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Impact of echocardiography on one-month and one-year mortality of intertrochanteric fracture patients

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ABSTRACT

Objective: The aim of this study was to analyze the effects of preoperative echocardiography on patient survival, timing of surgery in length of hospital stay in patients who will undergo hip nailing for an intertrochanteric fracture.

Methods: The clinical records of the patients who were admitted to a tertiary university hospital with an intertrochanteric femur fracture were retrospectively analyzed. The age, gender, American Society of Anesthesiologists (ASA) score, days to surgery, total hospital stay, cardiac drug prescription/modification, cardiac intervention and presence of an echocardiography assessment including detailed findings were reviewed. Mortality data were accessed from the national civil registration system.

Results: 181 (110 women and 71 men; mean age 81 (44–98)) cases were studied whom 65 underwent pre-operative echocardiography. Time to surgery and total hospital stay was 2 days longer at transthoracic echocardiography (TTE) group ($p < 0.001$). At one month control group survival rate was 93.1% on contrary it was 75.4% at TTE group. One-year survival rates were 77.3% and 55.1% respectively. Likewise mean expected survival time was 21.6 ± 1.03 months for control group and 15.12 ± 1.64 months for TTE group ($p < 0.001$). Only increased left ventricular end diastolic diameter (LVEDD) was showed to be associated with increasing one-year mortality with a hazard ratio of 10.78 (2.572–45.19) at multivariate model.

Conclusion: Cardiac findings and requisite for preoperative TTE and increased LVEDD is a strong predictor for mortality. TTE significantly lengthens the time to surgery. Also LVEDD measurement can be easily performed in the bedside which we believe would save time and reduce mortality.

Level of evidence: Level III Diagnostic study.

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Introduction

At the beginning of millennium 1.6 million patients worldwide had hip fracture in a year and data show incidence is expected to increase.¹ Hip fracture is a significant burden for health care and

economics.² And it is associated with a one-year mortality rate ranging from 14% to 36%.³ Many comorbidities that patients with hip fracture have may increase the risk of mortality.⁴ Heart disease is common in this elderly population and remains the most frequent cause of postoperative mortality.⁵

Cardiac conditions associated with the highest rates of mortality in non-cardiac surgery include aortic stenosis, cardiac failure and pulmonary hypertension, all of which are reliably evaluated by echocardiography.^{3,6,7} On contrary preoperative echocardiography can lengthen the time to surgery, where delay to the time of surgery is considered as another major risk factor for the mortality of hip fracture patient.^{3,4,8,9} Although hip fracture is not considered an

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orthopedic emergency many authors and guidelines assert the importance early surgery.^{9–12}

In spite many known risk factors, the mortality rates for people with trochanteric fracture has not been reduced. Since neither the impact of echocardiographic findings leading to death nor the effect of preoperative delay caused by echocardiography assessment has been fully investigated, we decided to explore these factors that might be adjusted in order to improve outcome.

The aim of this study was to analyze whether if it is worthy to perform a preoperative echocardiography and whether a specific TTE finding was related to the survival of intertrochanteric fracture surgery with closed intramedullary nail fixation the at the one and twelve month mortality. Secondly we want to determine whether preoperative echocardiographic assessment in intertrochanteric fracture patients had an impact on the timing of surgery, the length of the hospital stay and medical and cardiac optimization.

Patients and method

This is a retrospective study approved by the Local Medical Human Research Ethics Committee (23 May 2016, 10-432-16) Between 1 January 2013 and 31 December 2014, all patients who were admitted to a tertiary university hospital and sustained an intertrochanteric fracture of femur were included. Any patient was excluded if the surgery was not for isolated intertrochanteric femur fracture or any surgical technique other than closed proximal femoral nail fixation was used. Also cases were excluded if the patient had terminal cancer (e.g. metastatic fracture) at the time of operation.

Two independent anesthetists who were solely work with orthopedics department more than 10 years routinely evaluated all patients at the time of admission. Patients suspected of having cardiac disease, or worsening of known cardiac disease was first consulted to cardiology department and transthoracic echocardiography (TTE) was carried out by a single independent echocardiography technician since TTE is a user dependent procedure. All patients received combine spinal-epidural block with close hemodynamic monitoring. A single trauma surgeon treated the patients with proximal femoral intramedullary nail.

