

# Prevalence of left ventricular diastolic dysfunction in asymptomatic patients undergoing routine endoscopic urological surgery under regional anaesthesia-A prospective, observational study

## INTRODUCTION

The onset of left ventricular diastolic dysfunction (LVDD) is insidious and generally asymptomatic in the general population, and over the years, it progresses to diastolic heart failure. Asymptomatic LVDD patients undergoing vascular surgery are known to have an 18% incidence of undesirable perioperative cardiovascular events.<sup>[1,2]</sup> The magnitude of this entity has not been studied in patients undergoing non-cardiac surgery. Periods of stress in the form of activity or surgery, which increase heart rate, stroke volume, end-diastolic volume, or blood pressure, can result in pulmonary overload, manifesting as shortness of breath and dyspnoea during the operative period.<sup>[3]</sup>

Hence, the study was planned to see the prevalence of various grades of LVDD in adult asymptomatic patients undergoing endoscopic urological surgery.

## METHODS

This prospective, observational study was conducted after obtaining clearance from the institutional research and ethics committee (vide approval no ECR/533/INST/HP/2014/RR-17 dated 29/8/2019) and was registered with Clinical Trials Registry-India (CTRI2020/01/022911, <http://ctri.nic.in>).

Asymptomatic patients aged 50–80 years undergoing routine endoscopic urological surgery belonging to the American Society of Anesthesiologists (ASA) physical status I–III were included and subjected to echocardiographic Doppler assessment of diastolic function done by the cardiologist. The study was in accordance with the strengthening the reporting of observational studies in epidemiology (STROBE) guidelines and the principles of the Declaration of Helsinki, 2013, and written informed consent was

obtained from the patients to be part of the study and to use the data thus obtained for research and publication. The criteria for diagnosis of left ventricular dysfunction was guided by the recommendations of Nagueh SF *et al.*<sup>[4]</sup>

In the operation theatre, an 18-G cannula was secured, and maintenance of normal saline fluid was started before the procedure. Under aseptic precautions, spinal anaesthesia at the L3–L4 level was administered with a 2.5-mL hyperbaric bupivacaine (0.5%). The sensory block level was assessed using a 25-G hypodermic needle by pinprick method in the midclavicular line every 2 minutes until the fixation of sensory level for two consecutive times, and this was taken as the maximum sensory block height. The surgery was started when a sensory level of T10 was achieved. The onset of motor block was assessed using the modified Bromage score until a score of  $\leq 2$  was achieved following subarachnoid block (SAB). Patients were monitored for intra-operative haemodynamic changes (heart rate and mean arterial pressure (MAP)), respiratory rate, oxygen saturation, and any complications such as pulmonary oedema, atrial fibrillation, and hypotension in the postoperative period. Hypotension (systolic blood pressure  $< 90$  mmHg or MAP  $< 30\%$  of baseline) was treated with an infusion of intravenous fluid or intravenous mephentermine 6 mg as and when needed (100 mL bolus fluids in normal diastolic function patients and vasopressors in patients of LVDD). Bradycardia (heart rate  $< 50$  beats per minute) was treated with intravenous atropine 0.6 mg.

Data were entered into a Microsoft Excel spreadsheet, and the final analysis was done using Statistical Package for the Social Sciences (SPSS) statistics software version 21.0 (Armonk, New York: International Business Machines Corp, USA). For statistical significance, *P*-values of less than 0.05 were considered significant.

## RESULTS

A total of 150 patients were initially assessed for inclusion, but as general anaesthesia was planned in 10 patients, they were excluded, and only 140 patients were included in the study.

