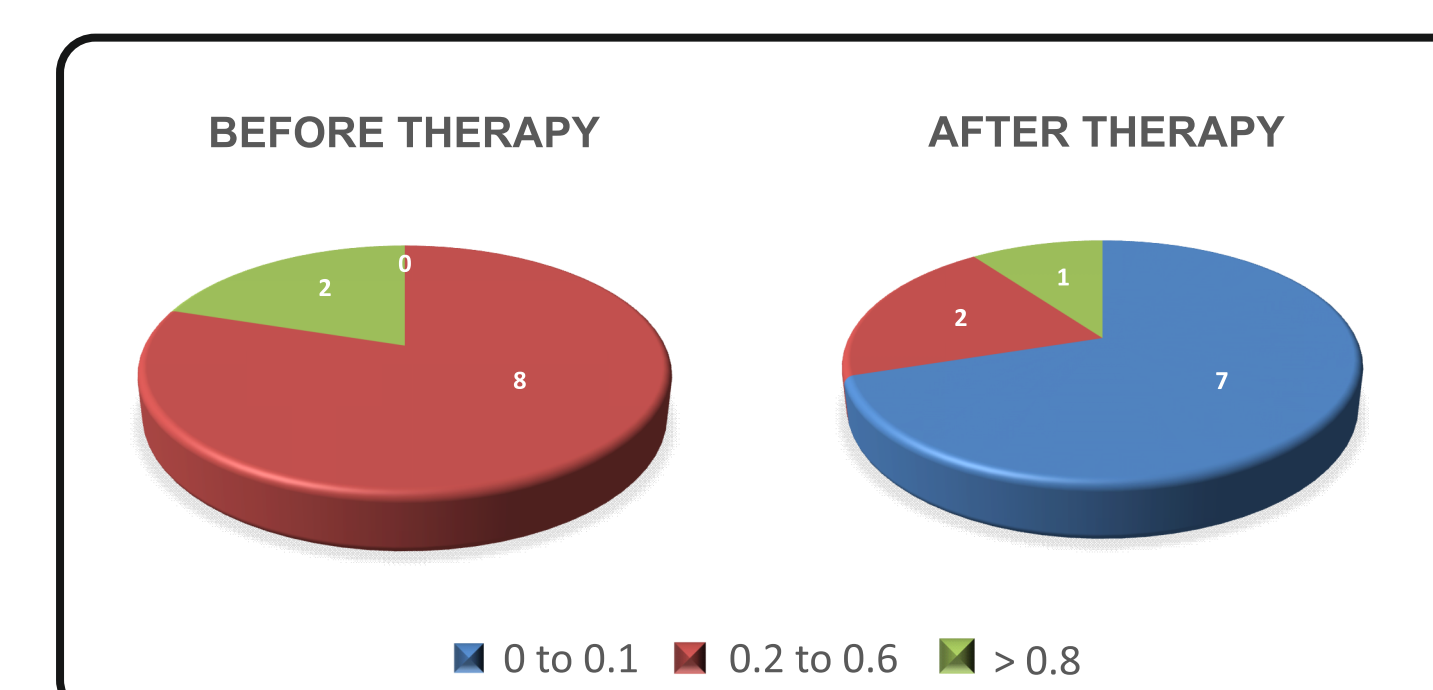


Figure 2: Norepinephrine Dose in Patients Before and After Therapy



- Of 3 patients on dopamine, 2 were weaned off and one had a reduced dose.
- Urine output increased considerably in all the patients after ECAD application.
- Overall, 6 patients survived (Table 1).

CONCLUSIONS

- All our patients had multiple organ failure and septic shock. These patients require aggressive management and vasopressor therapy. Hemadsorption can be beneficial in these patients and help reduce mortality.
- Overall, we observed that a reduced dose of vasopressor agents was required for our patients after ECAD application. Optimization of dose of vasopressor agents is essential as these agents have significant adverse events.
- Following ECAD (CytoSorb®) therapy, patients who had improvisation of hypoxemia showed a normalization of serum lactate levels in survived patients.
- There was an improvement in APACHE II and SOFA scores of majority of patients following CytoSorb® therapy.
- ECAD (CytoSorb®) can be a beneficial adjuvant therapy in patients with severe sepsis and/or septic shock and/or multiple organ failure. CytoSorb®, a novel ECAD might play a role in optimization of vasopressor therapy but future well designed studies are needed to substantiate this claim.

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