

Comparison of respiration-induced variations in arterial blood pressure and multi-site photoplethysmographic signals during surgery

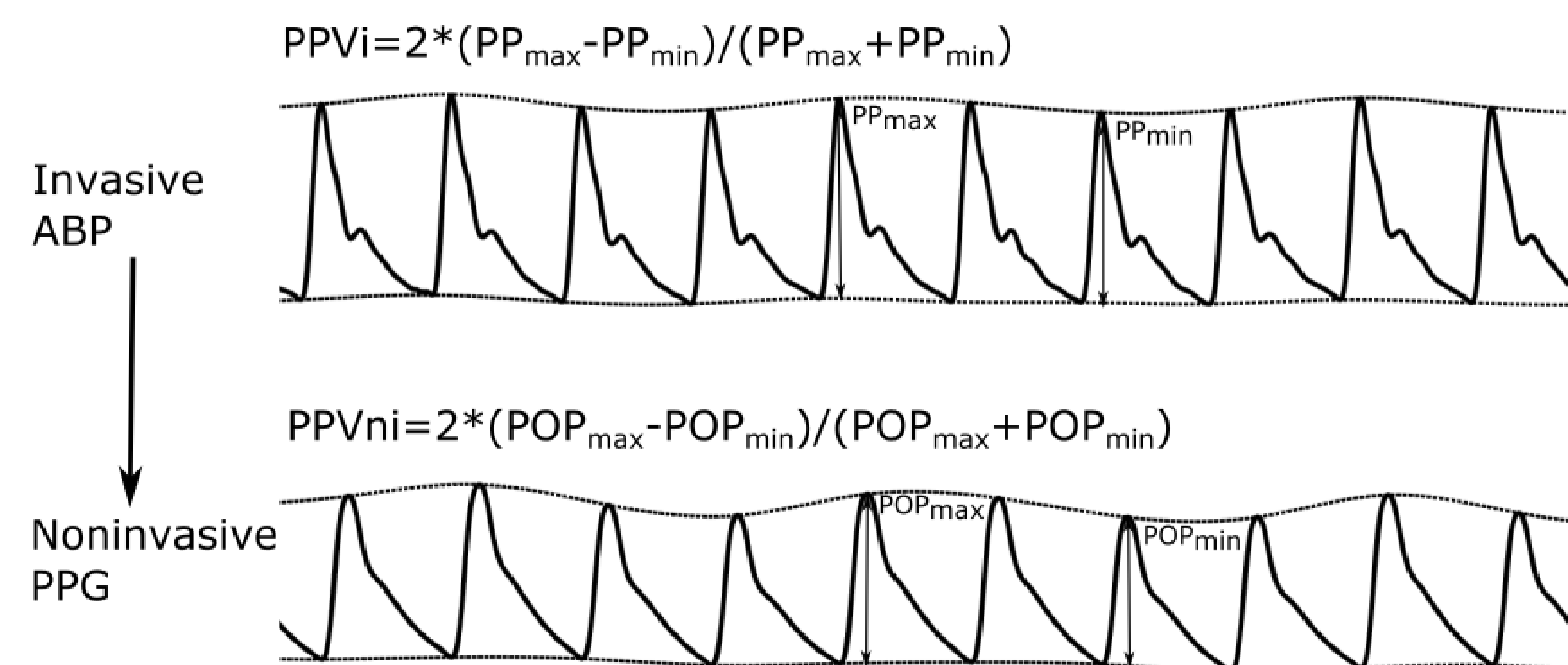
S Sun^{1,2}, WH Peeters¹, R Bezemer¹, I Paulussen^{1,2}, RM Aarts^{1,2}, GJ Noordergraaf³ ¹Philips Research NL, ²TU/e NL, ³St. Elisabeth Hospital NL Email: s.sun@tue.nl

Introduction

- Invasively-measured pulse-pressure variations (PPVi) are used to assess fluid responsiveness in OR¹
- Non-invasive photoplethysmography (PPG)-derived alternatives (PPVni) are being sought²
- We compared PPVi and PPVni from the forehead, the nasal bridge, and the right index finger during surgery.

