## **Journal of Advanced Medical and Dental Sciences Research**

@Society of Scientific Research and Studies

Journal home page: www.jamdsr.com

doi: 10.21276/jamdsr

Index Copernicus value = 85.10

(e) ISSN Online: 2321-95

(p) ISSN Print: 2348-6805

# **Original Research**

### Assessment of continuous non-invasive arterial pressure monitoring during induction of general anaesthesia in patients undergoing cardiac surgery: An observational study

Yadunath Vishwakarma

Assistant Professor, Department of Anaesthesiology, Era's Lucknow Medical College & Hospital, Lucknow, Uttar Pradesh, India

#### ABSTRACT:

**Background:** During the perioperative period, arterial pressure (AP) should be monitored at frequent intervals or, under some circumstances, continuously. Intermittent monitoring is performed using an oscillometric pressure device and generally referred to as non-invasive AP (NIAP) monitoring. Hence; the present study was conducted for assessing continuous non-invasive arterial pressure monitoring during induction of general anaesthesia in patients undergoing cardiac surgery. **Materials & methods:** 50 Patients above the age of 20 years undergoing cardiac surgery were recruited. Complete demographic and clinical details of all the patients were recorded. The basic principle of the CNAP<sup>TM</sup> is that the blood volume in a suitable artery is measured and kept constant by applying corresponding external pressure (i.e., volume clamping). The CNAP<sup>TM</sup> monitoring system consists of reusable finger cuffs, the cuff controller, and the CNAP<sup>TM</sup> pod, which interfaces into the patient monitor. After 5 min of stabilisation, simultaneous measurements of IAP and CNAP were recorded every minute. **Results:** The systolic ABP by CNAP<sup>TM</sup> was consistently lower than systolic IAP, and the CNAP<sup>TM</sup> diastolic ABP was consistently higher than diastolic IAP, yielding a systolic bias of 6.13 mm Hg and a diastolic bias of − 3.84 mm Hg. CNAP<sup>TM</sup> MAP values were almost close to the IAP mean ABP value, yielding a bias of − 0.04 mm Hg. **Conclusion:** We recommend CNAP monitor for induction of GA in patients undergoing different types of cardiac surgeries. **Key words:** CNAP, Induction, Cardiac

Received: 14 March, 2018

Accepted: 19 April, 2018

**Corresponding author:** Yadunath Vishwakarma, Assistant Professor, Department of Anaesthesiology, Era's Lucknow Medical College & Hospital, Lucknow, Uttar Pradesh, India

**This article may be cited as:** Vishwakarma Y. Assessment of continuous non-invasive arterial pressure monitoring during induction of general anaesthesia in patients undergoing cardiac surgery: An observational study. J Adv Med Dent Scie Res 2018;6(5):116-118.

#### **INTRODUCTION**

During the perioperative period, arterial pressure (AP) should be monitored at frequent intervals or, under some circumstances, continuously. Intermittent monitoring is performed using an oscillometric pressure device and generally referred to as non-invasive AP (NIAP) monitoring. Continuous monitoring is generally conducted invasively using an arterial line. Both methods have a number of risks, although those associated with invasive monitoring cause greater concern. Common complications of invasive monitoring include vessel occlusion (13%), haematoma (12%), abnormal pulse (15%), and rarely blood loss due to unintended disconnection, nerve lesions, necrosis, and fistula formation.<sup>1-3</sup>

A number of studies have reported catheter-related infections. Prolonged use of an automated oscillometric device may cause nerve and skin damage. Since non-invasive monitoring provides discontinuous readings, the Association for the Advancement of Medical Instrumentation (AAMI) standard states that the AP should be measured every 3-5 min. A number of studies emphasize the importance of continuous perioperative AP monitoring as more than 20% of all hypotensive episodes during surgery are missed by NIAP monitoring and another 20% are detected only after a delay.<sup>4-6</sup> Hence; the present study was conducted for assessing continuous non-invasive arterial pressure monitoring during induction of general anaesthesia in patients undergoing cardiac surgery.

