Original Article

Impact of Preoperative Echocardiography on Perioperative Management in Geriatric Hip Trauma: A Retrospective Observational Study

Abstract

Background and Aim: Hip fractures are associated with a significant risk of morbidity and mortality in the elderly population. Current guidelines propose that these patients should be operated as early as possible. Preoperative cardiac investigations, especially echocardiography, have been considered to delay surgery with few changes in the patient management. The present study has been conducted to evaluate whether preoperative echocardiography improve or worsen the prognosis in such hip trauma surgery. **Materials and Methods:** In this retrospective study, we reviewed the records of elderly patients with hip trauma operated in the tertiary care trauma center of our institute over a period of 1 year. Out of 120 patients, preoperative echocardiography was done in 30 patients. We compared the patients for whom echocardiography was done with the patients who did not undergo echocardiography. Descriptive statistical methods were used to analyze the results and observations. **Results:** We observed that preoperative transthoracic echocardiography led to an escalation in cardiac medication in 53% patients when compared with 23.3% in patients who did not undergo echocardiography. No preoperative cardiac intervention was done in any patient. However, there was a delay of 2.5 days in surgery in the echocardiography group as compared to the patients of nonechocardiography group. Rate of regional anesthesia was comparable in both the groups (54% vs. 56.6%). **Conclusions:** In the present study, it was observed that echocardiography significantly delays surgery without a significant change in preoperative cardiac medication or anesthesia technique. This may have a potential possible adverse effect on the outcome in geriatric hip trauma which was not observed to a significant limit in the present study as the study was not a longitudinal study. For "fast tracking" of geriatric hip trauma, institutional guidelines should be developed depending on the resources available.

Keywords: *Anesthesia, geriatrics, hip fracture, preoperative transthoracic echocardiography, trauma*

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Introduction

Hip fracture is the most common orthopedic trauma in the elderly. The annual incidence of hip fractures in India was reported to be more than 6 lakh in 2004 and is expected to increase in the coming decades. This can be attributed to many factors including but not limited to increase in life expectancy, zest to improve quality of life after trauma, increased number of hospitals, and many more factors which are responsible for increasing admission of elderly population into trauma ward.[1,2] These fractures usually occur due to trivial trauma with high incidence of 1-year mortality (40%–45%).[3] However, early surgical intervention within the first 24–48 h greatly reduces the risk of potential complications such as venous thromboembolism, pressure sores, and death.[4,5]

Preoperative prognostic and risk factors evaluation can have a decisive role in overall morbidity and mortality. Among various preoperative investigations, echocardiography particularly is considered to be associated with potentially deleterious delay to surgery by many surgeons.[6] However, preoperative echocardiography can be a lifesaving investigation, especially in cardiac patients, as the anesthetic management varies with different clinical pathologies. Keeping in consideration the potential advantages of preoperative echocardiography; the present retrospective study was conducted with a primary aim of evaluating and to identify the effect of preoperative echocardiography on cardiac interventions in the form of medication, angioplasty, or surgery. The secondary aim was to assess the effect on choice of anesthesia technique, operative delay, and intra- and postoperative complications.

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Materials and Methods

After approval from the Institute Ethics Committee, this retrospective study was conducted in the Department of Anesthesia and Critical Care in a Level I trauma center of our institute over a period of 1 year. All the elderly patients (above 60 years of age) undergoing surgery for hip fracture were included in the study. To eliminate any sort of bias, all the confounding factors in choosing demographic profile were taken care of.

