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## INTRODUCTION

Valvular lesions due to Rheumatic Heart Disease are an alarming dilemma in our population which is increasing day by day and causes a huge economical burden in the medical budget. There must be some indicator which may predict the expected cost of the surgical treatment of a given procedure. Left atrial size reflects the chronicity and magnitude of increased left ventricular filling pressures and is also a one of the most simple and accurate predictor of the cost effectiveness of the given surgical procedure (valve repair/replacement) and gives accurate clues towards the expected morbidity and mortality postoperatively.

Most patients with chronic valvular disease are sicker, may have poor cardiac reserves, enlarged heart chambers, clots in LA, previous H/O stroke, low cardiac output syndrome, chronic Atrial fibrillation and cardiac cachexia. An increase

## VALVULAR PATIENTS;

### POST OPERATIVE COURSE, SIZE OF THE LEFT ATRIUM CAN PREDICT THE COST EFFECTIVENESS

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**ABSTRACT...** Cost effectiveness in any surgical procedure is a major contributory factor in the continuation of medical services in developing countries. Limited data is available in assessing the factors related with the duration of ICU stay and treatment after valvular replacement surgeries. **Objectives:** Our aim was to see the correlation of pre operative Left Atrial size of the patient and duration of post operative stay in ICU. **Study Design:** Observational Study. **Period:** March 2010 to April 2014. **Setting:** Faisalabad Institute of Cardiology, Faisalabad. **Method:** A total of 550 consecutive patients with valvular lesions were included in the study. Their Left Atrial size was measured echocardiographically pre-operatively and their stay /course in the ICU was monitored. **Result:** Three categories were identified in regard with the Left Atrial size and the ICU stay. If LA size is below 60 cm<sup>2</sup>, the post operative course & stay in ICU is normal and lasts for about 1-2 days. If LA size is between 60-65 mm<sup>2</sup>, the post operative course may be complicated & prolonged by the atrial fibrillation / flutter for which pharmacological cardio version may be needed and the stay in ICU is prolonged and may last for about 2-3 days. And if pre-operative LA size is more the 65 mm<sup>2</sup> the patient may behave in entirely different way. His atrial fibrillation persists in spite of electro cardioversion or pharmacological cardioversion and his stay in ICU may last up to 4-5 days and thus the cost of treatment is raised. **Conclusions:** LA size can predict the post operative behavior of the patient in ICU and duration of stay and expected cost of the treatment. Smaller is the size of LA, shorter is the stay in ICU and thus lesser is the post operative cost & vice versa.

**Key words:** Cost effectiveness, Left atrial size, Predict, ICU stay, Cardioversion

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in left atrial size is a known risk factor for atrial fibrillation, flutter, stroke, clots in LA, and has been generally related to cardiovascular risk of death. Left atrial size is also known as a marker of left ventricular diastolic dysfunction even in those patients who do not have significant mitral valve disease or heart failure. In this scenario the decision in their management plan is very crucial and must be safe and cost effective.

## METHODS

All the patients operated upon from March, 2010 to April, 2014 at Faisalabad Institute of Cardiology, for their valvular lesions were included in the study with the pre-operative Echocardiography reports measuring their LA size especially.

## Exclusion criteria

Valvular patients with previous H/o strokes, valvular patients with other congenital defects,

valvular patients with associated IHD and valvular patients complicated with other non cardiac complications like respiratory tract infection, urinary tract infections, bleeding disorders, RTA and psychological trauma etc.

## RESULT

The Demographic data of the patients was summarized in table-I.

Total No. Patients (N) 550				
Characteristics	All Patients	LA Below 60 mm <sup>2</sup>	LA Between 60-65 mm <sup>2</sup>	LA Above 65 mm <sup>2</sup>
Sex				
Male	208	70	76	62
Female	342	98	114	130
Age in years				
Mean (SD)	38	26	29	35
H/o AF	281	02	67	212
Clot in LA	16	NIL	03	13
Cardiac cachexia	22	NIL	06	16

**Table-I. Base line characteristics of the study patients.**

Variables	Below 60 mm <sup>2</sup>	Between 60-65mm <sup>2</sup>	Above 65 mm <sup>2</sup>
Age < 50 years	61	40	49
Age > 50 years	99	122	129
H/o AF	02	67	212
LV EF < 45%	17	47	62
LV EF > 55%	196	171	57
Normal LV Size	330	140	80

**Table-II. Prognostic value of left atrial size in adjusted in multivariable model for the prediction of post operative morbidity across a range of baseline characteristics.**

On analysis of the above data, it is quite clear that the size of left atrium can accurately predict the post operative course of the patient and thus its cost-effective value in the surgical procedures is highlighted.