#### **MATERIALS & METHODS**

The present study was conducted for assessing continuous non-invasive arterial pressure monitoring during induction of general anaesthesia in patients undergoing cardiac surgery. Patients above the age of 20 years undergoing cardiac surgery were recruited. Complete demographic and clinical details of all the patients were recorded. In the induction room, a 16G cannula was inserted into a peripheral vein for infusion of fluids and drugs. A 20G arterial line was inserted into the left radial artery after skin infiltration with 0.5-1 ml of 2% lignocaine and connected to transducer after calibration. The tubing and transducer were inspected to ensure that there were no technical issues or air bubbles that could cause erroneous recordings. The basic principle of the CNAP<sup>™</sup> is that the blood volume in a suitable artery is measured and kept constant by applying corresponding external pressure (i.e., volume clamping). The CNAP™

monitoring system consists of reusable finger cuffs, the cuff controller, and the CNAP<sup>TM</sup> pod, which interfaces into the patient monitor. After 5 min of stabilisation, simultaneous measurements of IAP and CNAP were recorded every minute. All the results were recorded in Microsoft excel sheet and were assessed by SPSS Software.

#### RESULTS

Assessment of a total of 50 patients was done. Mean age of the patients was 43.8 years. Out of these 50 patients, 28 were males and 22 were females. The systolic ABP by CNAP<sup>TM</sup> was consistently lower than systolic IAP, and the CNAP<sup>TM</sup> diastolic ABP was consistently higher than diastolic IAP, yielding a systolic bias of 6.13 mm Hg and a diastolic bias of -3.84 mm Hg. CNAP<sup>TM</sup> MAP values were almost close to the IAP mean ABP value, yielding a bias of -0.04 mm Hg

 Table 1: Agreement between IAP and CNAP<sup>TM</sup> BP measurement

Variable	IAP-CNAP (mm of Hg)	SD	Limits of agreement	
			Lower	Upper
SBP	6.13	9.18	-15.43	27.19
DBP	-3.84	5.42	-6.84	9.78
MAP	-0.04	4.11	-10.55	10.96

#### DISCUSSION

Acute elevations in blood pressure (>20%) in the intraoperative period are typically considered hypertensive emergencies. Postoperative hypertension (arbitrarily defined as systolic BP ≥190 mm Hg and/or diastolic BP 100 mm Hg on 2 consecutive readings following surgery) may have significant adverse sequelae in both cardiac and noncardiac patients. Hypertension, and hypertensive crises, are very common in the early postoperative period and are related to increased sympathetic tone and vascular resistance. Postoperative hypertension often begins ~10-20 minutes after surgery and may last up to 4 hours. If left untreated, patients are at increased risk for bleeding, cerebrovascular events, and myocardial infarctions.<sup>6- 10</sup> Hence; the present study was conducted for assessing continuous non-invasive arterial pressure monitoring during induction of general anaesthesia in patients undergoing cardiac surgery.

Assessment of a total of 50 patients was done. Mean age of the patients was 43.8 years. Out of these 50 patients, 28 were males and 22 were females. Kumar GA et al assessed the performance of CNAP during GA with invasive arterial pressure (IAP) in patients undergoing cardiac surgeries. Sixty patients undergoing cardiac surgery were included. Systolic, diastolic, and mean arterial pressure (MAP) data were recorded every minute for 20 min simultaneously for both IAP and CNAPTM. Statistical analysis was performed using mountain plot and Bland Altman plots for assessing limits of agreement and bias (accuracy) calculation. Totally 1200 pairs of data

were analysed. The CNAP<sup>TM</sup> systolic, diastolic and MAP bias was 5.98 mm Hg, -3.72 mm Hg, and -0.02 mm Hg respectively. Percentage within limits of agreement was 96.0%, 95.2% and 95.7% for systolic, diastolic and MAP. The mountain plot showed similar results as the Bland Altman plots. They concluded CNAP<sup>TM</sup> provides real-time estimates of arterial pressure comparable to IAP during induction of GA for cardiac surgery.<sup>10</sup>

