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**Prognostic value of liver scoring systems in predicting early outcomes after pericardiectomy:
a single-center retrospective study**

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Abstract

Pericardiectomy for constrictive pericarditis remains a high-risk operation, and early outcomes are inadequately predicted by conventional cardiac risk models despite the high prevalence of chronic hepatic congestion in this population. We performed a retrospective observational analysis of 104 consecutive patients undergoing isolated pericardiectomy between 2010 and 2024 to determine whether established hepatic scoring systems [Child-Pugh, Model for End-Stage Liver Disease (MELD) and Model for End-Stage Liver Disease-Sodium (MELD-Na)] predict early mortality and major postoperative morbidity. Preoperative clinical and biochemical variables were used to derive the hepatic scores. The primary endpoint was 30-day mortality; the secondary endpoint was new postoperative renal-replacement therapy. Thirty-day mortality was 4.8% (5/104). Patients were classified as Child-Pugh A in 66 (63.5%), B in 35 (33.7%), and C in 3 (2.9%), with corresponding mortalities of 1.5%, 2.9%, and 100% ($p < 0.01$ for trend). Discrimination for 30-day mortality was strong for Child-Pugh [area under the receiver operating characteristic curve (AUC) 0.89, 95% confidence interval 0.73-1.00], MELD (0.85, 0.60-0.98), and MELD-Na (0.83, 0.55-0.97), whereas EuroSCORE II showed no meaningful predictive ability (AUC $\approx$ 0.51). Hepatic dysfunction quantified by Child-Pugh and MELD-based scores is a strong predictor of early mortality after pericardiectomy and outperforms conventional cardiac risk models in this cohort. Incorporation of structured hepatic assessment into preoperative risk stratification may improve perioperative planning and patient counseling; however, the small number of Child-Pugh C patients and the retrospective single-center design necessitate validation in larger prospective cohorts.

Key words: liver scoring, constrictive pericarditis, pericardiectomy, EuroSCORE II, MELD score, Child-Pugh class.

Introduction

Constrictive pericarditis (CP) is an uncommon but serious sequela of chronic pericardial inflammation that impairs ventricular filling and produces right-sided heart failure and systemic venous congestion. Sustained elevation of central venous pressure causes chronic hepatic congestion that may progress to fibrosis and, ultimately, cardiac cirrhosis—a recognised hallmark of advanced disease in which congestive hepatopathy reflects the chronicity and severity of constriction [1].

Pericardiectomy remains the definitive treatment, offering haemodynamic relief and symptom improvement when medical therapy fails. Despite advances in surgical technique and perioperative care, early mortality remains substantial: a contemporary meta-analysis of 2,114 patients reported an operative mortality of 6.9% [2], and pooled series spanning several decades describe comparable figures [3]. Long-term survival is determined largely by the underlying aetiology and the patient's overall clinical condition [4,5].

Most preoperative risk-stratification tools, including EuroSCORE II [6], were developed in general cardiac surgery populations and do not incorporate hepatic reserve, leaving a critical gap in prognostic evaluation for CP, in which the liver bears the burden of chronic venous congestion [7]. Previous work has suggested that liver-specific indices, particularly the Child-Pugh and MELD scores, may better capture this risk: the MELD score has been reported as a strong predictor of mortality after pericardiectomy [8]. However, data from UK centres are limited, and the comparative performance of hepatic scores versus traditional cardiac models has not been validated in contemporary practice. We therefore aimed to determine whether the preoperative Child-Pugh, MELD, and MELD-Na scores predict early (30-day) postoperative mortality and major morbidity after pericardiectomy for constrictive pericarditis, and to compare their discrimination with that of EuroSCORE II, in a single-centre UK cohort.

Materials and Methods

Study design and population

We performed a retrospective observational study of all patients who underwent pericardiectomy at a single UK cardiothoracic surgery unit over a 20-year period (2010–2024). The institutional database and patient records were reviewed, and 104 consecutive patients formed the study cohort.

Inclusion criteria

Adult patients (≥ 18 years) undergoing pericardiectomy for constrictive pericarditis of any aetiology, with preoperative laboratory values available within 7 days of surgery.

