

Role of Trans-thoracic Echocardiography in Pre-anesthesia evaluation of Surgical patients undergoing Non-cardiac surgery.

Maqsood Ahmad¹, Fatima Wajahat², Amna Wajahat³

ABSTRACT

Objective: To determine the utility of pre-operative echocardiography in the assessment of cardiac status of patients undergoing non cardiac surgery.

Study Design: A retrospective observational study.

Place and Duration: The study was conducted at Armed Forces Institute of Urology Rawalpindi from 10 Jan 2016 to 10 Jan 2018.

Methodology: Retrospectively, we selected 1000 patients of ASA (American Society of Anaesthesiologist) 2, ASA 3, and ASA 4, who underwent non cardiac surgery under general or spinal anaesthesia. All these patients were advised 2D echocardiography in pre anaesthesia check-up due to their underlying illness, pre-existing ischemic heart disease, previous angioplasty, cardiac bypass, bed ridden old age cases and history of shortness of breath. Young patients having cardiac murmur and history of valvular heart disease were also advised to undergo this test. Moreover the physical efficiency in terms of MET (metabolic equivalent) score was also determined for each patient and their final anaesthesia fitness was given after reviewing the echocardiography report. The risk of surgery and anaesthesia was calculated by finding MET score and 2D echo report. SPSS 16 was used to analyse the data which was presented in percentages, mean and standard deviation.

Results: Out of 1000 echo reports, 75.9% were normal, 14.8% had mild change in ejection fraction (EF >40%), 6.5% with moderate heart dysfunction, and 2.8% with severe heart compromise.

Conclusion: Although, patient's history and MET score determines the perioperative risk without history of cardiac illness whereas 2D echocardiography did not provide any help but where indicated it is a useful investigation.

Keywords: 2D Echocardiography, Ejection fraction, History, Mortality, Non-cardiac surgery, Pre anaesthesia evaluation.

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INTRODUCTION

Pre-anesthesia evaluation is done in all elective cases many days before surgery to assess the patient ahead of surgical procedure

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while keeping enough time to optimize his condition if needed or even to reschedule surgery^{1,2}. The procedure of pre anesthesia evaluation varies among different hospitals but aim remains the same which is safe surgery depending on patient's condition and type of surgery³. The physical status of the patient is assessed by the MET score⁴, which is the maximum amount of metabolic work that an individual can perform and this corresponds to overall cardiovascular fitness and is used for risk stratification for perioperative complications in non-cardiac surgical procedures.

The irrational trend of advising 2D echocardiography in pre anesthesia clinic are on the rise which has laid an extra burden on resources whereas establishing physical efficiency in terms of MET score is simple and valid procedure which is not being followed. It is pertinent to note that poor functional capacity is associated with increased cardiac complications in non-cardiac surgery^{5,6}. The ACC/AHA (American College of Cardiology/ American Heart Association) guidelines have established a role of echocardiography in routine practice⁷.

Moreover, resting echocardiography has relatively weak prediction of active underlying cardiac lesions and cannot determine the physical status of patients⁸. The determination of physical status of patients is a familiar method of finding the

fitness of patients before surgery but patients are routinely sent for further cardiac status evaluation by advising echocardiography⁹. Although, the investigation has advantage of being non-invasive without any side effects and helpful in follow up of cardiac patients but has least value in the routine pre anaesthesia clinics resulting in undue delay¹⁰.

We have found an increased trend of advising echocardiography in pre anaesthesia clinics to evaluate the cardiac status in patients undergoing non cardiac surgery. Most of the time, the echo (echocardiography) is not available in the same setting and patients have to be referred to other hospitals. Thus, considering above we have conducted this study to find the utility of advising routine echocardiography in preoperative settings in our hospitals. So, the objective of our study was to determine the utility of pre-operative echocardiography in the assessment of cardiac status of patients undergoing non cardiac surgery.

METHODOLOGY

Retrospectively, we selected 1000 patients of ASA (American Society of Anaesthesiologist) 2, ASA 3, and ASA 4, who underwent non cardiac surgery under general or spinal anaesthesia. The patients were advised 2D echocardiography in pre anaesthesia check-up considering their underlying illness, pre-existing ischemic heart disease, previous angioplasty, cardiac bypass and bed ridden old age cases having history of shortness of breath. Young patients having cardiac murmur and history of valvular heart disease were also advised to undergo this test. Moreover the physical efficiency in terms of MET (metabolic equivalent) score was determined for each patient and their final anaesthesia fitness was given after reviewing the echocardiography report.

The study was started at Armed Forces Institute of Urology Rawalpindi in 1000 patients presented for genitourinary surgery for two years from Jan 2016 to Jan 2018 after approval from hospital ethical committee (IRB/2020/101 Dated Jun 2020). The sample size was calculated with WHO sample size calculator which was 386 patients but we included 1000 patients in our study¹¹. The patients included in the study were all patients presenting for urology surgery, while patients of renal transplant, multi organ dysfunction and emergency surgery patients were excluded from the study.

In pre-anesthetic evaluation, patients were assessed using history, lab reports and by finding physical efficiency level. The MET score was written for each patient on the record book. The procedure of advising echocardiography was followed for all patients as per the existing local policy. We finalized our plan of anesthesia depending upon the results of echocardiography and physical activity level (MET score). These combined findings either did not change the anesthesia plan; anesthetist was alert with more monitoring, drugs or optimization of the patient's condition or rescheduling of surgery, thus finding utility of echocardiography in pre anesthesia clinics.