In the present study, the systolic ABP by CNAPTM was consistently lower than systolic IAP, and the CNAP<sup>TM</sup> diastolic ABP was consistently higher than diastolic IAP, yielding a systolic bias of 6.13 mm Hg and a diastolic bias of - 3.84 mm Hg. CNAP<sup>TM</sup> MAP values were almost close to the IAP mean ABP value, yielding a bias of -0.04 mm Hg. Hofhuizen CM et al assessed the adequacy of a prototype device (Nexfinpaediatric), designed for a paediatric population, for detecting rapid arterial pressure changes in children during cardiac surgery. Thirteen anaesthetized children with a median age of 11 months (2 months-7 yr) undergoing congenital cardiac surgery were included in the study. reBAP and intra-arterial pressure (IAP) were recorded simultaneously during the surgical procedure. To assess the accuracy of reBAP in tracking arterial pressure changes, the four largest IAP variations within a 5 min time interval were identified from each procedure. In 10 out of 13 children, a non-invasive arterial pressure recording could be obtained. Therefore, recordings from these 10 children were eligible for further analysis, resulting in 40 data points. The correlation coefficient between reBAP and IAP in tracking mean arterial pressure (MAP) changes was 0.98. reBAP followed changes in IAP with a mean bias for systolic, diastolic arterial pressure, and MAP of 0.0 mm Hg (sd 5.8), 0.1 (sd 2.8), and 0.19 (sd 2.7), respectively. The prototype device closely follows arterial pressure changes in children.<sup>11</sup>

#### CONCLUSION

We recommend CNAP monitor for induction of GA in patients undergoing different types of cardiac surgeries.

#### REFERENCES

- 1. Szmuk P, Pivalizza E, Warters RD, Ezri T, Gebhard R. An evaluation of the T-Line Tensymeter continuous noninvasive blood pressure device during induced hypotension. Anaesthesia. 2008;63:307–12.
- Janelle GM, Gravenstein N. An accuracy evaluation of the T-Line Tensymeter (continuous noninvasive blood pressure management device) versus conventional invasive radial artery monitoring in surgical patients. Anesth Analg. 2006;102:484–90.
- De Backer D, Biston P, Devriendt J, et al. SOAP II Investigators Comparison of dopamine and norepinephrine in the treatment of shock. N Engl J Med. 2010;362(9):779–789.
- Longrois D, Lejus C, Constant I, Bruyère M, Mertes PM. Traitement des réactions anaphylactiques survenant en cours d'anesthésie et en particulier du choc anaphylactique [Treatment of hypersensitivity reactions and anaphylactic shock occurring during anaesthesia] Ann Fr Anesth Reanim. 2011;30(3):312– 322.

- Eyraud D, Brabant S, Nathalie D, et al. Treatment of intraoperative refractory hypotension with terlipressin in patients chronically treated with an antagonist of the renin-angiotensin system. Anesth Analg. 1999;88(5):980–984.
- 6. 84. Boccara G, Ouattara A, Godet G, et al. Terlipressin versus norepinephrine to correct refractory arterial hypotension after general anesthesia in patients chronically treated with renin-angiotensin system inhibitors. Anesthesiology. 2003;98(6):1338–1344.
- Helfman SM, Gold MI, DeLisser EA, Herrington CA. Which drug prevents tachycardia and hypertension associated with tracheal intubation: lidocaine, fentanyl, or esmolol? Anesth Analg. 1991;72(4):482–486.
- Pigott DW, Nagle C, Allman K, Westaby S, Evans RD. Effect of omitting regular ACE inhibitor medication before cardiac surgery on haemodynamic variables and vasoactive drug requirements. Br J Anaesth. 1999;83(5):715–720.
- Fortin J, Marte W, Grüllenberger R, Hacker A, Habenbacher W, Heller A, et al. Continuous noninvasive blood pressure monitoring using concentrically interlocking control loops. Comput Biol Med. 2006;36:941–57.
- Kumar GA, Jagadeesh AM, Singh NG, Prasad SR. Evaluation of continuous non-invasive arterial pressure monitoring during induction of general anaesthesia in patients undergoing cardiac surgery. Indian J Anaesth. 2015;59(1):21-25.
- 11. Hofhuizen CM, Lemson J, Hemelaar AEA, Settels JJ et al. Continuous non-invasive finger arterial pressure monitoring reflects intra-arterial pressure changes in children undergoing cardiac surgery. Br J Anaesth. 2010 Oct;105(4):493-500.