The treatment protocols of the institution were uniformly followed during treatment of such patients. Medical records were evaluated for the following content: Patient demographics, comorbidities, American Society of Anesthesiologists (ASA) grade, and date of injury, date of admission, and date of surgery. Preoperative changes in cardiac medication, invasive cardiac intervention (angiography or angioplasty), type of anesthesia (general or regional), and intraoperative monitoring were recorded. Delay in surgery was taken as the time between admission and surgery. All the intraoperative and postoperative events were documented including in-hospital complications. Patients were allocated into two groups (echo and nonecho group) depending on whether echocardiography was done or not. The inequality in the number of patients in both the groups was statistically corrected as this was a retrospective observational study; statistical methods were applied only after nonnormally distributed data were transformed to normal data wherever possible and analyzed by parametric and nonparametric tests. Data were analyzed using Stata 12.0 and presented in mean (standard deviation)/median (min-max) and frequency percentage. Categorical variables were compared in the two groups by Chi-square test/Fisher's exact test. Continuous variables following normal distribution were compared using *t*-test, and nonnormally distributed continuous variables were compared by Wilcoxon rank sum test. Analysis of covariance was applied to see the difference in delay time in the two groups after adjusting confounders (age, sex, ISS, ASA grade, comorbidities, and preoperative mobility). $P < 0.05$ was taken as statistically significant.

Results

Out of 120 geriatric patients operated for hip trauma, preoperative echocardiography was done in 30 patients (25%). Mean age in echo Group (E) was 73 (62–84) years, whereas in the nonecho Group (C), mean age was 68.5 (61–76) years. Four patients (13.3%) in E Group were above 95 years of age. Eight patients (26.6%) in E Group were ASA Grade 3 and 4 and the rest were ASA Grade 2 whereas, C Group comprised ASA Grade I and 2 patients [Table 1].

Table 1: Demographic data

Parameter	Echo group (*n*=30)	Control group (*n*=90)	*P*
Age (years)	73±11.1	68.5±7.6	0.01
Male/female	7/23	45/45	
ASA (%)			
I	2 (6.7)	18 (20.0)	0.003
II	19 (63.3)	66 (73.3)	
III-IV	9 (30.0)	6 (6.7)	
Comorbidities (%)			
<3	18 (60.0)	63 (92.6)	0
>3	12 (40.0)	5 (7.3)	

Continuous data expressed as mean±SD or median (minimum, maximum) and frequency (%). Categorical data expressed as frequency (%). SD: Standard deviation; ASA: American Society of Anesthesiologists

All the patients in E Group had comorbidities. Twelve patients (40%) had cardiac comorbidities. Most common findings on echocardiography were diastolic dysfunction and regional wall motion abnormalities. Aortic stenosis was the most common valvular lesion diagnosed in 8 (26.6%) patients followed by aortic sclerosis in 3 (10%) and other minor valvular abnormalities in 11 patients (36.6%). There was preoperative escalation or addition of another antihypertensive drug in 16 patients in E Group and 32 patients in C Group (53.3% vs. 35.5%). No invasive cardiac intervention (angiography or angioplasty) was required in any patient in any group. There was a significant delay of 2.5 days to surgery in E Group as compared to C Group. Rates of regional anesthesia versus general anesthesia were comparable in two groups (54% vs. 41.3% in E Group compared to 56.6% vs. 40% in C Group). Invasive arterial pressure monitoring was used for all patients in E Group. All patients in E Group were shifted to the ICU for postoperative monitoring for at least 24 h.

Overall, six patients died in the hospital (5% mortality). In E Group, three patients (10%) died due to cardiac failure and one (3%) due to sepsis. In C Group, two patients (2.2%) died due to sepsis.

Discussion

The WHO defines geriatric age group as above 65 years of age, but this definition is not applicable to the Indian population where the life expectancy is 66–70 years and osteoporosis begins earlier in life (50 years) as compared to the western population.[7] Considering the possible early onset of osteoporosis in our nation, we decided to include patients above 60 years of age in our study. Our results show that the patients in E Group (25%) were older and had more comorbidity with a significantly higher ASA grade as compared to C Group. In the geriatric population with hip fracture, increased age and the presence of comorbidities are independent predictors for postoperative complications.[8,9]

