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Safety of performing transoesophageal echocardiography in patients with oesophageal varices

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ABSTRACT

Introduction Oesophageal varices (EV) are one of the complications of liver cirrhosis that carries a risk of rupture and bleeding. The safety of performing transesophageal echocardiography (TEE) in patients with pre-existing EV is not well described in literature. Therefore, this retrospective study has been conducted to evaluate the safety of preforming TEE in this group of patients.

Methods The study population was extracted from the 2016 Nationwide Readmissions Data using International Classification of Diseases, Tenth Revision, Clinical Modification/Procedure Coding System for EV, TEE and in-hospital outcomes. Study endpoints included in-hospital all-cause mortality, hospital length of stay, postprocedural gastrointestinal bleeding and oesophageal perforation.

Results A total of 81 328 discharges with a diagnosis of EV were identified, among which 242 had a TEE performed during the index hospitalisation. Mean age was 58.3 years, 36.6% female. In comparison to the no-TEE group, the TEE group was associated with comparable in-hospital all-cause mortality (7.0% vs 6.7%, p=0.86) and bleeding (0.9% vs 1.1%, p=0.75); however, TEE group was associated with longer hospital stay (14.9 days vs 6.9 days, p<0.01). There were no reported oesophageal perforations.

Conclusions TEE is not a common procedure performed in patients with pre-existing EV. TEE seems to be a safe diagnostic tool for evaluation of heart diseases in this group of patients.

Key messages

What is already known about this subject?
► The safety of preforming transoesophageal echocardiography (TEE) among patients with oesophageal varices (EV) is not widely described in medical literature. The most recent practice guidelines consider the presence of EV as a relative contraindication for preforming TEE. As in most clinical situations, physicians need to weigh the risk versus benefits of such diagnostic procedures.

What does this study add?
► This study showed that performing TEE on hospitalised patients with pre-existing EV was not associated with increased in-hospital mortality or complications such as gastrointestinal bleeding or oesophageal perforation.

How might this impact on clinical practice?
► The results of this study may help clinicians in determining the risk versus benefit of preforming TEE among patients with known EV. The study will encourage preforming prospective randomised clinical trials to further support these findings.

performing TEE in patients with EV.[8 9] Therefore, the current study was conducted to evaluate the safety of preforming TEE in this group of patients.

1.INTRODUCTION

The presence of oesophageal varices (EV) is common in patients with hepatic cirrhosis, and is estimated to occur in 60% of patients with decompensated liver disease and 30% of patients with compensated liver disease.[1 2] Bleeding EV is considered a serious complication with a high mortality rate that ranges from 30% to 50% in the first 6 weeks following an initial bleed.[3] The risk of variceal bleeding is directly proportional to the size of the varices and the severity of liver dysfunction.[4]

Concurrence of cardiovascular diseases among patients with liver cirrhosis is not uncommon, with coexistence of diseases such as alcohol-induced dilated cardiomyopathy, infective endocarditis secondary to intravenous drug use and multiple cardiac arrhythmias.[5–7] Among such patients, transoesophageal echocardiography (TEE) may be indicated to confirm the diagnosis or evaluate the severity of various cardiac pathologies. There are limited data in the literature evaluating the safety of

2.METHODS
2.1.Data source
The Nationwide Readmissions Data (NRD) is a part of the Healthcare Cost and Utilization Project (HCUP) databases, which has been developed through a federal-state-industry partnership and sponsored by the Agency for Healthcare Research and Quality. HCUP databases include the largest collection of deidentified longitudinal hospital care data in the USA, with all-payer and encounter-level information. The NRD is a unique data subset designed to support various types of analyses including readmission rates with safeguards to protect the privacy of individual patients, physicians and hospitals. It contains more than a hundred clinical and non-clinical variables for each hospital stay, including a verified patient linkage number for linking hospital visits for the same patient across hospitals, International Classification of Diseases, Tenth Revision, Clinical Modification/Procedure

