

## PREOPERATIVE TWO DIMENSIONAL ECHOCARDIOGRAPHY IN PATIENTS WITH LOWER LIMB FRACTURES; ITS RELATIONSHIP WITH TIME OF SURGERY, POST-OPERATIVE AMBULATION AND HOSPITAL STAY

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### ABSTRACT

**Objective:** To determine the effect of two dimensional echocardiography on time of surgery, post-operative ambulation and hospital stay among patients with lower limb fractures.

**Study Design:** Descriptive cross sectional study.

**Place and Duration of Study:** Combined Military Hospital Rawalpindi, from Sep 2015 to Dec 2015.

**Patients and Methods:** A total of 123 patients were included in study based on non-probability convenient sampling who presented with lower limb fractures. The patients were divided into two groups, group A included those who underwent only electrocardiogram (ECG) for assessment and group B included those patients who were further assessed by echocardiography.

**Results:** There was significant delay in group B patients from time of admission to surgery ( $p=0.0001$ ) as well as post-operative ambulation ( $p=0.0001$ ) and mean hospital stay was also longer ( $p=0.0005$ ). However the post-operative complications were similar in two groups.

**Conclusion:** Pre-operative cardiac evaluation by echocardiography is associated with delay in surgery and increases overall hospital stay. The implementation of the American College of Cardiology/American Heart Association guidelines may prevent unnecessary cardiac consultations which can minimize use of preoperative resources, delay in time of surgery and early post-operative recovery.

**Keywords:** American College of Cardiology/ American Heart Association guidelines, Delay in surgery, Echocardiography, Fracture fixation, Lower limb fractures.

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### INTRODUCTION

In patients with orthopedic trauma, lower limb constitutes more than half of overall fractures<sup>1,2</sup>. There is concurrent rise in cardiovascular diseases (CVD) worldwide with developing countries accounting for 86% of the global CVD disease burden<sup>3,4</sup>. This means that there will be substantial number of patients who have CVD and musculoskeletal trauma simultaneously<sup>3</sup>. About 25% of major surgeries performed in cardiac patients are associated with high perioperative cardiovascular morbidity and mortality<sup>2,5</sup>. However early surgical treatment followed by prompt mobilization is associated with better outcome in these patients<sup>2,3,5</sup>.

Preoperative assessment and risk stratification of patients who sustained lower limb fractures with other systemic diseases can hardly be over emphasized but at the same time over investigating the patients will delay the definitive surgery and will result in high morbidity and mortality. A number of researches have delineated a criterion for preoperative cardiac evaluation of patients undergoing surgery<sup>2,5</sup>.

In Pakistan the most common injury warranting admission after trauma is lower limb fractures<sup>6</sup>. Study by Abbas et al in Karachi showed a significant delay from triage to surgery and overall hospital stay due to additional cardiac tests<sup>3</sup>. There must be a balance that warrants careful selection of patients undergoing preoperative extended cardiac evaluation, as investigative delay in surgery may not only

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increase the post-operative mortality but increase the overall cost and hospital stay. This study was designed to assess the association of detailed cardiac evaluation with time of surgery, post-operative ambulation and hospital stay among patients with lower limb fractures.

### PATIENTS AND METHODS

A descriptive cross sectional of patients was done who presented with lower limb fractures as an emergency at Combined Military Hospital (CMH) Rawalpindi from 1<sup>st</sup> September 2015 to 31<sup>st</sup> December 2015. Sample size was calculated by WHO calculator and non-probability convenient technique was used. During this time a total of 123 patients with lower limb fractures were operated. All patients were

anesthetist and tests advised, additional 2 D-ECHO advised by whom, findings of 2 D-ECHO and time of surgery. The postoperative course was evaluated by ambulation and hospital stay. The surgical procedure used (hemiarthroplasty, Austin Moore Implant, dynamic hip screw, Interlocking Intramedullary nails, distal femur locking plate etc) and complications during hospital stay were also recorded. Major complications included death, MI, pulmonary embolism, DVT, and pneumonia.

