

CONTINUOUS AND NON-INVASIVE BLOOD PRESSURE MEASUREMENT BASED ON PULSE TRANSIT TIME COMPARED TO AMBULATORY BLOOD PRESSURE MEASUREMENT

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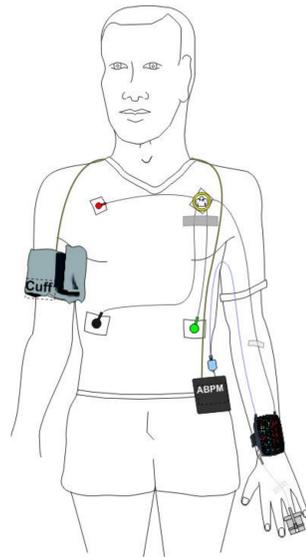
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Objectives

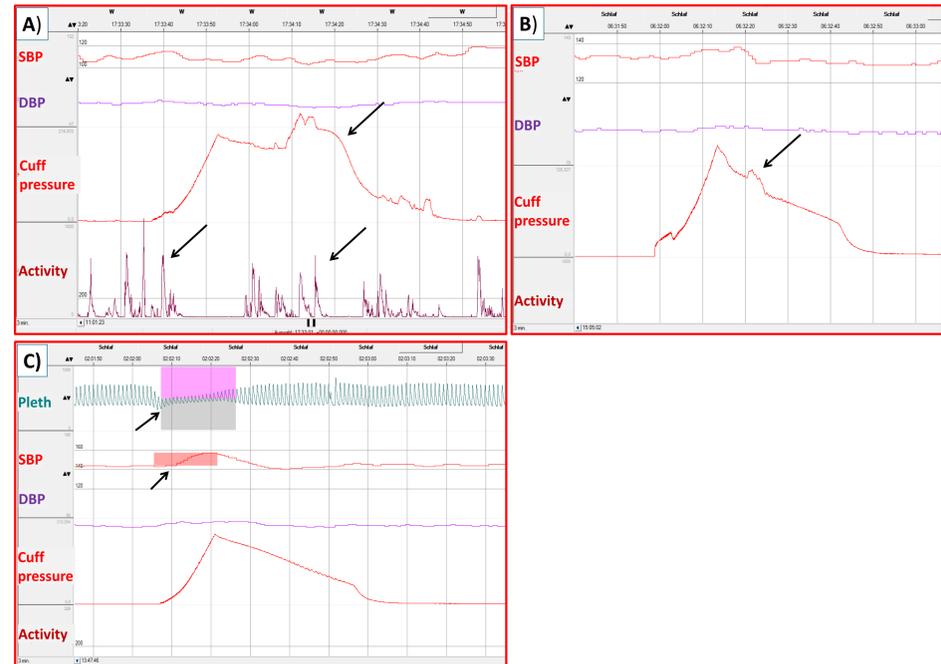
Ambulatory blood pressure monitoring (ABPM) with cuff is considered the gold-standard for the diagnosis of hypertension and assessment of cardiovascular risk. This study aimed to compare the reliability of a cuff-less blood pressure (BP) method based on pulse transit time (PTT) versus oscillometric ABPM considering limitations of cuff based BP measurement such as movement artifacts, arrhythmia and arousals during sleep caused by inflation of the cuff.

Methods

Systolic (SBP) and diastolic (DBP) blood pressure was measured in 30 adults (9 women, mean age 65.5 ± 9.3 years) using an oscillometric ABPM (Boso TM-2430 PC2). Measurement intervals were 15 min during daytime (6-22 h) and 30 min during night-time (22-6 h). Simultaneously, BP was recorded beat-to-beat and non-invasively based on PTT (SOMNOtouch™ NIBP, SOMNOmedics GmbH) on the contralateral arm. In addition we recorded a 3-channel ECG, motoric activity, finger plethysmogram, oxygen saturation and cuff pressure.