If LA size is less than 60 mm<sup>2</sup>, the chances of complication in ICU are very low and means ICU stay is 1-2 days. If LA size is between 60-65 mm<sup>2</sup>, patients' behavior is borderline and they may have some short course of minor complications in ICU like short episodes of atrial fibrillation, low cardiac output syndrome, mild renal dysfunction, or some minor respiratory complications.

If LA size is more than 65 mm<sup>2</sup>, the post operative course may be different altogether and the chances of complications are higher. Their stay in ICU is therefore prolonged. He may need higher doses of inotropic support for prolonged period of time and may also need some treatment of various other complications in ICU and so their ICU stay and cost of surgical treatment is raised.

## DISCUSSION

Left Atrial Size has been shown to be of a significant predictive and prognostic value of the cardiovascular outcome after valvular operations in many recent studies conducted all over the world<sup>1-2</sup>. Although left atrium has only a minimal active contribution towards Left Ventricular Filling (only 20%), rest of its role is only passive.

- α. It acts as a reservoir of blood coming from pulmonary veins.
- β. It works as a conduit towards Left Ventricle.

But the size of left atrium contributes much towards its predictive role in post surgical course of the patients in ICU and early phases of patients, recovery in the hospitals and thus describes the cost effectiveness of the surgical procedures<sup>1-2</sup>. Size of the left atrium also reflects at least to some extent the chronicity and the magnitude of the disease and thus can also be a marker of left ventricular diastolic dysfunction, increased left ventricular filling pressures and increased risk of cardiovascular deaths in cardiac patients<sup>2-3-4</sup>.

Bangalore et al. studied 2,705 patients to see the role of left atrial size if it is any, in the cardiovascular risk stratification assessment programs and its role in early post operative days and found that patients with increased left atrial size were older and had a greater number of cardiovascular risk factors, like congested cardiac failure (CCF), valvular heart diseases, hypertension, low mean BMI or morbid obesity, prior myocardial infarction and H/O prior cardiovascular interventions<sup>2-3</sup>. They also found that patients with dilated left atrium achieved a lower peak heart rate and lower peak systolic blood pressure values than patients with normal left atrial size during stress

echocardiography. They also noted that patients with dilated left atrium had a lower left ventricular ejection fractions (LVEF%), higher rest and stress wall motions score indices, a greater number of ischemic segments in the walls of heart thus causing severe segmental wall motion abnormalities on echocardiography and greater severity of ischemia compared with patients having normal left atrial size<sup>3-4</sup>.

Benjamin et al. found in 3,581 patients in the Framingham cohort that the relative risk of death was 1.3 in men and 1.4 in women for every 10-mm increase in the size of left atrium. In this study, the increase in left atrial size was also associated with higher risk of cardiovascular events or even cardiac deaths suggesting that the dilated left atrium can be a marker of severe cardiovascular co-morbidities in its individual and independent capacity<sup>5-8</sup>. Similarly, Kjaergaard et al. found that left atrial size was a predictor of low exercise capacity together with mean body mass index, resting heart rate, and left ventricular end-systolic diameter and found that the patients with dilated left atrium were less likely to exercise and more likely to be chronotropically and ionotropically incompetent as compared to patients having normal left atrial size<sup>7-9</sup>.

So, size of the left atrium was found to be a significant predictor of cardiovascular events in both pre operative and post operative patients affecting the early post operative course in ICU even after controlling their baseline variables. It is further noted that for every 10 mm/m<sup>2</sup> increase in the size of left atrium, the risk of cardiovascular events including cardiac deaths can increase up to even 3.15 fold. So when the left atrial size is taken as a cutoff value of 2.4mm/m<sup>2</sup>, it effectively risk-stratifies the patients into normal and abnormal groups<sup>8-9</sup>. The rate of cardiovascular events was 2.9 times higher in patients with dilated left atrium than patients having normal left atrial size. Thus it is very easily concluded that the size of the left atrium can significantly predict the future behavior of the patients in their early post operative recovery in the ICU and the expected cardiovascular events, on the basis of which cost effectiveness of the surgical treatment can be assessed<sup>11-12</sup>.

Although our study is done in a small center and number of patients included in our study were less than various other studies in the world but the results are consistent with the other studies that have shown an incremental increase in risk of cardiovascular events as the size of left atrium increases.

## CONCLUSIONS

Like various other authors in the world, we also conclude that the size of the left atrium provides independent and incremental prognostic value independent of various other traditional risk factors and that the size of left atrium should be routinely incorporated in the prognostic interpretation of the patients pre operatively and post operatively and thus the cost effectiveness of the procedure made. More studies are needed to further elaborate the role of left atrial size in its risk stratification, its prognostic value in pre operative and post operative patients and its role in predicting cost effectiveness of the surgical procedures in post surgical patients.

