European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 10, Issue 05, 2023

COMPARISON OF INOTROPIC REQUIREMENTS WITH RADIAL AND FEMORAL ARTERIAL BLOOD PRESSURE MONITORING DURING ORTHOTOPIC LIVING DONOR LIVER TRANSPLANTATION

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Abstract:

Introduction: Patients with advanced liver disease receiving liver transplantation often become hypotensive during surgery. Factors that promote hypotension include profound systemic vasodilation, negative inotropy and vasodilation associated with anesthetics, potential for excessive bleeding during hepatectomy, and post reperfusion syndrome (PRS) after reperfusion of the liver graft. Contrary to common belief and practice, detailed analysis of intraoperative blood pressure showed that well-maintained average blood pressure does not always correlate with improved outcome.

Materials and Methods: A prospective comparative study was conducted at Department of Liver transplant Anaesthesia and Intensive Care, AIG hospitals, Gachibowli, Hyderabad from April 2020 to April 2023 (3 years) in 500 patients). 500 patients (250-Femoral arterial BP monitoring, 250-Radial arterial BP monitoring). Femoral arterial BP monitoring, Radial arterial BP monitoring was done during dissection, anhepatic and reperfusion phages. Requirement of inotropes during femoral arterial BP monitoring, Radial arterial BP monitoring were measured simultaneously.

Results: Femoral Arterial BP monitoring was done in 250 patients during orthotopic living donor liver transplantation, Radial Arterial BP monitoring was done in 250 patients during orthotopic living donor liver transplantation. Male patients were 410 (82.05%), females were 90 (17.95%). Male predominance was seen in our study.

Conclusion: Inotropic requirements is less with femoral arterial blood pressure monitoring compared with Radial arterial blood pressure monitoring during orthotopic living donor liver transplantation.

Key Words: liver disease, Inotropes, cardiac output, Femoral Arterial BP, radial Arterial BP.

INTRODUCTION

Patients with advanced liver disease receiving liver transplantation often become hypotensive during surgery.[1] Factors that promote hypotension include profound systemic vasodilation, negative inotropy and vasodilation associated with anesthetics, potential for excessive bleeding during hepatectomy, and postreperfusion syndrome (PRS) after reperfusion of the liver graft.[2] Contrary to common belief and practice, detailed analysis of intraoperative blood pressure showed that well-maintained average blood pressure does not always correlate with improved outcome. The *average* blood pressure is less likely to distinguish between stable blood pressure and multiple episodes of hypotension followed by rapid correction, which is common during liver transplantation.[3]

The radial artery is the most common site for arterial blood pressure monitoring because of its ease of cannulation and the low incidence of complications. Many therapeutic decisions rely on blood pressure values in everyday clinical practice, in particular during major surgical procedures such as liver transplantation. Systolic arterial pressure (SAP) measured in the radial artery is usually higher than aortic SAP, whereas mean arterial pressure (MAP) remains the same throughout the arterial tree.[4] A reverse central-to-radial difference has been documented after cardiopulmonary bypass and in other clinical situations, including septic patients being given vasoconstrictor drugs.[5] Although similar blood pressure differences have been described during liver transplant surgery, these differences have not been confirmed. The aim of this study was comparison of inotropic requirements with radial and femoral arterial blood pressure monitoring during orthotopic living donor liver transplantation.

MATERIALS AND METHODS

Study design: A prospective comparative study.

Study location: Department of Liver transplant Anaesthesia and Intensive Care, AIG hospitals, Gachibowli, Hyderabad.

Study duration: April 2020 to April 2023 (3 years).

Sample size: 500 patients (250-Femoral arterial BP monitoring, 250-Radial arterial BP monitoring).

Inclusion criteria:

1. Age groups between 18 to 70 years

2. Both gender female and male patients

3. Patients with history of End stage Liver disease who is coming for Orthotropic Liver Transplant Surgery irrespective of etiology.

Exclusion criteria:

1. Patients with history of arterial malformations

2. Pediatric patients

3. Acute Liver Failure patients

4. ABO incompatibility Liver Transplant patients

5. Patients with history of sepsis

6. Diseased donor Liver Transplant patients.

7. Paediatric and aged above 70 years.

We studied consecutive patients of a orthotopic living donor liver transplantation who required monitoring with a radial arterial line and femoral arterial access between April 2020 to April 2023. In our OT routinely, the default site for invasive arterial pressure monitoring is the radial artery. Femoral arterial BP monitoring, Radial arterial BP monitoring was done during dissection, anhepatic and reperfusion phages. Requirement of inotropes during femoral arterial BP monitoring, Radial arterial BP monitoring were measured simultaneously.