Medical data regarding age, gender, ASA score, days to surgery, total hospital stay, cardiac drug prescription/modification, cardiac intervention and presence of an echocardiography assessment upon a cardiac diagnosis were gathered retrospectively from hospital database at November 2016. A detailed data was sorted from echocardiography reports including findings such as left ventricular hypertrophy, left ventricular excursion, fractional shortening, valvular heart disease (stenosis, regurgitation or insufficiency), cardiac ejection fraction and pulmonary artery pressure (Table 1). One month and twelve month mortality data were accessed from the national civil registration system.

Those patients who underwent pre-operative echocardiography were clustered as TTE group, and those who did not to form the control group. Also subgroups for having specific TTE findings were formed to determine the specific impact on mortality. The primary outcome measure was mortality at first month and twelve months after surgery. Secondary outcome measures included the number of days before surgery and total days spent in hospital and the effect of echocardiography on medical or invasive cardiac treatment. Cox proportional hazards model (including univariate predictors of mortality with two-tailed p values below 0.10), Kaplan–Meier, Chi-square and Mann–Whitney–U tests were used as appropriate. Data were analyzed using SPSS for Windows 15 (SPSS Inc, Chicago, IL, USA). Statistical significance was defined as a value of $p < 0.05$.

Table 1

Table showing the detailed data sorted from echocardiography reports (TTE: transthoracic echocardiography).

Detailed TTE Findings	Normal Findings
Left ventricular hypertrophy	Posterior wall/septal thickness <1.1 cm
Left ventricular end diastolic diameter	<5.5 cm
Fractional shortening (%)	>30%
Left atrial dilatation	>4.0 cm
Right atrial dilatation	>4.5 cm
Right ventricular dilatation	>8.0 cm (base-to-apex-length)
Left ventricular wall motion	No hypokinetic area
Ejection fraction (%)	>55%
Aort diameter	<3.5 cm
Aortic valve stenosis	No gradient at valve
Mitral valve stenosis	No gradient at valve
Tricuspid valve stenosis	No gradient at valve
Pulmonary valve stenosis	No gradient at valve
Pulmonary arterial blood pressure	<25 mmHg
Mitral valve insufficiency	No regurgitation
Aortic valve insufficiency	No regurgitation
Tricuspid valve insufficiency	No regurgitation
Pulmonary valve insufficiency	No regurgitation

Results

In the 24-month study period (from January 2013 to December 2014), 203 consecutive intertrochanteric fracture patients were admitted to the hospital. Data were collected on 181 cases; two cases were international patients with no mortality records on national registry, fourteen patients had other surgeries for concomitant injury and six patients had terminal stage cancer. Of those 181 cases sixty-five patients underwent pre-operative echocardiography; whereas one hundred sixteen patients did not received TTE. For further investigation detailed findings at TTE were recorded as mentioned earlier at methods.

Median age of patients was 81 (44–98) where in control group 81 (44–94) and in TTE group 83 (48–98). There were 110 women (64 in control and 46 in TTE) and 71 (52 in control and 19 in TTE) men. ASA of the patients were distributed as ASA I 46.6%, ASA II 48.3% and ASA III 5.2 at control group. On the contrary 23.1 was ASA I, 61.5 was ASA II and 15.4 was ASA III at TTE group. Contritely age, gender distribution and ASA distribution was statistically different between groups (Table 2).

Five patients out of 65 at TTE group underwent cardiac interventions (4 pacemaker implantation and 1 angiography) pre-operatively, while two out of 116 patients had a pacemaker implanted. However this is not statistically significant ($p = 0.096$; >0.005).

16 patients at control group needed a medical optimization preoperatively where 22 medication optimizations were made at TTE group. This ratio is significantly higher at TTE group ($p = 0.001$).

Table 2

Table showing age, gender and ASA distributions between the groups (TTE: transthoracic echocardiography, ASA: American Society of Anesthesiologists score).

	Control Group	TTE Group	Total	p value
n	116	65	181	n/a
Age (median)	81 (44–94)	83 (48–98)	81 (44–98)	0.012
Gender				0.039
Male	52	19	71	
Female	64	46	110	
ASA Score				0.002
ASA I	54 (46.6%)	15 (23.1%)	69 (38%)	
ASA II	56 (48.3%)	40 (61.5%)	96 (53%)	
ASA III	6 (5.2%)	10 (15.4%)	16 (8%)	
ASA IV/V	0	0	0	

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