The demographic data, LVDD prevalence data, and distribution of other factors in various grades of LVDD status are shown in Tables 1 and 2. The variations in intra-operative heart rate and oxygen saturation (SpO<sub>2</sub>)

Table 1: Demographic profile, co-morbidities, and diastolic dysfunction prevalence

Parameter	Frequency (Percentage) (n=140)
Age (years)	
Mean (SD)	67.71 (8.1)
Age Groups - 50–60/61–70/71–89 years	27 (19.29)/61 (43.57)/52 (37.14)
Gender- Female/Male	15 (10.71)/125 (89.29)
American Society of Anesthesiologists physical status-I/II/III	65 (46.43)/74 (52.86)/1 (0.71)
Co-morbidities: Hypertension/Diabetes mellitus/Coronary artery disease	50 (35.71)/31 (22.14)/9 (6.43)
Surgery: Transurethral resection of bladder tumour/Transurethral resection of prostate	99 (70.71)/41 (29.29)
Left ventricular diastolic dysfunction Grade 0/1/2/3	47 (33.57)/51 (36.43)/37 (26.43)/5 (3.57)

SD: Standard deviation

Table 2: Comparison of prevalence, preoperative hypertension, intra-operative hypotension, and use of mephentermine between grades of left ventricular diastolic dysfunction

Parameter	Grade 0 (n=47)	Grade 1 (n=51)	Grade 2 (n=37)	Grade 3 (n=5)	P
Irrigation fluid used (ml), Mean (SD)	10,808 (1963)	10,333 (1704)	10,797 (2459)	11,200 (2387)	0.557
Intravenous fluid used (mL), Mean (SD)	805 (118)	777 (121)	812 (168)	800 (226)	0.654
Preoperative hypertension present, n (%)	8 (17.02%)	15 (29.41%)	24 (64.86%)	4 (80%)	<0.001
Intra-operative hypotension present, n (%)	1 (2.13%)	9 (17.65%)	37 (100%)	5 (100%)	<0.001
Mephentermine administered (mg), Median (25 <sup>th</sup> –75 <sup>th</sup> percentile)	0 (0–0)	3 (3–6)	18 (15–18)	24 (24–30)	<0.0001

SD: Standard deviation

were comparable among different grades of LVDD patients ( $P > 0.05$ ). No other postoperative complications were observed until discharge.

The echocardiographic findings noted were the mean (standard deviation [SD]) distribution of mitral E/A values (ratio between E wave and A wave) 0.83 (0.3), deceleration time: 243.09 (67.34) ms, left atrium (LA) volume: 31.96 (6.16) mL/m<sup>2</sup>, medial e' (velocity of early diastolic mitral annular motion): 6.82 (1.24), medial E/e': 8.28 (2.03), lateral e': 7.32 (1.52), lateral E/e': 7.79 (2.24), average E/e': 8.07 (2.08), and tricuspid regurgitation: 2.85 (0.51) mL/s.

## DISCUSSION

The prevalence of LVDD was 66.43% in our study, similar to that observed by Shantsila *et al.*, Phillip B. *et al.*, and Kabeer *et al.*<sup>[5-7]</sup> in their respective studies.

Jun IJ *et al.* and Cabrera Schulmeyer *et al.*<sup>[8,9]</sup> observed a higher incidence of perioperative pulmonary oedema, arrhythmias, and longer intensive care unit and hospital stay in those having preoperative diastolic dysfunction. We also observed significant hypotension in patients with higher grades of diastolic dysfunction in the first 20 minutes of the intra-operative period, but it responded to mephentermine effectively. Regional anaesthesia can improve the LVDD status of patients.<sup>[10]</sup> Thus, this could be the reason why we, too, observed fewer perioperative complications in our patients.

Asymptomatic patients of different grades of LVDD, although have a propensity for hypotension after regional anaesthesia, can be managed effectively with routinely used vasopressors without any significant alteration in the treatment modality offered with preoperative echocardiography.

## CONCLUSION

The prevalence of LVDD was 66.43% in asymptomatic patients undergoing routine endoscopic urological surgery under regional anaesthesia. More studies under different techniques of anaesthesia, preferably using biomarkers such as B-type natriuretic peptide, are needed to address the risk stratification strategies for this subset of patients.

