J Pediatr (Rio J). 2017;xxx(xx):xxx–xxx

Jornal de Pediatria
www.jped.com.br

ORIGINAL ARTICLE

# Differences in perioperative femoral and radial arterial blood pressure in neonates and infants undergoing pediatric cardiac surgery requiring cardiopulmonary bypass☆

Hwa Jin Cho[a], Sang Hoon Lee[a], In Seok Jeong[b,*], Nam Sik Yoon[c], Jae Sook Ma[d], Byoung Hee Ahn[b]

[a] Chonnam National University Medical School, Chonnam National University Hospital, Department of Pediatrics, Gwangju, South Korea
[b] Chonnam National University Medical School, Chonnam National University Hospital, Department of Thoracic and Cardiovascular Surgery, Gwangju, South Korea
[c] Chonnam National University Medical School, Chonnam National University Hospital, Department of Internal Medicine, Gwangju, South Korea
[d] KS Hospital, Department of Pediatrics, Gwangju, South Korea

Received 26 December 2016; accepted 16 March 2017

**KEYWORDS**
Infant;
Neonate;
Congenital heart disease;
Invasive blood pressure monitoring;
Femoral artery

## Abstract

*Objective:* Several reports claim that blood pressure (BP) in the radial artery may underestimate the accurate BP in critically ill patients. Here, the authors evaluated differences in mean blood pressure (MBP) between the radial and femoral artery during pediatric cardiac surgery to determine the effectiveness of femoral arterial BP monitoring.

*Method:* The medical records of children under 1 year of age who underwent open-heart surgery between 2007 and 2013 were retrospectively reviewed. Radial and femoral BP were measured simultaneously, and the differences between these values were analyzed at various times: after catheter insertion, after the initiation of cardiopulmonary bypass (CPB-on), after aortic cross clamping (ACC), after the release of ACC, after weaning from CPB, at arrival in the intensive care unit (ICU), and every 6 h during the first day in the ICU.

*Results:* A total of 121 patients who underwent open-heart surgery met the inclusion criteria. During the intraoperative period, from the beginning to the end of CPB, radial MBPs were significantly lower than femoral MBPs at each time-point measured ($p < 0.05$). Multivariate analysis

☆ Please cite this article as: Cho HJ, Lee SH, Jeong IS, Yoon NS, Ma JS, Ahn BH. Differences in perioperative femoral and radial arterial blood pressure in neonates and infants undergoing pediatric cardiac surgery requiring cardiopulmonary bypass. J Pediatr (Rio J). 2017. http://dx.doi.org/10.1016/j.jped.2017.03.011

* Corresponding author.
*E-mail:* isjeong1201@gmail.com (I.S. Jeong).

http://dx.doi.org/10.1016/j.jped.2017.03.011

showed that longer CPB time (>60 min, odds ratio: 7.47) was a risk factor for lower radial pressure. However, discrepancies between these two values disappeared after arrival in the ICU. There was no incidence of ischemic complications associated with the catheterization of both arteries.
*Conclusion:* The authors suggest that femoral arterial pressure monitoring can be safely performed, even in neonates, and provides more accurate BP values during CPB-on periods, and immediately after weaning from CPB, especially when CPB time was greater than 60 min.


**PALABRAS CLAVE**
Bebê;
Neonato;
Cardiopatia congênita;
Monitoramento da pressão arterial invasiva;
Artéria femoral

## Diferenças na pressão arterial femoral e radial no perioperatório em neonatos e bebês submetidos a cirurgia cardíaca pediátrica com *bypass* cardiopulmonar

### Resumo
*Objetivo:* Diversos relatos alegam que a pressão arterial (PA) na artéria radial poderá subestimar a PA precisa em pacientes gravemente doentes. Aqui, avaliamos diferenças na pressão arterial média (PAM) entre a artéria radial e femoral durante cirurgia cardíaca pediátrica para determinar a eficácia do monitoramento da PA da artéria femoral.
*Método:* Realizamos uma análise retrospectiva de prontuários médicos de crianças com menos de 1 ano de idade submetidas a cirurgia de coração aberto entre 2007 e 2013. As PAs radial e femoral foram auferidas simultaneamente, as diferenças entre esses valores foram analisadas diversas vezes: após a inserção do cateter, após o início do *bypass* cardiopulmonar (CPB-on), após pinçamento cruzado da aorta (ACC), após a liberação do ACC, após desmame do CPB, na entrada na unidade de terapia intensiva (UTI) e a cada 6 horas durante o primeiro dia na unidade de terapia intensiva (UTI).
*Resultados:* Um total de 121 pacientes submetidos a cirurgia de coração aberto atenderam aos nossos critérios de inclusão. Durante o transoperatório, do início ao término do CPB, as PAMs da artéria radial foram significativamente menores do que as PAMs da artéria femoral em cada ponto de medição ($p < 0,05$). A análise multivariada mostrou que a duração mais longa do CPB (> 60 minutos, Razão de Chance = 7,47) representou um fator de risco de pressão radial mais baixa. Contudo, as diferenças entre esses dois valores desapareceram após a entrada na UTI. Não houve incidência de complicações isquêmicas associadas à cateterização de ambas as artérias.
*Conclusão:* Sugerimos que o monitoramento da pressão arterial femoral pode ser realizado com segurança, mesmo em neonatos, e fornece valores da PA mais precisos durante períodos de CPB-on e imediatamente após o desmame do CPB, principalmente nos casos em que a duração do CPB foi superior a 60 minutos.


## Introduction

Invasive blood pressure (BP) monitoring is essential for patients during and after open-heart surgery (OHS), and the radial artery is the most common site of catheterization during OHS. However, many investigators have reported that, in adults, during the early phase of cardiopulmonary bypass (CPB), the femoral arterial pressure is significantly higher than the peripheral arterial pressure.[1,2] However, to the best of the authors' knowledge, few studies have investigated the difference between femoral and radial arterial BP during surgery and postoperative period in neonates and infants.

In the present study, the differences in BP between the radial and femoral arteries in neonates and infants during the perioperative period were evaluated to determine whether they were clinically relevant, and to identify the patient groups in which these differences occurred.

## Materials and methods

This was a respective review of data, and the study was approved by the Institutional Review Board (CNUH-2015-024). The authors retrospectively reviewed both surgical and medical data of patients under 1 year of age who had undergone open-heart surgery between January 2007 and December 2013. The exclusion criteria were as follows: OHS without ACC, CPB weaning failure, conversion to extracorporeal membrane oxygenation support, early hospital mortality (<24 h), lack of simultaneous catheterization in the radial and femoral arteries, and congenital heart disease that could have affected the discrepancy in BP of these arteries, such as aortic arch anomalies. Demographic data, including age at diagnosis, age at surgery, sex, weight, height, and body surface area, were reviewed. Preoperative factors, such as cardiac diagnosis and medications were also reviewed in all patients. Among the