Statistical analysis was performed with SPSS 20 software (SPSS Inc., Chicago, IL, USA). Mean and standard deviation was calculated for age, time of admission to surgery, time of surgery to ambulation and discharge in two groups. The

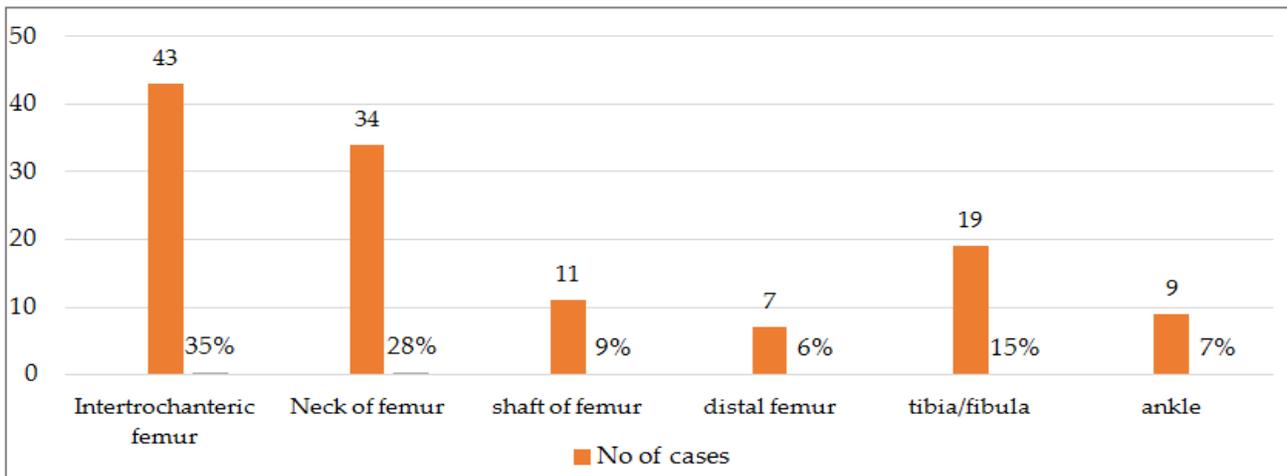


Figure: Frequency of lower limb fractures.

initially assessed by anesthetist and advised basic tests but thirty patients were subjected to additional cardiac evaluation that included two-dimensional echocardiography (2 D-ECHO). Patients in whom surgery was delayed for other reasons were excluded from study.

Patients were divided into two groups based on their cardiac investigations. Group A (n=93) included patients evaluated with ECG only and group B (n=30) included those who underwent 2 D-ECHO in addition to ECG.

Information gathered included patient demographics, comorbidities, fracture type, pre-operative ambulation status, initial assessment by

student's t-test was applied to compare two means, depending on the data distribution. Percentages were calculated for number of complications in two groups and compared by using chi-square fisher's exact test. A *p*-value of <0.05 was considered significance.

### RESULTS

There were 117 (95%) males and 6 (5%) females who were included in the final analysis. Fifty nine patients had previous systemic disease and 14 had more than one co-morbid. The distribution of lower limb fractures is shown in figure. The most common fracture was intertrochanteric fracture. Ninety three patients

were assessed by ECG whereas 30 patients had 2 D-ECHO before operation. Their preoperative ambulatory status is shown in table-I. 2D-Echo was advised by trainee anesthetist in 18 (60%) cases while 10 (33%) were seen by consultant anesthetist before undergoing echocardiography. Only 2 (6%) underwent echo on advise of medical specialist.

