Maastricht University

Intradialytic monitoring of blood pressure, oxygen saturation and relative blood volume

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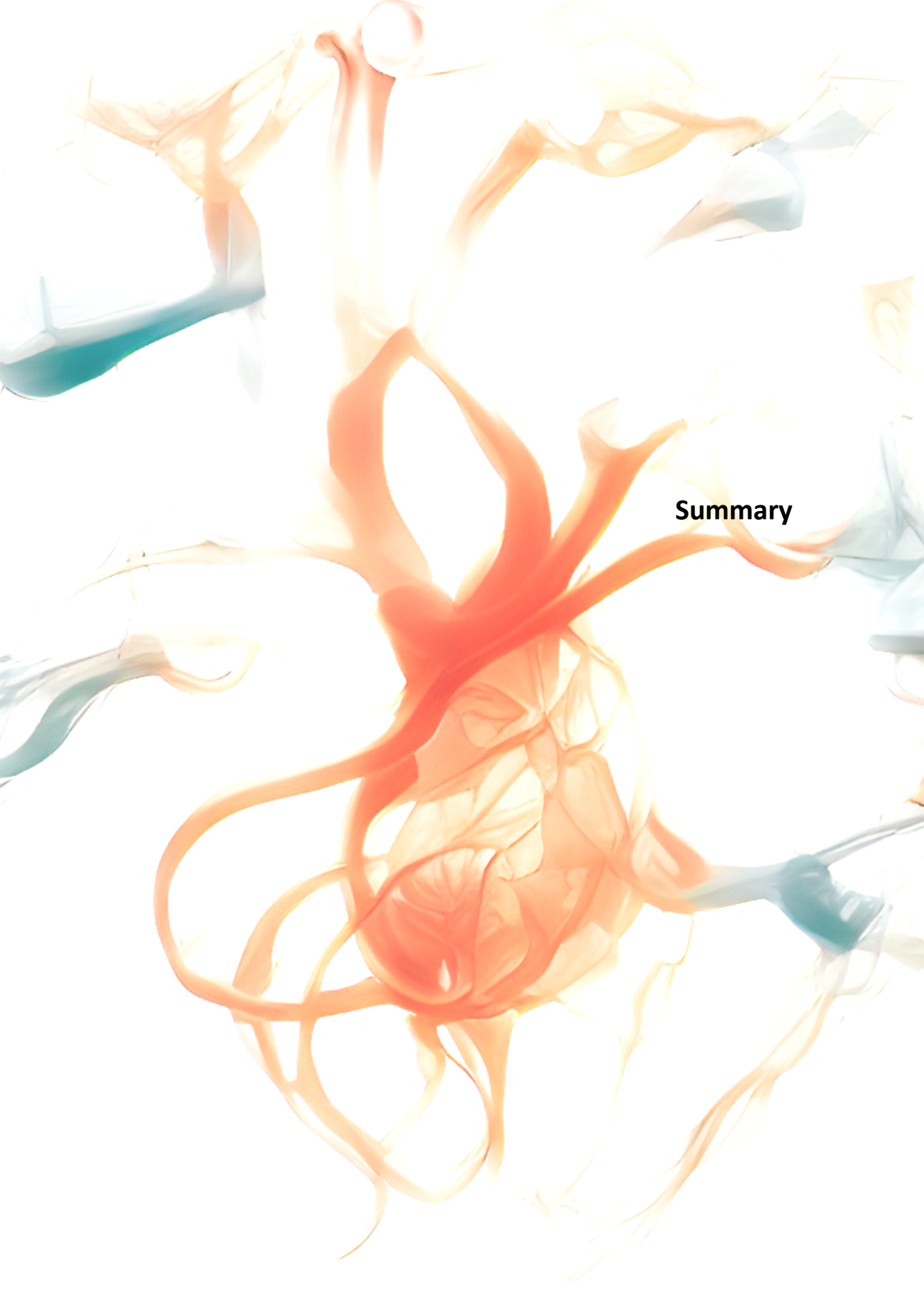

Summary

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The research presented in this thesis sought to provide deeper understanding of the intradialytic hemodynamics effects caused by the hemodialysis (HD) treatment. By using available technology (Crit-Line Monitor, CLM) as well as routinely collected parameters it is able to monitor key parameters during treatment including systolic blood pressure (SBP), relative blood volume (RBV), central venous oxygen saturation ($ScvO_2$) and arterial oxygen saturation (SaO_2). The studies presented in this thesis focused on the associations of these parameters with clinical outcomes.

Chapter 2 explored the joint association between pre-HD SBP levels and peridialytic SBP change with clinical outcomes. The chapter showed these 2 parameters should be interpreted jointly as mortality risk changes depending on the pre-HD level and the direction of the peridialytic change. Patients whose pre-HD SBP is low and have an increase in SBP during HD are associated with improved outcomes as compared to patients experiencing a further decline; whereas a further increase of SBP in patients who already begin with a high pre-HD SBP level is associated with higher mortality.

Chapter 3 investigated the association between intradialytic RBV levels attained during treatment and mortality. The main finding was the identification of specific RBV ranges associated with significantly lower all-cause mortality, namely RBV levels of 93-96%, 89–94% and 86–92% at the first, second and third hour into treatment, respectively, were associated with better survival. This research showed that achieving the favorable RBV range at 3 hours into the treatment did not result in an increased rate of intradialytic hypotension (IDH), despite higher UFRs. Furthermore, for the first time the association between intradialytic $ScvO_2$ and RBV changes in relation with patient survival was explored in **Chapter 4**. This research found that combined monitoring of intradialytic $ScvO_2$ and RBV change is relevant as $ScvO_2$ levels are a major driver of the association of RBV changes and patient survival. We showed that in patients with lower mean $ScvO_2$ levels a concurrent small RBV decline is associated with higher mortality while patients with higher $ScvO_2$ levels a larger RBV decline is associated with improved survival.

Lastly, **Chapter 5** studied the time course of intradialytic SaO_2 and the occurrence of hypoxemia before and after COVID-19 diagnosis among HD patients, and their association with clinical outcomes such as hospitalization and mortality. It was reported a rise in intradialytic hypoxemia rate in the days before onset of symptoms and diagnosis of COVID-19. This research also found that a steeper decline in SaO_2 was

associated with poorer outcomes, identifying intradialytic hypoxemia as a potential predictor of poor prognosis in patients with COVID-19. An interesting finding was the recognition of the presence of ‘silent’ hypoxemia in our study, a known phenomenon described among non-dialysis COVID-19 patients.