Statistical Analysis: Mean and standard deviation were calculated for continuous data. Bland–altman analysis 21 was used to compare agreement of radial and femoral measurements of systolic, diastolic and mean arterial pressures. Multiple linear regression was used to determine demographic or haemodynamic factors associated with a map gradient. Data were analysed using microsoft excel and minitab 15 software.

RESULTS

A prospective comparative study was conducted at Department of Liver transplant Anaesthesia and Intensive Care, AIG hospitals, Gachibowli, Hyderabad. 500 patients were included in the study. Femoral Arterial BP monitoring was done in 250 patients during orthotopic living donor liver transplantation, Radial Arterial BP monitoring was done in 250 patients during orthotopic living donor liver transplantation. Male patients were 410 (82.05%), females were 90 (17.95%). Male predominance was seen in our study.

S.No	Age group	Femoral Arterial BP N (%)	Radial Arterial BP N (%)	Total N (%)
1	21-30 years	30 (12%)	26 (12%)	56 (12%)
2	31-40 years	40(16.45%)	31 (12.14%)	71 (14 %)
3	41-50 years	87 (35%)	59 (23.48%)	146 (29%)

4	51-60 years	63 (25.54%)	84 (34%)	147 (30%)
5	61-70 years	30 (11.68%)	50 (19.83%)	77(16%)
6	Total	250	250	500

Table 1: Age distribution

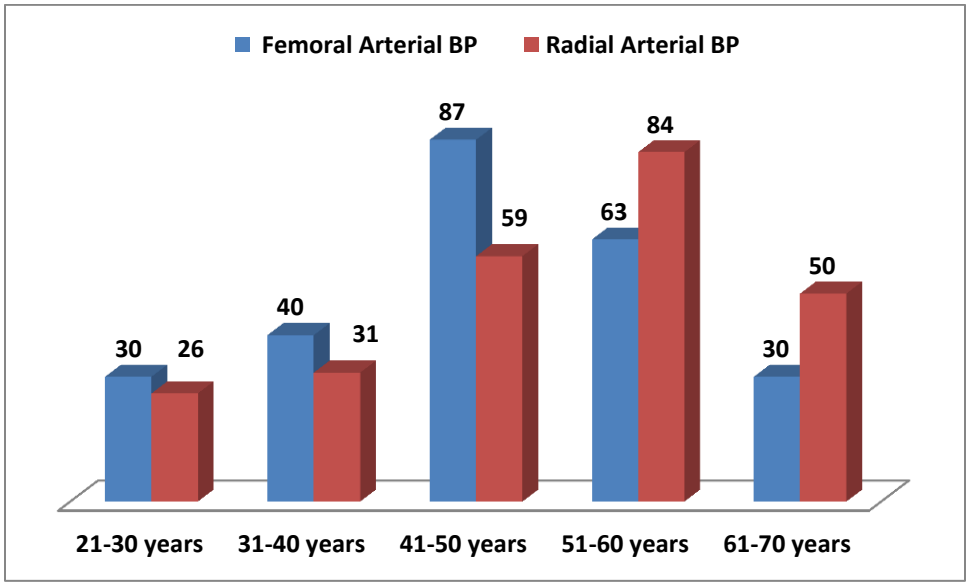

Figure 1: Age distribution

S.No	Gender	N (%)
1	Male	410 (82.05%)
2	Female	90 (17.95%)
3	Total	500 (100%)

