Dear ladies and gentlemen, dear ADVOS users and interested parties,
we are pleased to present you another issue of our ADVOS Literature Service. We regularly select one or more papers from international journals which might be of interest to you in connection with our ADVOS procedure. This month we have selected the following:

Professor Dr. Wolfgang Huber (Klinikum rechts der Isar, Munich) has dealt with the safety of the ADVOS procedure. In the following, we have summarized the following three abstracts:

THE IMPACT OF CONNECTION TO THE EXTRACORPOREAL CIRCUIT ON HAEMODYNAMICS (TRANSPULMONARY THERMODILUTION (TPTD) AND PULSE CONTOUR ANALYSIS (PCA)) IN PATIENTS TREATED WITHE THE ADVOS/HEPA WASH-DEVICE: THE HAEMADVOS-I-STUDY.

Huber et al.

HAEMODYNAMIC EFFECTS OF DISCONNECTION FROM THE "ADVANCED ORGAN SUPPORT" (ADVOS): THE HAEMADVOS-II-STUDY EVALUATING THE "RETRANSFUSION VOLUME CHALLENGE OPTION" (REVOLUTION).

Huber et al.

FEASIBILITY OF ULTRAFILTRATION IN PATIENTS TREATED WITH THE ADVOS/HEPA WASH-DEVICE UNDER HAEMODYNAMIC MONITORING WITH TRANSPULMONARY THERMODILUTION (TPTD) AND PULSE CONTOUR ANALYSIS (PCA): THE HAEMADVOS-III-STUDY.

Huber et al.

Key Message

Treatments with ADVOS multi are as hemodynamically safe as with conventional dialysis. In addition, during 8-hour treatments preset ultrafiltration goals were achievable without circulatory impairments in most patients.

Background

The ADVOS multi device uses two dialyzers to provide an adequate elimination of watersoluble and protein-bound toxins, CO2 elimination and acid-base balance correction. This results in an increased extracorporeal blood volume of 400-500 ml/min. This high volume might affect hemodynamic. Here we summarize three studies (HAEMADVOS Studies I, II and III) conducted in the Klinikum rechts der Isar by Prof. Dr. Huber, who analyzed the hemodynamic impact of the connection to the ADVOS device, the disconnection, the

retransfusion (i.e. “REVOLUTION maneuver”, analogous to a volume challenge to check the fluid balance), and the feasibility of ultrafiltration.

Methods

The hemodynamic status (HAEMADVOS I and II) was analyzed by transpulmonary thermodilution and pulse contour parameters with the PiCCO-device (Pulsion; Germany) immediately before and after connection (T1, T2) and disconnection (T3; T4) to ADVOS multi at a 100 ml/min blood flow. Data from 25 treatments in 6 patients were analyzed. The feasibility to reach a pre-defined ultrafiltration goal set immediately after T1 was additionally analyzed in 36 treatments in 13 patients (HAEMADVOS III).

Results

HAEMADVOS Studies I and II:

6 Patients (83% male; 65 ± 18 years, SOFA-Score 11 ± 3) with cirrhosis (3), alcoholic steatohepatitis (1) or sepsis (2) were admitted to the intensive care unit. During 96% of the ADVOS treatments, patients were on mechanical ventilation and 80% needed vasopressors.

The following parameters increased (↑), decreased (↓) or did not change (=) significantly during ADVOS treatments:

	Connection	Disconnection	Treatment
Parameter	T2 vs. T1	T4 vs. T3	T4 vs. T1
Mean arterial pressure (MAP)	=	↑	=
Systemic vascular resistance index (SVRI)	=	=	=
Central venous pressure (CVP)	=	=	=
Global end diastolic index (GEDI)	=	↑	=
Heart rate (HR)	=	=	=
Maximum left ventricular contractility (dPmax)	=	=	=
Global ejection fraction (GEF)	=	=	=
Extravascular lung water index (ELWI)	↓	=	=
Cardiac Index (CI)	↓	↑	=
Cardiac power index (CPI)	↓	↑	=
Pulmonary vascular permeability index (PVPI)	n.a.	n.a.	↓
Stroke volume index (SVI)	n.a.	=	n.a.

n.a. = not analyzed

HAEMADVOS-Studie III:

13 Patients (70% male; 64 ± 13 years, SOFA-Score 12 ± 3) suffering from cirrhosis (8) or sepsis (5) participated in the study. During 92% and 69% of the ADVOS treatments, patients were on mechanical ventilation and vasopressors, respectively.

Pre-defined ultrafiltration goal and final ultrafiltration correlated ($r=0.577$; $p<0.001$) and were not significantly different (1553 ± 905 vs. 1563 ± 1039 ml; $p=0.860$). Ultrafiltration rate was lower than 80% of the pre-defined goal in 10/36 (28%) of the treatments. An underestimation of at least 20% of the ultrafiltration target was predicted in ROC-analysis by decreases in global end-diastolic volume index (ROC-AUC 0.737;

p=0.048), cardiac index (AUC 0.737; p=0.048) and stroke volume index (AUC 0.753; p=0.035) during connection (T2 vs. T1). Changes in CVP, heart rate or MAP were not predictive.

The authors conclude:

- Acute connection to the ADVOS with pre-filled tubing did not result in hemodynamic impairment.
- 8h-ADVOS therapy was hemodynamically safe and reduced PVPI.
- Disconnection after ADVOS therapy with re-transfusion of 500 mL blood resulted in significant increases of MAP, GEDVI and CPI.
- Due to the larger extra-corporeal volume of 500mL, the “REVOLUTION-maneuver” (Volume Challenge through re-transfusion) might be even more useful after ADVOS than after conventional dialysis.
- Ultrafiltration with ADVOS was well tolerated in most of the patients.
- Failure to achieve the preset filtration goals was best predicted by decreases in GEDVI, CI and SVI after the connection to ADVOS.

We think that:

Two dialyzers are not commonly needed during conventional extracorporeal support therapies. However, internal studies conducted by Hepa Wash have shown that ADVOS multi is more efficient with this setting.

A larger surface implies also a larger volume of blood circulating through the dialyzers. This might result into hypotonic episodes during the connection of the patient.

A shown in the series of studies performed by Huber et al., ADVOS is as safe as any conventional hemodialysis device and hemodynamic parameters are not worsened after the disconnection. In fact, due to the large volume of blood needed to be reinfused at the end of the treatment, the fluid balance of the patients can be checked analogously to a volume challenge. Additionally, an adequate fluid balance could be achieved in most patients as no deviations were shown in preset ultrafiltration goals during 8 hour-treatments. This confirms our preclinical studies. There, we observed a blood pressure stabilizing effect too, independently of the stabilization of the acid-base balance.

In conclusion, ADVOS therapy remains as safe as other hemodialysis therapies, with the additional advantage of the removal of protein-bound toxins, CO2 and acid base-balance control. In addition, in critically ill patients, the set ultrafiltration goals can be achieved within 8 hours.

If you have further questions or suggestions - please contact us at marketing@advitos.com.

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