Evaluation of a continuous non-invasive arterial blood pressure monitoring device (CNAP) in comparison with an invasive arterial blood pressure measurement in the ICU

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Methods:
We performed a prospective study on 49 critically ill patients in the Medical ICU. In 3 patients it was not possible to achieve a CNAP measurement and thus, 46 patients are included in the statistical analysis. All patients were sedated and mechanically ventilated (BIPAP, tidal volume >7ml/kg ideal body weight). Furthermore, all patients were under vasopressor therapy. CNAP was applied on two fingers of the hand contra lateral to the invasive arterial blood pressure catheter in the radial artery. All measurements were digitally recorded with a sample frequency of 100Hz, every pulse beat was automatically identified by an algorithm [2] and subsequently artefacts were removed from the datasets. The average recording time for each patient was 163 minutes (± 37 minutes/patient).

Results:
In total we analyzed 500,000 beats. Over all valid data points we observed a bias in mean pressure of -7.49mmHg with a standard deviation of 10.90mmHg. The Bland-Altman-Plot (Figure 3) shows a uniform distribution of the variances over all measured blood pressure values and a good agreement of the mean blood pressure between CNAP and IBP. The results indicate differences in bias and standard deviation between the individual patients (Figure 4). The bias ranges from 0.28mmHg to 23.9mmHg (median= -6.6mmHg), with a standard deviation between 2.0mmHg and 14.9mmHg (median= 5.8mmHg).

Conclusions:
In our study we detected a good agreement between CNAP and IBP in critically ill patients on the Medical Intensive Care Unit. Considering the individual results of the patients a bias between 0.28mmHg and 23mmHg was observed. Further analyses will be performed to explain the individual differences between the patients. The future perspective of this study is to investigate if the continuous non-invasive blood pressure waveform is suitable for deriving further hemodynamic parameters of volume responsiveness.

References:
(1) Jeleazcov et al. Precision and accuracy of a new device (CNAP) for continuous non-invasive arterial blood pressure monitoring: assessment during general anesthesia. British Journal of Anaesthesia 2010 vol. 105 (3) pp. 264-72

Introduction:
Due to a lower risk of complications non-invasive or minimal invasive methods become more and more important in Intermediate and Intensive Care Units (ICU). The measurement of arterial blood pressure intermittently or continuously belongs to the standard hemodynamic monitoring of ICU patients. A newly developed continuous non-invasive arterial blood pressure measurement method (CNAP Monitor, Figure 1 and 2) is now available and has already shown high accuracy during anesthesia [1]. The purpose of our study was the comparison of the CNAP monitoring device with the gold standard, the invasive arterial blood pressure measurement (IBP) in critically ill patients.