The mean age, mean time between admission and surgery and mean time from surgery to ambulation of both groups is shown in table-II. The mean time between admission and discharge in group A was 3 days and it was 5 days in group B ( $p<0.001$ ). 73% of patients who

Group B patients had a significant time between admission and surgery ( $p<0.001$ ) and surgery and ambulation ( $p<0.001$ ). There was also increased hospital stay of group B patients ( $p<0.005$ ). The overall mortality and morbidity remained insignificant ( $p=0.15$ ) between two groups as shown in table-II.

## DISCUSSION

Recent advances in surgery and anesthesia have rendered previously thought high risk cases a routine but surgical trauma and anesthetic interventions are invasive processes which may aggravate the underlying systemic illness. Pre-operative cardiac evaluation has its due

**Table-I: Pre-operative functional status of patients in two groups.**

	Pre-operative Ambulation				<i>p</i> -value
	Community ambulant	House ambulant	Bed bound	Total	
ECG only	47	46	-	93	0.63
Echocardiography	12	12	6	30	

**Table-II: Comparison of two groups.**

Outcome	Group A (ECG only) n=93	Group B (2D-Echo) n=30	<i>p</i> -value
Mean age (years)	58.5 ± 9.1	69.8 ± 10.5	-
Mean time from admission to surgery (hours)	17.7 ± 4.2	46 ± 8.8	<0.001
Mean time from surgery to ambulation (hours)	15.5 ± 3.1	29 ± 11.8	<0.001
Mean time from admission to discharge (days)	3.4 ± 0.6	5.3 ± 1.3	<0.001
No. of complications	3 (3.2%)	3 (10%)	0.15

underwent 2 D-ECHO in group B had normal results and 23% had ejection fraction between 20-50% and 1 patient had ejection fraction below 20%. Results of echocardiography did not alter the surgical intervention of these patients. The major cardiovascular complications encountered in both groups were myocardial Infarction, pulmonary embolism and deep venous thrombosis. Three (3.2%) patients had major complications in group A and 3 patients had major complications in group B (10%) as mentioned in table-II. In group B, 2 patients who had major complication were having abnormal echocardiography.

importance but in emergency situations this may delay the definitive surgery which is directly related to high mortality and morbidity<sup>3,7,8</sup>.

Our study reported that patients who underwent 2D-ECHO were relatively old (had a median age difference of 10 years) and had a considerable delay between admission and surgery for lower limb fractures ( $p<0.001$ ). Abbas et al also demonstrated a delay in patient's surgery who were subjected to additional cardiac evaluation<sup>3</sup>. In our study there was delay in post-operative ambulation ( $p<0.001$ ) and over all increased hospital stay ( $p<0.005$ ) in patients with detailed cardiac evaluation. It was observed that

there is a definite benefit observed in patients who were ambulated early after surgery<sup>9</sup>. The major complication witnessed were myocardial infarction and pulmonary embolism in both groups. Complication rate was 3.6% (3/93) in patients who were not delayed whereas it was 10% in group that was subjected to pre-operative 2D-ECHO (3/30) ( $p < 0.07$ ). The major complications noted in patients of lower limb trauma included Myocardial infarction, deep venous thrombosis and pneumonia in previous studies which are consistent with our observation<sup>1,5,10,11</sup>.

In our study, out of 30 patients subjected to 2D-ECHO, 22 had normal study and only 1 patient had ejection fraction of less than 20%. A recent study showed similar result in which no cardiac abnormality was found in 70% of cases who were subjected to echocardiography. Most of 2D-ECHOs were advised by residents (60%) without any prior consultation with consultant. Whereas the pre-operative echocardiogram did not alter the surgical management of patient<sup>12</sup>.

There exists an ambiguity among which patients should be extensively investigated from cardiac point of view, however, it is postulated that patients who don't have major risk factors should be treated as having moderate cardiac dysfunction instead of subjecting them to more tests. This is said to increase the overall outcome of patient although more research is warranted regarding this phenomenon. American College of Cardiology/American Heart Association (ACC/AHA) has laid down pragmatic guidelines according to the risk factors of patients and their subsequent evaluation<sup>5,13</sup>. A multi-disciplinary approach is indicated in fractures of lower limb especially in elderly where time of surgery is of utmost importance hence there should be meticulous screening by a team who are well aware of guidelines.