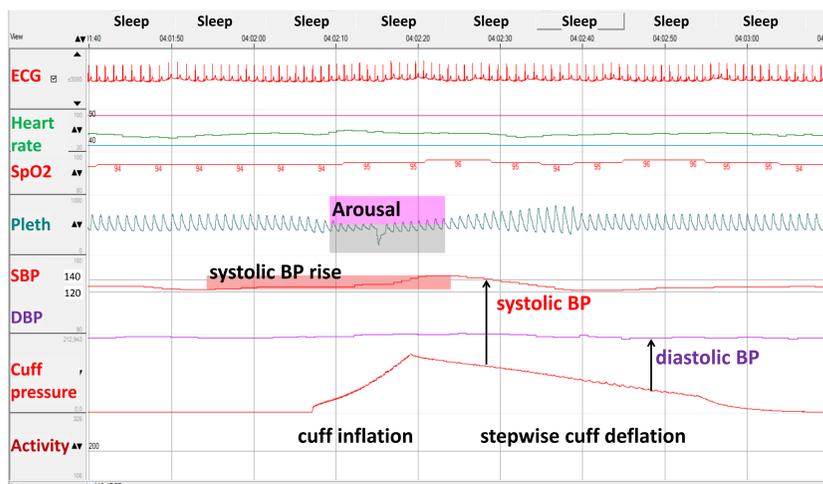


Artifacts caused by cuff method



Original data showing PTT based systolic blood pressure (SBP), PTT based diastolic blood pressure (DBP), cuff pressure, pleth and activity.

- A) Artifact during cuff pumping caused by muscle activity
- B) Cuff inconsistencies
- C) Arousal reaction caused by inflation of the cuff



Original data showing ECG, heart rate, oxygen saturation (SpO2), plethysmogram (Pleth), PTT based SBP and DBP, cuff pressure and activity.

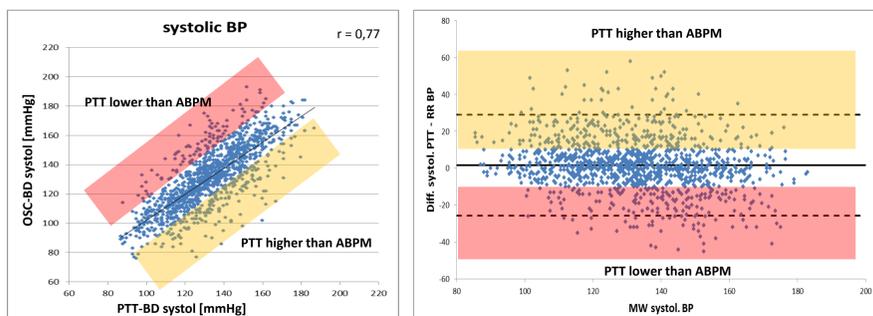
Incidence of Artifacts during cuff deflation

- Physical Activity >200mg/Cuff inconsistencies: 18%
- Arousal Reaction during sleep (SBP rise >12mmHg): 6%
- Arrhythmia (beat-to-beat variation of RR-interval >40%): 5%

→ A total of 29% of 1.293 cuff BP measurements were affected by artifacts

→ 921 valid BP pairs of both measurements

Pre-Analysis of Raw Data

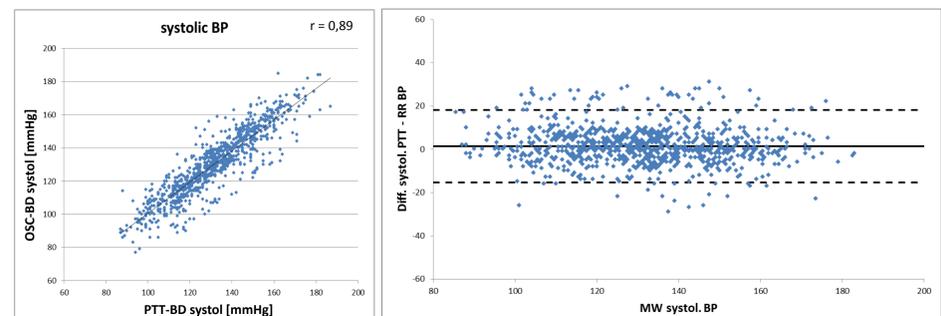


Correlation $r = 0.77$ ($n = 1293$)

Limits of agreement in Bland Altman plot +28.3 mmHg and -25.1 mmHg

The mean difference between both methods was 1.6 mmHg.

Results after exclusion of cuff related artifacts



Correlation coefficient $r = 0.89$ ($n = 921$)

Limits of agreement in Bland Altman plot +17.6 mmHg and -14.7 mmHg

The mean difference between both methods was 1.4 mmHg.

Conclusions

- 29% of all measurements were affected by physical activity/cuff artifacts (18%), arrhythmia (5%) and arousal reactions (6%, corresponds to 18% of all nocturnal BP measurements).
- After elimination of all cuff related artifacts the two methods result in comparable SBP and DBP values with clinically acceptable limits of agreement in Bland Altman plot.
- PTT method allows a much better analysis of BP fluctuations due to continuous and non-reactive BP measurement.
- Cuff methods are less accepted by patients and are affected by various artifacts which limit the reliability of cuff based BP measurement.