

## Use of CytoSorb in a patient with acute bleeding complications due to oral anticoagulation with rivaroxaban

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This report describes the case of a 68-year-old patient (known medical history: untreated chronic obstructive pulmonary disease (COPD), ectopic atrial tachycardia, liver cirrhosis CHLD stage B, no contact with physicians for about 9 years), who was admitted to the emergency room with decompensated right heart failure due to cor pulmonale and respiratory failure type II (hypercapnia).

### Case presentation

- The patient was admitted hemodynamically stable, however in a somnolent condition
- Advanced laboratory diagnostics, electrocardiogram, blood gas analysis and volume replacement therapy with electrolyte solution (1 liter) were performed followed by transfer to the intensive care unit
- CT thorax revealed thrombotic occlusion of the right vena subclavia, right vena jugularis and the vena cava superior
- After admission to the intensive care unit in a hypovolemic condition, volume therapy was continued, he also received non-invasive ventilation for treatment of his pronounced hypercapnia (paCO<sub>2</sub> 65 mmHg, pH 7.2), anticoagulative therapy with enoxaparin (0.8 ml subcutaneously adapted to body weight) as well as empiric antibiotic therapy with Unacid due to suspected infection, after which the patient stabilized and could be transferred to a normal ward after a total of 6 days
- During his stay on the normal ward, the patient received rivaroxaban (20 mg) on day 6 for his arrhythmia and due to thrombosis in the V. subclavia (enoxaparin administration was stopped), another dose of rivaroxaban (20 mg) was administered the following day
- Shortly afterwards, the patient had to be retransferred to the ICU due to a massive hemorrhage in the groin
- Laboratory diagnosis showed mild leukocytosis (14,900/μl), increased CRP (176 mg/l), marked anemia (Hb 6.7 g/dl, Hct 20%) and compromised coagulation variables (INR 2.03, Quick 36, PTT 54 sec, total calcium 1.9 mmol/l, potassium 3.40 mmol/l, fibrinogen of 392 mg/dl, ATIII >120%, D-dimer 1626 ng/ml)
- Renal values were normal, however a significant increase in GOT 65 U/l, GPT 64 U/l, GGT 123 U/l, LDH 408 U/l was noted, probably as part of the existing liver cirrhosis, CK had also increased to 1539 U/l
- To counter the effect of the rivaroxaban, 2000 units of prothrombin concentrate (PPSB), 2x red blood cell concentrates, 2x frozen fresh plasma and 2g tranexamic acid (antifibrinolytic) were administered
- In addition and with the rationale to reduce anti-Xa (rivaroxaban) activity and plasma levels, hemoadsorption using CytoSorb was initiated
- Anti-Xa plasma concentration measured immediately before the start of CytoSorb therapy was 403 ng/ml

## Treatment

- One treatment with CytoSorb for a total of 17 hours
- CytoSorb was used in combination with CRRT (Multifiltrate, Fresenius Medical Care, Hemofilter AV1000 F) run in CVVHD mode
- Blood flow rate: 100-150 ml/min
- Anticoagulation: citrate
- CytoSorb adsorber position: pre-hemofilter

## Measurements

- Rivaroxaban plasma concentrations

## Results

- Rivaroxaban plasma concentration could be reduced from pre-treatment levels of 403 ng/ml to 60 ng/ml after 12 hours of treatment, a repeated measurement after 31 hours post CytoSorb start (and meanwhile termination of treatment) showed a plasma concentration of 25 ng/ml

## Patient Follow-Up

- On the following day, the patient underwent surgical hematoma removal on the right medial thigh and was postoperatively retransferred to the intensive care unit due to ongoing catecholamine-dependency. He received erythrocyte concentrates and catecholamines, which could be finally tapered off after a total of 2 days
- Another 5 days later development of an inflammatory process in his right leg which was treated with empirical antibiotic therapy for soft tissue infection using levofloxacin and daily surgical follow-up examinations
- The infectious situation resolved under continuous antibiotic therapy, the patient was transferred to the normal ward after 4 days where therapy with enoxaparin was resumed (initially 0.4 ml subcutaneously once daily, after 4 days 0.7 ml subcutaneously once daily)
- Again, development of an infectious situation and surgical removal of an infected recurring hematoma with placement of a VAC dressing followed by another operation with lavage, wound closure and installation of a Redon drainage
- Discharge 4 days after the last operation for planned rehabilitation including regular wound and medical check-ups, continued physiotherapy due to ischial pressure injury with foot-drop weakness resulting from the hematoma

## Conclusions

- In this patient with acute bleeding complications under oral anticoagulation with rivaroxaban, hemoadsorption therapy with CytoSorb resulted in a significant reduction of rivaroxaban plasma concentrations and thus presumably the successful antagonization of the drug and control of the acute bleeding complication
- To study removal kinetics, serial (possibly every 2 hours) and pre-/post-adsorber measurements would have been desirable
- According to the medical team, from now on CytoSorb will always be considered in cases of massive bleeding due to known, proven CytoSorb-eliminated substances, such as rivaroxaban or ticagrelor
- Safe and easy application of CytoSorb