Researchers have always been working consistently to minimize such postoperative complications by adopting

suitable perioperative measures, especially in patients with comorbidities.[9] There is a high prevalence of moderate to severe valvular heart disease in the elderly.[10,11] Severe aortic stenosis due to degenerative calcific stenosis with a prevalence of 2%–7% is one of the main causes of morbidity and mortality in this age group which increases substantially when such patients present to the emergency trauma ward.[12-14] Murmurs due to valvular heart disease can be detected on cardiac auscultation, but clinical evaluation of severity of the lesion requires echocardiography.[15,16] McBrien *et al*. recommended from the observations of their study that preoperative echocardiography should be a routine in all geriatric hip trauma patients.[17]

Our findings are similar to a study by Ricci *et al*. in elderly hip trauma patients who found that 35 (14.9%) patients required preoperative cardiac investigations.[18] This led to a delay in surgery by 3.3 days as compared to 2.5 days in our study. Even when adjusted for confounders (age, sex, ISS, ASA, comorbidities, and preoperative mobility), delay due to echocardiography was significant. Weller *et al*. observed that more than 20% patients with hip fractures were delayed by two or more days for preoperative optimization, and there was an independent relationship between delay and mortality.[19] Review of literature reveals various studies that have reported the detrimental effects of operative delay.[4,19] However, there are other studies such as Scottish hip fracture surgery which did not observe a significant association between time-to-surgery and mortality.[5]

In a meta-analysis by Moja *et al*., the authors concluded that surgical delay is mainly due to cardiology or nephrology consultation required for preoperative optimization.[4] In our study, echocardiography was done by a cardiologist in all the patients. Nonavailability of a cardiologist in a dedicated trauma center like ours was one of the reasons for delay in echocardiography. There are numerous studies that emphasize the use of anesthetist-performed TTE in risk stratification and even prediction of postoperative morbidity.[20-24] In patients with fracture neck of femur, anesthetist-performed TTE led to a reduction in delay and 12-month mortality by 15%.[25]

In our study, regional anesthesia was safely administered to most of the patients in both the groups. This was due to the fact that no severe valvular or regional wall motion abnormalities were detected in any patient on echocardiography. This is in consensus with the national survey for perioperative management of hip fracture in UK where 785 respondents preferred regional anesthesia.[26] It is recommended that anesthesia should be tailored to individual patient's requirements for optimal outcomes.[27,28] Invasive arterial pressure monitoring was used for all the patients in E Group. Intraoperative period actually represents a period of relative stability due to judicious fluid administration along with the beat-to-beat monitoring of arterial blood pressure.[29] However, intraoperative complications were comparable in the two groups.

In our study, there was a significant increase in the in-hospital mortality in E Group as compared to C Group ($P < 0.03$). Sepsis was the most common cause of death in both the groups, whereas in a previous study based on the autopsy report, cardiovascular events were the main cause of mortality.[30] In C Group, this could be due to preexisting electrolyte imbalance in otherwise, asymptomatic patients, whereas in E Group, adverse outcome could be due to multiple comorbidities which required preoperative optimization.

Our study has several limitations which we acknowledge. First, the small sample size of a retrospective study limits the power of the study and increases the likelihood of type II errors. Second, it is a single-center study which we may not be able to generalize to other centers. Third, our follow-up was limited to the hospital stay, so the long-term complications are missed out. Finally, it is a retrospective study, so the documentation of factors such as indications for echocardiography was inconsistent, so this was not analyzed.

However, this study has formed a clinical base for us as we now follow a protocol for "fast tracking" hip fracture geriatric patients where the orthopedician evaluates the patient. In patients with suspected or symptomatic cardiac disease, focused TTE is done by a physician, and this has reduced the delay to surgery considerably.

Conclusions

Echocardiography significantly delays surgery without a significant change in preoperative cardiac medication or anesthesia technique. This may have a potential possible adverse effect on the outcome in geriatric hip trauma which was not observed to a significant limit in the present study as the study was not a longitudinal study. Anesthesiologists with echocardiography training can help in avoiding unnecessary delay due to echocardiography and may improve upon the morbidity and mortality statistics.

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Conflicts of interest

There are no conflicts of interest.

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