

Clinical Evaluation of Continuous Noninvasive Blood Pressure Monitoring with the Task Force® Monitor during Cardiac Surgery

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Introduction: The Task Force® monitor (TFM) is a recently developed monitoring device which supplies continuous noninvasive arterial pressure measurement (CNAP) by finger photoplethysmomanometry with intermittent oscillometric calibration [1]. The aim of the study was to clinically evaluate its reliability during significant changes in systolic, diastolic and mean blood pressure in critically ill patients undergoing cardiac surgery.

Methods: After IRB approval and written informed consent, 24 patients (67.8 ±15.2 yrs) requiring intra-arterial catheter placement for continuous blood pressure measurement were enrolled to the study. The noninvasive beat-to-beat arterial pressure was measured ipsilaterally at the proximal limb of fingers II to IV by means of an improved version of Penaz` vascular unloading technique. Simultaneously recorded data pairs from TFM and arterial line were collected during induction of general anaesthesia (P1), after extracorporeal circulation (P2) and postoperatively on the intensive care unit (P3), respectively. Before analysis, all incomplete or artefactual data pairs were excluded. Pressure differences were calculated offline for each measurement pair of systolic, diastolic and mean pressure values. We also calculated the mean pressure differences (bias), the sum of the absolute pressure differences, divided by the number of measurements (absolute error), and the mean pressure difference divided by the mean of average pressure times 100 (percentage error) between corresponding invasive and non-invasive pressure values [2].

Results: We obtained 42550, 24915 and 65846 data pairs during P1, P2 and P3, respectively. Greatest agreement between noninvasive and intraarterial blood pressure measurements was found after extracorporeal circulation, whereas least agreement could be seen during induction of anaesthesia. The table below shows the overall results (mean (sd)):

	P1			P2			P3		
	Systolic	Diastolic	Mean	Systolic	Diastolic	Mean	Systolic	Diastolic	Mean
Average pressure [mm Hg]	124.60 (21.01)	69.25 (13.21)	86.22 (14.71)	102.27 (12.15)	51.21 (7.16)	67.59 (9.59)	110.03 (13.38)	58.71 (8.20)	74.71 (9.93)
Bias [mm Hg]	-22.17 (22.65)	2.63 (14.52)	-10.92 (15.63)	2.24 (15.75)	1.72 (12.23)	3.03 (10.84)	-12.45 (15.06)	5.56 (9.41)	-0.21 (10.15)
Absolute error [mm Hg]	30.08 (12.48)	14.01 (7.11)	17.99 (8.27)	13.78 (10.40)	10.81 (6.46)	9.93 (5.89)	17.54 (9.27)	10.23 (5.13)	9.12 (5.39)
Percentage error of average [%]	-17.90 (17.25)	3.38 (21.50)	-12.88 (18.61)	1.31 (14.17)	3.29 (24.53)	3.79 (15.85)	-12.02 (14.50)	8.91 (16.27)	-0.87 (14.31)

Conclusion: CNAP measurements with TFM offer a reliable trend indicator of pressure changes during haemodynamic stability, as seen after extracorporeal circulation period during cardiac surgery or during postoperative sedation on the intensive care unit. In contrast, rapid haemodynamic changes during induction of general anaesthesia may not be reliably represented by the TFM measurements. Thus, invasive arterial pressure monitoring should not be replaced by the investigated CNAP method in high-risk patients during major surgical interventions.

References: [1] Fortin J et al. *Comput Biol Med* 2006; 36(9):941-57. [2] Weiss BM et al. *Brit J Anaesth* 1996; 76: 405-411.

