Monitoring of heart rate and inter-beat-intervals with wrist photoplethysmography in patients with atrial fibrillation

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Backround

- Atrial fibrillation (AF) causes marked risk for patients, while silent fibrillation may remain unnoticed if not suspected and screened
- Gold standard ECG has limitations in long term use
- Wrist photoplethysmography (PPG) can potentially be used to monitor heart rate (HR)

Material and methods

- 29 patients with multiple comorbidities were monitored during post-operative care (15 with AF, 14 with Sinus rhythm (SR))
- Optical HR Monitor using green light (PulseOn, Espoo, Finland)
- Inter-beat intervals (IBI) from the wrist were compared to RR intervals obtained from the ECG
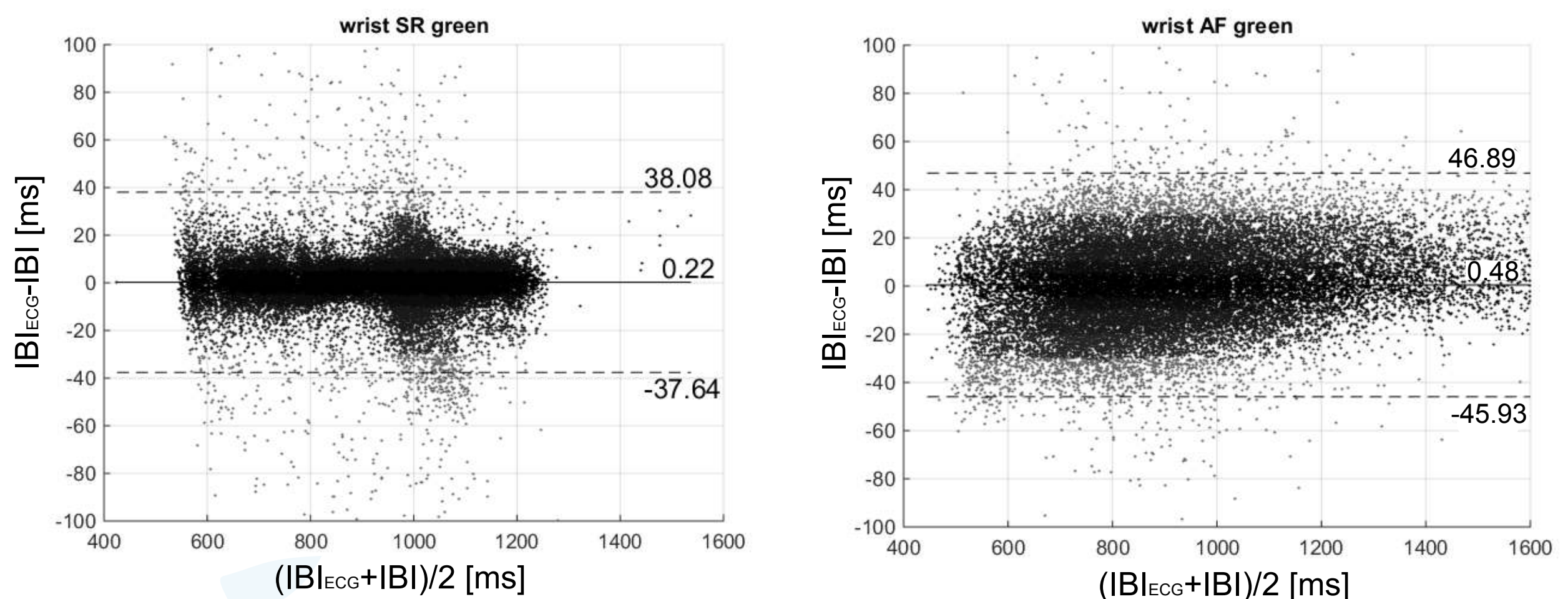- IBI values were further used to differentiate between the AF or SR condition

Figure 1 Bland-Altman plots showing the comparison of Inter-beat intervals between ECG and wrist measurements during SR and AF. The numbers indicate mean error and limits of agreement.

Results

- Mean duration of recording 1.5 h
- Mean absolute error for IBI
  - SR group = 7.64 ms.
  - AF group =14.67 ms.
- AF detection
  - sensitivity 99.00% and specificity 92.96%.
- AF detection with artefact reduction
  - sensitivity 99.88% and specificity 99.92%

Conclusions

- Wrist PPG measurement allows very good beat detection accuracy
- Differentiation between SR and AF with very good sensitivity.
- By discarding the periods with artefacts, usually caused by motion, the performance was found excellent.