A novel method for early identification of cardiac tamponade in patients with continuous flow left ventricular assist devices by use of sublingual microcirculatory imaging

Introduction:
Diagnosis of cardiac tamponade post continuous-flow left ventricle assist devices (cf-LVADs) is challenging due to missing pulsatility. Recent case study of sublingually microcirculation with incident dark-field imaging (IDF) provide a new improved imaging for clinical assessment of cardiac tamponade in a patient with cf-LVAD. We sought to examine the changes in microvascular flow index (MFI) as a sign of cardiac tamponade following LVAD implantation.

Methods:
Off-site quantitative analysis of sublingual microcirculation clips with Automated Vascular Analyses software (AVA; MicroVision Medical©), and the velocity distributions followed during admission till discharge in patients with end-stage heart failure treated with cf-LVAD complicated by cardiac tamponade.

Results:
Eleven out of thirty LVAD implantations, 9 males, mean age 58 ± 10 years, April 2015 to January 2017, (8 Heart Mate 3 (HM 3) and 3 HeartMate II (HM II) (Thoratec Corp., CA)), were complicated by rethoracotomy due to early postoperative cardiac tamponade within 1 week. There sublingual microcirculation was examined by a novel incident dark-field imaging (IDF) before and daily post-LVAD implantation. Pre-LVAD microcirculation was typical for heart failure, characterized by slowly, sludging movement of red blood cells (RBCs), (Figure 1A arrows). Directly after implantation, a normal microcirculatory flow was seen with a high RBCs velocity (Figure 1B). On the day of tamponade the patients were stable except for severe failure of microcirculation as reflected by drop in MFI (Figure 1C) and congestion in venules (* in figure 1C). In 8 out of 11 patients there was a significant drop in MFI before tamponade was clinically recognized (p<0.05). Shortly after rethoracotomy a quick restoration of microcirculatory flow has been found.

Conclusion:
Sublingual microcirculation imaging is a simple and sensitive non-invasive tool in early detection of cardiac tamponade.

Image 1:
Figure 1