Table 2: Gender distribution

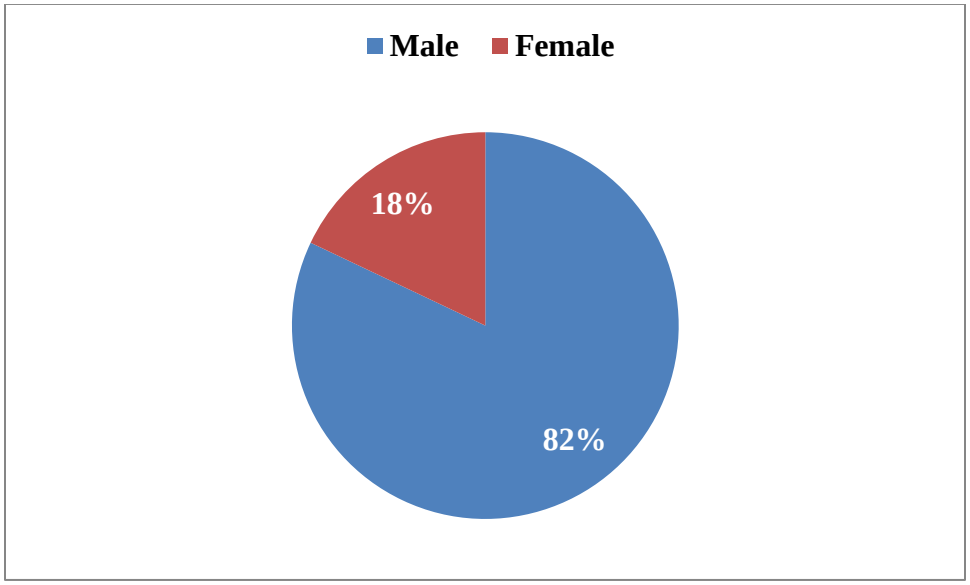

Figure 2: Gender distribution

Inotropic requirements in dissection (in ug)	Femoral Arterial BP N	Radial Arterial BP N	P Value
Nor adrenaline			
0-100	105	115	
101-200	20	28	
201-300	16	20	
301-400	20	26	0.002
401-800	18	23	
801-1000	10	8	
1001-2000	15	18	
2001-2600	10	12	
Phenylephrine			
0-100	76	92	
101-200	21	25	
201-300	2	5	
301-400	7	11	
401-800	8	11	0.003
801-1000	1	2	
1001-2000	2	4	
2001-8000	6	10	

Table 3: Inotropic requirements in Dissection

Inotropic requirements in Anhepatic (in ug)	Femoral Arterial BP N	Radial Arterial BP N	P Value
Nor adrenaline			
0-100	17	21	
101-200	24	27	
201-300	17	19	0.002
301-400	28	32	
401-800	50	56	
801-1000	11	13	
1001-2000	40	44	
2001-2600	28	33	
Phenylephrine			
0-100	41	56	
101-200	20	22	
201-300	12	14	
301-400	27	34	
401-800	65	76	0.003
801-1000	3	7	

1001-2000	23	26	
2001-8000	35	44	

Table 4: Inotropic requirements in Anhepatic

Inotropic requirements in Reperfusion (in ug)	**Femoral Arterial BP N**	**Radial Arterial BP N**	**P value**
Nor adrenaline			
0-100	35	37	
101-200	25	26	
201-300	15	18	0.001
301-400	15	17	
401-800	35	45	
801-1000	06	10	
1001-2000	40	45	
2001-2600	43	47	
Phenylephrine			
0-100	120	149	
101-200	12	15	0.002
201-300	6	8	
301-400	4	6	
401-800	13	18	
801-1000	5	7	
1001-2000	14	17	
2001-8000	16	22	

Table 5: Inotropic requirements in Reperfusion

Inotropic requirements (in ug)	**Femoral Arterial BP N**	**Radial Arterial BP N**	**P value**
Dissection			
Nor adrenaline	214	245	0.002
Phenylephrine	129	160	0.003
Anhepatic			
Nor adrenaline	215	245	0.001
Phenylephrine	226	279	0.002
Reperfusion			
Nor adrenaline	214	245	0.001
Phenylephrine	190	242	0.002

Table 6: Average total usage of inotropes

Average total usage of inotropes			
	Nor adrenaline	**Phenylephrine**	**P Value**
Femoral Arterial BP	643	545	0.001
Radial Arterial BP	735	681	0.001

Table 7: Average total usage of inotrope throughout the surgery

DISCUSSION

Rational fluid and vasopressor/inotrope administration during liver transplant surgery is important to maintain haemodynamic stability and adequate perfusion to major organs. Inotropes such as dopamine and dobutamine have been mainstays for the management of haemodynamic instability in these patients. However, fluid administration in patients with cirrhosis leads to increased splanchnic volume, and therefore some centres advocate the preferential use of vasopressors. Therefore, α_1-agonists such as noradrenaline and phenylephrine have now been adopted into clinical practice. Research has demonstrated that α_1-agonists reduce portal pressure by reducing portal tributary blood flow Graft reperfusion in OLT is often associated with hemodynamic instability requiring infusion of fluids and the administration of vasopressive drugs. Hemodynamic changes during the early post reperfusion period are characterized by a combination of reduced MAP and SVRI and increased CI and mean pulmonary artery pressure, and this has been referred to as the post reperfusion syndrome.

In our study, inotropic requirements with radial and femoral arterial blood pressure monitoring during orthotopic living donor liver transplantation was determined. Inotropic requirements was determined in three phages dissection, anhepatic and reperfusion. In dissection, Inotropic requirements such as Nor adrenaline, Phenylephrine was compared among radial and femoral arterial blood pressure monitoring, we have found statistically significant 0.002, 0.003 in Nor adrenaline, Phenylephrine respectively in orthotopic living donor liver transplantation patients.