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## REFERENCES

1. Brian D. Hoit. **Left atrial size and function: Role in Prognosis.** Journal of American College of cardiology 2014 Feb 18;63(6):493-505.
2. Strpal Bangalore, MD, MHA, Siu-Sun Yau, MD, FACC, Farooq A, Choudhary, MD, FACC. **Role of Left Atrial Size in Risk Stratification and Prognosis of Patients undergoing stress Echocardiography.** Journal of American College Of Cardiology 2007, Volume 50, (13):1254-1262.
3. S.M Vaziri, M.G. Larson, E.J. Benjamin, D. Levy. **Echocardiographic predictors of non r h e u m a t i c atrial fibrillation: The Framingham heart study.** Circulation, 1994,89: 724-730.
4. Dharmenderakumar A. Patel, MD,MPH, Carl J. Lavie, MD, Richard V. Milani, MD, Sangeeta Shah MD, Yvonne Gilliland, MD. **Clinical Implication of Left Atrial Enlargement. A Review.** Ochsner J.2009 Winter, Volume 9,(4):191-196.
5. Alberto Bouzas-Mosquera, MD, Francisco J. Broullon, MS, Nemesio Alvarez-Garcia, MD, Elizabet Mendez, MD, Jesus Peterio, MD PhD, Alfonso Castro-Beiras, MD, PhD. **Left Atrial Size and risk for all-cause mortality and ischemic stroke.** CMAJ. Jul,2011,Volume 183,(10): E657-E664.
6. Petty GW, Khandheria BK, Whisnant JP, Sicks JD, O'Fallon WM, Wiebers DO. **Outcomes among valvular heart disease patients experiencing ischemic stroke or transient ischemic attack in Olmsted County, Minnesota.** Mayo Clin Proc.2005 Aug;Volume 80,(8):1001-8.
7. Barnes ME, MiyasakaY, Seward JB, Gersh BJ, Rosales AG, Bailey KR, Petty GW, Wiebers DO, Tsang TS. **Left Atrial Volume in the prediction of first ischemic stroke in an elderly cohort without atrial fibrillation.**

- Mayo Clin Proc.2004 Aug; Volume 79,(8):1008-14.
8. Andrea Rossi, Pier luigi temporelli, Miguel Quintana, Frank L. Dini, Stefano Ghio, Graham S. Hillis. **Independent Relationship of Left Atrial Size and Mortality in Patients with Heart Failure: an individual patient Meta-Analysis of Longitudinal Data (MeRGA Heart Failure)**. Eur J Heart Fail. 2009.8(10):929-936.
  9. Poulsen MK, et al. **"Left Atrial Volume Index: Relation to long-term clinical outcome in type 2 diabetes"**. J Am Coll Cardiol 2013;DOI: 10.1016/j.jacc.2013.08.1622.
  10. Esmeray Acarturk, MD,FESC, Mevlut Koc, MD, Abdi Bozkurt, MD, Liker Unal, MSc. **Left Atrial Size May Predict Exercise Capacity and Cardiovascular Events in Patients with Heart Failure**. Tex Heart Inst J. 2008; 35(2):136-143.
  11. Teresa S.M. Tsang, MD, FACC, Walter P. Abhayaratna, MBBS, FRACP, Marion e. Barnes, MS, Yoko Miyasaka, MD, PhD, FACC, Bernard J. Gersh, MB, ChB, Phil, FACC,....**Prediction of cardiovascular outcomes with Left Atrial Size: Is Volume Superior to Area or Diameter?** J Am Coll Cardiol.2006;47(5):1018-1023.
  12. JE Moller, GS Hillis, Oh JK, Seward JB, Reeder GS, Wright RS, Park SW, Bailey KR, Pellikka PA. **Left Atrial Volume: A powerful predictor of survival after acute myocardial infarction**. Circulation. 2003 May 6:107(17):2207-12.
  13. Jorge R. Kizer , MD, MSc, Jonathan N. Bella, MD, Vittorio Palmieri, MD, Jennifer E. Liu, MD, Lyle G. Best, MD, Elisa T. Lee, PhD, Mary J. Roman, MD, Richard B. Devereux, MD. **Left Atrial Diameter as an independent predictor of first clinical cardiovascular events in middle-aged and elderly adults: The Strong Heart Study (SHS)**. American Heart Journal 2006; 151(2):412-418.



“Failure is the key to success;  
each mistake teaches us something.”

Morihei Ueshiba



#### AUTHORSHIP AND CONTRIBUTION DECLARATION

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1	Dr. Shahbaz Ahmad	Research work and paper writing	
2	Dr. Mohsin Nazeer	Supervision and proof reading	
3	Dr. Faisal Ali	Data collection	
4	Dr. Rehan Riaz	Data entry and data collection	