There were few limitations in our study. The bias and confounding factors encountered including the criteria for which echocardiography was advised was not assessed. In our records, the

exact time from trauma to admission was lacking. Moreover the financial burden endured was not considered as well as the post-operative long term outcome. We suggest further studies on a broader base and a more representative sample size involving long term outcome of patients to have a detailed insight in this subject.

## CONCLUSION

Pre-operative cardiac evaluation by echocardiography is associated with delay in surgery and increases overall hospital stay. The implementation of the American College of Cardiology/American Heart Association guidelines may prevent unnecessary cardiac consultations which can minimize use of preoperative resources, delay in time of surgery and early post-operative recovery

## CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

## REFERENCES

1. Vinand M, Michael R. The neglected epidemic: road traffic injuries in developing countries. *BMJ* 2002; 324(7346): 1139-41.
2. Roberts I, Mohan D, Abbasi K. War on the roads: The public health community must intervene. *BMJ* 2002; 324(7346): 1107-8.
3. Abbas K, Umer M, Askari R. Preoperative cardiac evaluation in proximal femur fractures and its effects on the surgical outcome. *Acta Orthop Traumatol Turc* 2012; 46(4): 250-4.
4. Oztürk I, Tokar S, Ertürer E, Aksoy B, Seçkin F. Analysis of risk factors affecting mortality in elderly patients (aged over 65 years) operated on for hip fractures. *Acta Orthop Traumatol Turc* 2008; 42(1): 16-21.
5. Eagle KA, Berger PB, Calkins H, Chaitman BR, Ewy GA, Fleischmann KE, et al; American College of Cardiology; American Heart Association. ACC/AHA guideline update for perioperative cardiovascular evaluation for noncardiac surgery executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Update the 1996 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery). *J Am Coll Cardiol* 2002; 39(3): 542-53.
6. Humail SM, Rehman A, Mamji MF, Hussain. Burden of Orthopaedic Trauma in Tertiary Care Public Sector Hospital: Challenges and Solutions; *Pak J Surg* 2012; 28(1): 43-7.
7. Richmond J, Aharonoff GB, Zuckerman JD, Koval KJ. Mortality risk after hip fracture. *J Orthop Trauma* 2003; 17: 53-6.
8. Aziz K, Faruqi A, Patel N, Jaffery H. Prevalence and awareness of cardiovascular disease including life styles in a lower middle class urban community in an asian country. *Pak Heart J* 2008; 41(3-4): 11-20.
9. Moja L, Piatti A, Pecoraro V, Ricci C, Virgili G, Salanti G, et al. Timing Matters in Hip Fracture Surgery: Patients operated within 48 hours have better outcomes. A meta-analysis and

- metaregression of over 190,000 patients. PLoS ONE 2012; 7(10): e46175.
10. Eireamhoin S, Beyer T, Ahmed M, Mulhall KJ. The role of Preoperative investigation in emergency Hip Surgery. J Trauma 2011; 71(5): 1345-7.
  11. Stitgen A, Poludniayk K, Dulaney-Cripe E, Markert R, Prayson M. Adherence to Preoperative Cardiac clearance Guidelines in Hip Fracture Patients. J Orthop Trauma 2015; 29(11): 500-3.
  12. Bergeron E, Lavoie A, Moore L, Bamvita JM, Ratte S, Gravel C, et al. Is the delay to surgery for isolated hip fracture predictive of outcome in efficient systems? J Trauma 2006; 60(4): 753-7.
  13. Ricci WM, Brandt A, Mcandrew C, Gander MJ. Factors affecting Delay to Surgery and Length of Stay for Patients with Hip Fracture J Orthop Trauma 2015; 29(3): e109-e114.
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