Coding System (ICD-10-CM/PCS) for principal and secondary procedures, and diagnoses (including comorbidities and complications), age, gender, length of stay (LOS) and others.[10–12]

2.2.Study cohort

The ICD-10-CM/PCS codes were used to search discharges with a diagnosis of EV in the 2016 NRD; TEE, comorbidities, in-hospital postprocedural complications and endpoints of interest were subsequently extracted. The 2016 NRD is the latest NRD data set that has been released to date. To differentiate postprocedural complications from chronic conditions, the 2016 NRD has a present-on-admission indicator for chronic conditions that present on admission. We also used the ICD-10-CM codes used in the Elixhauser comorbidity index to identify comorbid conditions and the ICD-10-CM specific postprocedural complications were used to postprocedural complications (online supplementary table 1).[11] EV included primary and secondary varices with or without haemorrhage. We excluded patients with liver disease without EV. The NRD also excludes discharges with missing age, missing or questionable linkage numbers or from hospitals with more than 50% of their discharges excluded because of these criteria. This is because patients treated in these hospitals may not be reliably tracked over time. All HCUP recommendations and best practices to use the HCUP data sets highlighted by Khera *et al* were followed.[10 13]

2.3.Study endpoints

The primary endpoints included in-hospital all-cause mortality, index hospital LOS, postprocedural gastrointestinal bleeding and oesophageal perforation. The 2016 NRD reports in-hospital all-cause deaths and mean LOS. The other endpoints were assessed during the index hospitalisation using specific ICD-10 codes for in-hospital postprocedural complications (online supplementary table 1). Postprocedural gastrointestinal bleeding was defined as any intraprocedural or postprocedural bleeding or haematoma in the digestive system, haematemesis, melena and/or postprocedural anaemia regardless of the site in the digestive system or severity of the bleeding. Oesophageal perforation included accidental laceration, puncture or perforation of the digestive system during a procedure.

2.4.Statistical analysis

Statistical Analysis System (SAS) software V.9.4 (TS1M4, SAS Institute) was used for the statistical analysis which was performed on the unweighted (ie, actual) number of discharges. Pearson's χ^2 of independence test was used to compare categorical variables of the endpoints, while the unpaired-sample t-test was used to compare continuous variables. The multivariable logistic regression models were used to identify predictors of in-hospital all-cause mortality of the EV-TEE group by calculating the adjusted ORs and 95% CIs for each baseline characteristic and common comorbidities.[14 15] A two-tailed p value <0.05 was used for statistical significance.

3.RESULTS

In the 2016 NRD database, there were around 17.2 million discharges. There were 81 328 discharges with a diagnosis of EV, only 0.3% (242 patients) had TEE during the index hospitalisation. The mean age of the overall cohort was 58.3 (±12.6) years, 36.6% female. Almost all of the patients had chronic liver disease. History of hypertension, diabetes mellitus, chronic kidney disease, alcoholism and active smoking were the most common comorbidities. The EV-TEE group were 4 years older

Table 1 Demographics, baseline characteristics and comorbidities of the oesophageal varices (EV) with and without transoesophageal echocardiography (TEE) groups

	EV-TEE	EV without TEE	P value
Patients, n	242	81 086	–
Mean age in years (±SD)	62.0 (11.8)	58.2 (12.6)	<0.01
Female	34.3%	36.6%	0.45
Chronic liver disease	100%	99.3%	0.19
Alcoholism	23.6%	40.6%	<0.01
Chronic peptic ulcer disease	7.4%	7.1%	0.83
Bacteraemia	8.3%	0.9%	<0.01
Infective endocarditis	16.1%	0.5%	<0.01
Hypertension	60.3%	50.0%	<0.01
Diabetes mellitus	47.1%	34.6%	<0.01
Hyperlipidaemia	29.3%	17.6%	<0.01
Chronic kidney disease	26.5%	17.4%	<0.01
Chronic coronary artery disease	27.7%	12.5%	<0.01
Congestive heart failure	31.4%	10.0%	<0.01
Valvular heart disease	30.2%	4.6%	<0.01
Peripheral vascular disease	12.0%	4.6%	<0.01
Chronic pulmonary disease	20.3%	16.7%	0.13
Obesity	17.4%	13.5%	0.08
Long-term anticoagulation	7.0%	3.0%	<0.01
Smoking	37.6%	40.9%	0.29
Abnormal coagulation profile	2.5%	1.8%	0.41
Thrombocytopenia	43.0%	39.1%	0.22