### Study data availability

De-identified data may be requested with reasonable justification from the authors (e-mail to the corresponding author) and shall be shared after approval as per the authors' institution policy.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

### ORCID

Darshan BK: <https://orcid.org/0009-0000-7846-0670>

Dara Negi: <https://orcid.org/0000-0001-6588-3914>

Jyoti Pathania: <https://orcid.org/0000-0002-6674-5174>

**Darshan BK, Dara Negi<sup>1</sup>, Arvind Kumar Kandoria<sup>2</sup>,  
Jyoti Pathania<sup>1</sup>**

Department of Anaesthesia, District Hospital Rohru, Shimla, Himachal Pradesh, <sup>1</sup>Departments of Anaesthesia and <sup>2</sup>Cardiology, IGMC, Shimla, Himachal Pradesh, India

**Address for correspondence:**

Dr. Jyoti Pathania,  
Department of Anaesthesia, Indira Gandhi Medical College,  
Shimla – 171 001, Himachal Pradesh, India.  
E-mail: pathaniajyoti7@gmail.com

**Submitted:** 22-Jun-2023

**Revised:** 11-Oct-2023

**Accepted:** 31-Oct-2023

**Published:** 21-Nov-2023

## REFERENCES

- Mahender A, Chavan SS, Saroa R, Chauhan M. Recent advances in geriatric anaesthesia. *Indian J Anaesth* 2023;67:152-8.
- Fleisher LA, Fleischmann KE, Auerbach AD, Barnason SA, Beckman JA, Bozkurt B, *et al.* American College of Cardiology; American Heart Association. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing non-cardiac surgery: A report of the American College of Cardiology/American Heart Association Task Force on practice guidelines. *J Am Coll Cardiol* 2014;64:e77-137.
- Ryu T, Song SY. Perioperative management of left ventricular diastolic dysfunction and heart failure: An anesthesiologist's perspective. *Korean J Anesthesiol* 2017;70:3-12.
- Nagueh SF, Smiseth OA, Appleton CP, Byrd BF 3<sup>rd</sup>, Dokainish H, Edvardsen T, *et al.* Recommendations for the evaluation of left ventricular diastolic function by echocardiography: An update from the american society of echocardiography and the european association of cardiovascular imaging. *J Am Soc Echocardiogr* 2016;29:277-314.
- Shantsila A, Shantsila E, Gill P, Lip G. Predictors of diastolic dysfunction in ethnic groups: Observations from the Hypertensive Cohort of The Ethnic-Echocardiographic Heart of England Screening Study (E-ECHOES). *J Hum Hypertens* 2018;32:477-86.
- Phillip B, Pastor D, Bellows W, Leung JM. The prevalence of preoperative diastolic filling abnormalities in geriatric surgical patients. *Anesth Analg* 2003;97:1214-21.
- Kabeer A, Hafiz S. Prevalence of left ventricular diastolic dysfunction by echocardiography in type II diabetes mellitus patients. *Int J Adv Med* 2019;6:1334.
- Jun IJ, Kim J, Kim HG, Koh GH, Hwang JH, Kim YK. Risk factors of postoperative major adverse cardiac events after radical cystectomy: Implication of diastolic dysfunction. *Sci Rep* 2019;9:14096. doi: 10.1038/s41598-019-50582-6.
- Cabrera Schulmeyer MC, Arriaza N. Good prognostic value of the intra-operative tissue Doppler-derived index E/e' after non-cardiac surgery. *Minerva Anesthesiol* 2012;78:1013-8.
- Pollock Kimberly A. Spinal anaesthesia may improve diastolic function in patients undergoing lower extremity orthopaedic surgery in Anaesthesiology annual meeting abstract website: Oct 23 2016: ASA publications in collaboration with Lippincott William and Wilkins Inc: A2152.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Access this article online	
Quick response code	Website: <a href="https://journals.lww.com/ijaweb">https://journals.lww.com/ijaweb</a>
	DOI: 10.4103/ija.ija_594_23

**How to cite this article:** Darshan BK, Negi D, Kandoria AK, Pathania J. Prevalence of left ventricular diastolic dysfunction in asymptomatic patients undergoing routine endoscopic urological surgery under regional anaesthesia—A prospective, observational study. *Indian J Anaesth* 2023;67:S281-3.