In anhepatic, Inotropic requirements such as Nor adrenaline, Phenylephrine was compared among radial and femoral arterial blood pressure monitoring, we have found statistically significant 0.002, 0.003 in Nor adrenaline, Phenylephrine respectively in orthotopic living donor liver transplantation patients.

In reperfusion, Inotropic requirements such as Nor adrenaline, Phenylephrine was compared among radial and femoral arterial blood pressure monitoring, we have found statistically significant 0.001, 0.002 in Nor adrenaline, Phenylephrine respectively in orthotopic living donor liver transplantation patients.

D. Arnal et al stated that No significant differences between radial and femoral pressures were found at the start of surgery. Femoral and radial systolic arterial blood pressures were statistically significantly different during liver 92 (22) mmHg vs. 76 (22)=reperfusion (mean (SD) arterial pressure mm Hg, $p<0.01$). Vasoconstrictor drug administration was associated

with a larger systolic pressure difference between femoral and radial arteries (28 (24) mmHg in patients being given vasoconstrictor drugs vs. 9 (19) mmHg in patients not needing vasoconstrictors during reperfusion, $p<0.001$). In our study, Inotropic requirements is less with femoral arterial blood pressure monitoring than radial arterial blood pressure monitoring during orthotopic living donor liver transplantation.

An important consideration in vasopressor use relates to the accuracy of invasive blood pressure measurements. Radial arterial pressure may underestimate true MAP during vasopressor infusion. Although this error can be avoided by use of long radial catheters or direct brachial or femoral cannulation. Therefore, we suggest that vasopressor treatment, especially at moderate or higher doses, should be guided by MAP values from one of these alternate techniques or from a non-invasive brachial blood pressure monitor of appropriate cuff size.

As per our study results we suggest we can bring down unnecessary requirement of inotrophs and its associated complications with invasive BP Monitoring and patient post operative outcome also.

CONCLUSION

Rational fluid and vasopressor/inotrope administration during liver transplant surgery is important to maintain haemodynamic stability and adequate perfusion to major organs. Inotropic requirements is less with femoral arterial blood pressure monitoring than Radial arterial blood pressure monitoring during orthotopic living donor liver transplantation.

LIMITATIONS FOR THE STUDY

Single centre observational study.

REFERENCES

1. Arnal D, Garutti I, Perez-Peña J, Olmedilla L, Tzenkov IG. Radial to femoral arterial blood pressure differences during liver transplantation. Anaesthesia. 2005;60:766–71.
2. Acosta F, Sansano T, Beltran R, Palenciano CG, Reche M, Roques V, et al. Is femoral and radial artery pressure different during reperfusion in liver transplantation? Transplant Proc. 2000;32:2647.
3. Aggarwal S, Kang Y, Freeman JA, Fortunato FL, Jr, Pinsky MR. Postreperfusion syndrome: hypotension after reperfusion of the transplanted liver. J Crit Care. 1993;8:154–60.
4. Shin BS, Kim GS, Ko JS, Gwak MS, Yang M, Kim CS, et al. Comparison of femoral arterial blood pressure with radial arterial blood pressure and noninvasive upper arm blood pressure in the reperfusion period during liver transplantation. Transplant Proc. 2007;39:1326–8.
5. Kundra P, Goswami S. Endothelial glycocalyx: Role in body fluid homeostasis and fluid management. Indian J Anaesth. 2019;63:6–14.

6. Siniscalchi A, Gamberini L, Laici C, Bardi T, Ercolani G, Lorenzini L, et al. Post reperfusion syndrome during liver transplantation: From pathophysiology to therapy and preventive strategies. World J Gastroenterol. 2016;22:1551–69.
7. Bhangui P, Bhangui P, Gupta N, Jolly AS, Bhalotra S, Sharma N, et al. Fast tracking in adult living donor liver transplantation: A case series of 15 patients. Indian J Anaesth. 2018;62:127–30.
8. Jeong SM. Postreperfusion syndrome during liver transplantation. Korean J Anesthesiol. 2015;68:527–39.
9. Lee HC, Ryu HG, Jung CW. Performance measurement of intraoperative systolic arterial pressure to predict in hospital mortality in adult liver transplantation. Scientific Reports. 2017;7:7030.
10. Ryu HG, Jung CW, Lee HC, Cho YJ. Epinephrine and phenylephrine pretreatments for preventing postreperfusion syndrome during adult liver transplantation. Liver Transpl. 2012;18:1430–9.