Methods

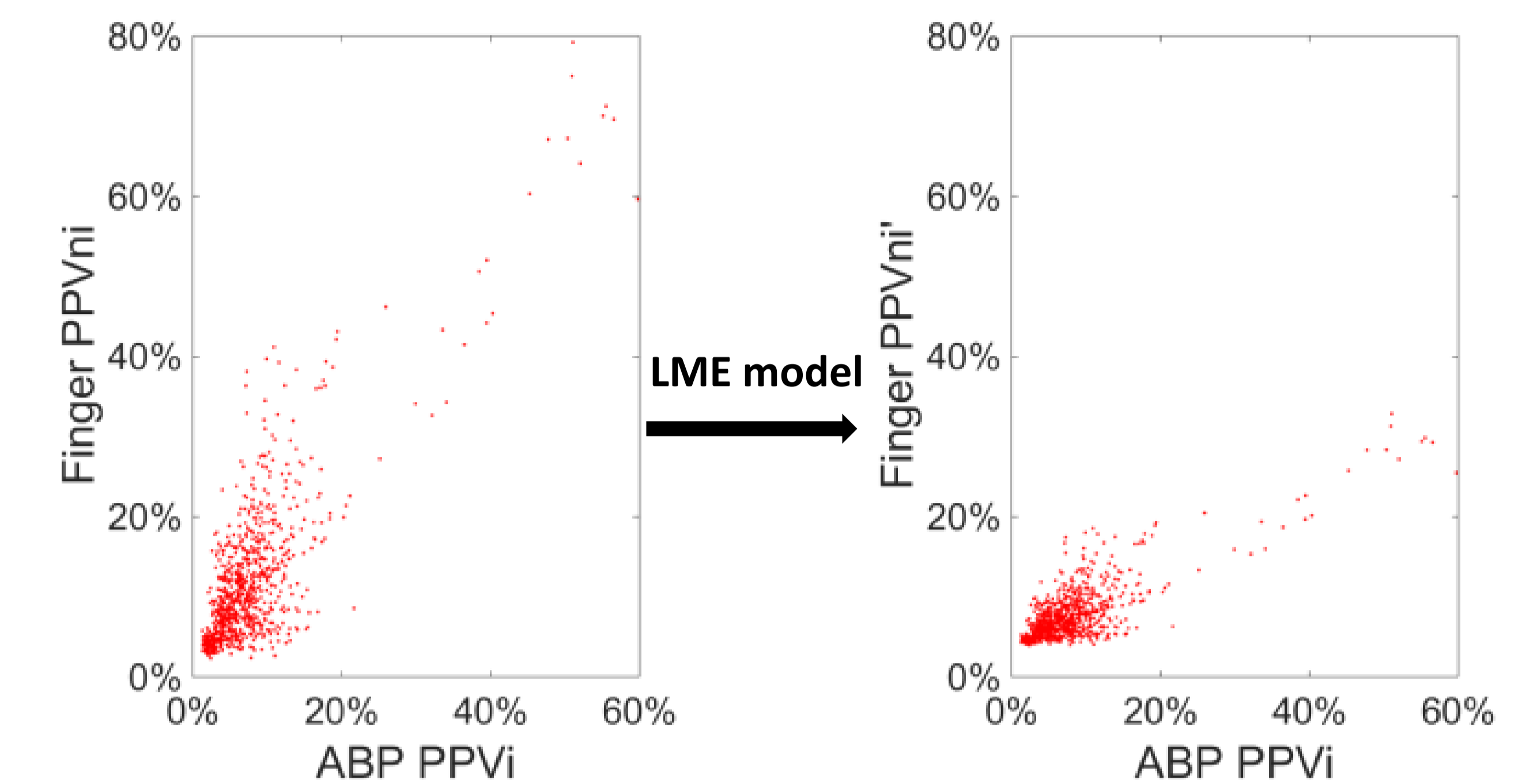
- N= 13 patients undergoing major abdominal surgery
- We computed PPVi and PPVni every two respiration cycles in arrhythmia-free periods¹
- Linear mixed-effects (LME) models were used to exploit patient-specific variability and transform the PPVni for all patients as a whole to obtain PPVni'.



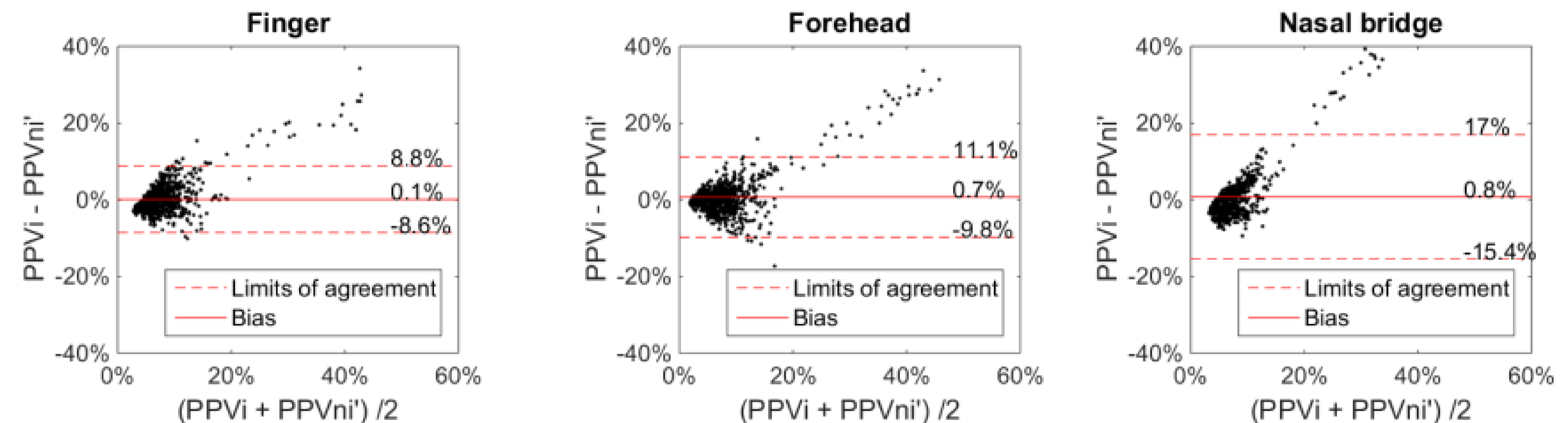
Results

| | Finger | Forehead | Nasal bridge |
|--------------------------------|--------------|---------------|---------------|
| Correlation coefficients | 0.62 ± 0.27 | 0.63 ± 0.27 | 0.38 ± 0.37 |
| Bias ± precision (without LME) | -4.3 ± 11.5% | -15.3 ± 20.5% | -33.8 ± 34.6% |
| Bias ± precision (with LME) | 0.1 ± 8.7% | 0.7 ± 10.5% | 0.8 ± 16.2% |

Illustration of effects of LME models on finger PPG



Bland-Altman plots for PPVi and PPVni' for three sites



Conclusions

- Agreements between PPVi and PPVni' were site-dependent and improved by applying LME models
- PPVni was not yet a reliable surrogate for PPVi during surgery