Data Analysis: Tables were used for descriptive analysis. Numerical data was shown in mean and standard deviation while categorical data was expressed as frequency (n) and

percentages (%). Confidence interval was set at 95% while power of study was 80%. SPSS software version 16 was used for statistical analysis.

RESULTS

We have studied 1000 patients over a period of 2 years including male and females (male >90%) aged 53 ± 15 years referred to pre-anesthesia clinic for elective non cardiac surgeries as shown in Table-I.

Table-I: Characteristics of the study population (N=1000)

Characteristics	n	%
Total	1000	100 %
Gender		
Men	900	90 %
Woman	100	10 %
Surgery		
Prostatectomy	400	40 %
Nephrectomy	200	20 %
Radical cystectomy	80	8 %
Resection of bladder tumor	250	25 %
Uretero-rensoscopy	70	7 %
ASA Type		
ASA 2	575	57.5 %
ASA 3	268	26.8 %
ASA 4	157	15.7 %
Age both genders	53±15	100 %

We found 759 (75.9%) patients were having normal echo report, 148 (14.8%) mild change in ejection fraction (EF >40%), 58 (5.8%) with moderate heart dysfunction, (EF30-40%) and 23 (2.3%) with severe cardiac dysfunction (EF≤25 %), whereas only 12 (1.2%) had some very significant changes as shown in Table-II.

Table-II: Frequency and correlation of changes found in preoperative echocardiography with MET score. (N=1000)

Electrocardiogram results Score	MET Score	Ejection Fraction	Number of Patients	Percentages
Normal	≥ 7	≥50	759	75.9%
Mild hypokinesia and low EF	5-7	≥45	148	14.8%
Moderate Ischemic changes/low EF	1-4	30-40	58	5.8 %
Severe Ischemic changes / low EF	1-4	≤25	23	2.3%
Others (CABG advised)	1-4	≤20	12	1.2%
Total			1000	100%

It is clear from the table-II above that MET scoring has correlation with the illness of patient and 2D echocardiography findings. Echo report revealed regional wall motion abnormalities, hypokinesia of different portions of heart, dilated cardiomyopathies, hypertrophy of heart chambers, valvular heart problems, rhythm abnormalities, and pacemakers. However it was clear that most of the patients with past history

of cardiac illness, low MET score, ECG changes, and drug history will be having abnormal echocardiography as evident in Table-II. Table-III, shows the relationship between echocardiography and the decisions made by the anesthetist before anesthesia and surgery. By comparing this data we have found that echocardiography has a significant role in management of only high risk patients and least role in patients with normal MET score.

Table-III: Anesthetic management following echocardiographic report (N=1000)

Total cases N 1000 (100%)	Normal Anaesthesia n(%)	Vigilance monitoring, extra drugs n(%)	Anaesthesia management changed n(%)	Surgery was postponed n(%)
Echo did not change plan	759 (75.9%)	0	0	0
Echo changed the plan	0	148 (14.8%)	65 (6.5%)	0
Surgery was rescheduled	0	0	0	28 (2.8%)

DISCUSSION

According to the ACC/AHA guideline, patients with minor clinical predictors do not require noninvasive testing unless they have poor functional capacity and are undergoing a high-risk procedure^{12,13}. The similar findings are found in our study where patients have low functional capacity and on investigation had compromised heart in majority of cases (Table-II). All these patients were advised echocardiography in pre anaesthesia check-up due to their underlying illness, pre-existing ischemic heart disease, previous angioplasty, cardiac bypass, bed ridden, old age cases and history of shortness of breath. Young patients having cardiac murmur and history of valvular heart disease were also advised to undergo this test. Moreover the physical efficiency in terms of MET (metabolic equivalent) score was determined for each patient and their final anaesthesia fitness was given after reviewing the echocardiography report. AHA and ACC had recommended invasive cardiac testing in high risk surgery whereas we are focusing on non-cardiac surgery in patients with poor functional capacity. The utility of 2D echo in complex non cardiac surgery in high-risk patients is established^{14,15}. Here our concern is those patients having good functional capacity and undergoing 2D echo without properly eliciting functional capacity which is emphasized by all guidelines^{16,17}.

Therefor we performed a single center study to find the role of preoperative echocardiography in pre anesthesia evaluation in non-cardiac surgery patients while determining MET score for each patient. There was some correlation between poor MET Score and the low ejection fraction on echocardiography report which was found in majority of cases. Majority of patients (75.9%) had normal 2D echo report and had good MET score (≥ 5 -7). Moreover it is clear from table 2 that the patients having low MET score (≤ 4) had poor ejection fraction on 2 D echo which is the similar finding to other studies¹⁸. The same practice of not advising 2D echo in all patients having good physical efficiency in terms of MET score is the criteria followed in many centers

for assessment of patients^{19,20}. It is much emphasized that the test has least predictive values in resting heart. Our focus was to accurately determine patient's MET score obtained by history in the anesthesia preoperative evaluation and asking 2D echocardiography report where indicated. This helped us in avoiding undue delays in scheduling surgery lists by determining physical efficiency of patients presenting for pre anesthesia.

CONCLUSION

Although, patient's history and MET score determines the perioperative risk without history of cardiac illness whereas 2D echocardiography did not provide any help but where indicated it is a useful investigation.

AUTHOR'S CONTRIBUTION

Ahmad M: Conceived idea, Designed research study, Manuscript writing, Data analysis.

Wajahat F: Revision of the work, Proof reading, Manuscript writing.

Wajahat A: Critical revision of manuscript, Grammar and spelling mistakes.

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