than the no-TEE group, and had a higher rate of bacteraemia, infective endocarditis, baseline coronary artery disease, congestive heart failure, valvular heart disease, chronic kidney disease and other cardiovascular comorbidities. Both EV-TEE and no-TEE groups were comparable in terms of gender and other comorbidities such as chronic pulmonary disease, peptic ulcer disease, obesity, long-term anticoagulation status, thrombocytopenia and abnormal coagulation profile (table 1).

In comparison to the no-TEE group, the TEE group was associated with comparable in-hospital all-cause mortality (7.0% vs 6.7%, p=0.86, 95% CI 0.64 to 1.72, OR 1.04) and bleeding (0.9% vs 1.1%, p=0.75); however, TEE group was associated with longer hospital stay (14.9 days vs 6.9 days, p<0.01, 95% CI 13.01 to 13.98). There were no reported oesophageal perforations. In multivariable logistic regression, the presence of infective endocarditis, congestive heart failure, chronic kidney disease and peripheral vascular disease was predictive of increased in-hospital all-cause mortality in the EV-TEE group (online supplementary table 2).

4.DISCUSSION

In this 2016 NRD-based retrospective study, only 0.3% of patients admitted with a diagnosis of EV had TEE during the index hospitalisation. The EV-TEE group had a higher baseline cardiovascular comorbidity, including valvular heart diseases, bacteraemia and infective endocarditis, which are the major indications for TEE.[16] This study showed that performing TEE on hospitalised patients with pre-existing EV was not associated with increased in-hospital mortality or complications such as gastrointestinal bleeding or oesophageal perforation.

These findings indicate the safety of performing TEE in patients with pre-existing EV and are consistent with recent

meta-analysis, which demonstrated an overall low risk of complications, including TEE-related bleeding, and perforation.[17 18] On the other hand, the TEE group was associated with 8 days longer LOS. This could be attributed to a more critically ill population with more comorbidities (such as bacteraemia, infective endocarditis) that required TEE for further diagnostic workup.

Despite the invasive nature of the procedure, the safety of TEE has been generally well established with low risk of major complications reported in medical literature.[19] Perforation of the upper gastrointestinal tract during the procedure has been reported in both the adult and paediatric population, with an estimated incidence rate of 0.01%–0.04%.[20 21] In addition, the overall incidence of major bleeding complications after TEE has been estimated to range from 0.02% to 1.00%.[22] The infrequency of the aforementioned complications has limited the identification of specific predictors of TEE-associated morbidity and mortality in the current literature.[19]

Previous clinical studies conducted to evaluate the safety of TEE generally excluded patients with known EV, due to a presumed association of increased risk of gastrointestinal bleed with blind passage of the TEE probe.[22 23] Furthermore, presence of EV is often reported in medical literature as a relative contraindication to performing TEE.[24 25] However, the current study results do not demonstrate an increased risk of complications with TEE in this group of patients and add more body of evidence to current literature about the safety of TEE in the presence of EV.

4.1.Limitations

As every other study, this study has limitations. This is a retrospective study, the EV-TEE group was relatively small; however, most of the available evidence is based on small case series and small studies. Moreover, the specific grade of EV, severity of thrombocytopenia and degree of coagulopathy could not be obtained from the database. Long-term outcomes could not be assessed as well.

5.CONCLUSIONS

TEE is currently not a common procedure performed in patients with pre-existing EV. TEE seems to be a safe diagnostic tool for evaluation of heart diseases in this group of patients. More randomised clinical trials are needed to support the results of this study.

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