Exclusion criteria

Concomitant cardiac procedures (e.g. coronary artery bypass grafting or valve surgery); preoperative renal failure requiring chronic dialysis; and pericardiectomy performed for indications other than constriction (e.g. isolated effusive disease). These criteria were applied to focus the analysis on isolated pericardiectomy for constriction.

Variables collected

For each patient we recorded demographics (age, sex), comorbidities (diabetes mellitus), preoperative functional status [New York Heart Association (NYHA) class], left ventricular ejection fraction (LVEF), aetiology of constriction, preoperative biochemistry [bilirubin, albumin, international normalised ratio (INR), creatinine, sodium], EuroSCORE II, and the derived hepatic scores. Operative details and early outcomes were also recorded. The parameters reported in the Results are limited to those listed in Table 1 (baseline characteristics) and Table 2 (early outcomes).

Risk scores

EuroSCORE II was obtained from institutional electronic records (calculated with the EuroSCORE online calculator at the time of surgery) [6]. The Child-Pugh score [9] and the MELD score [10] were calculated for each patient from the last preoperative blood tests and clinical notes, using the originally published definitions; patients were classified as Child-Pugh class A (5–6), B (7–9), or C (10–15). The sodium-adjusted MELD-Na was also computed. Where ascites or encephalopathy was not documented preoperatively, it was assumed to be absent, as overt cases were consistently recorded in the charts. All laboratory values were drawn within 7 days before surgery (most within 24 hours).

Outcomes

The primary outcome was 30-day mortality, defined as death from any cause within 30 days of surgery (including in-hospital and post-discharge deaths up to day 30), ascertained from hospital

records and general-practitioner follow-up. The secondary outcome was new postoperative renal-replacement therapy (RRT), defined as new initiation of haemodialysis or haemofiltration during the index admission.

Operative technique

All patients underwent radical (subtotal) pericardiectomy via median sternotomy, the institution's preferred approach, with phrenic-to-phrenic resection of the anterior, lateral, and diaphragmatic pericardium where safely possible. Cardiopulmonary bypass was used selectively (15 cases, 14%) when the heart was densely adherent or calcified. As a single operative approach was used throughout, the technique was not analysed as a determinant of outcome.

Statistical analysis

Analyses were performed in SPSS (IBM Corp) and R. Patients were stratified by Child-Pugh class. Categorical variables were compared with Fisher's exact test and continuous variables with the Mann-Whitney U or Kruskal-Wallis test. Univariate logistic regression assessed EuroSCORE II (per 1% increment), Child-Pugh score (per point), MELD (per point), and MELD-Na (per point) as predictors of 30-day mortality; results are reported as odds ratios (OR) with 95% confidence intervals. Discrimination was evaluated using receiver-operating-characteristic (ROC) curves and the area under the curve (AUC). Bivariate models combining EuroSCORE II with each hepatic score tested whether the liver scores added independent predictive value. Given the limited number of events, models were restricted to two predictors. A two-tailed $p < 0.05$ was considered statistically significant.

Results

Patient characteristics

Baseline characteristics for the whole cohort and by Child-Pugh class are summarised in Table 1. The cohort ($n=104$) had a median age of 65 years and was predominantly male (79.5%); the most common aetiology was idiopathic chronic pericarditis (>70%). Conventional cardiac risk was low (median EuroSCORE II 1.7%), yet liver function varied widely: 66 patients (63.5%) were Child-Pugh class A, 35 (33.7%) class B, and 3 (2.9%) class C. Class C patients had severe

hypoalbuminaemia, coagulopathy, and hyperbilirubinaemia (median bilirubin $\approx$ 82 vs 22 μ mol/L in class A), together with higher creatinine and impaired left ventricular function.

Early clinical outcomes

Early outcomes by Child-Pugh class are presented in Table 2. Overall 30-day mortality was 4.8% (5/104) and new RRT was required in 3 patients (2.9%). Mortality increased significantly across Child-Pugh classes—1.5% (A), 2.9% (B), and 100% (C) (trend $p<0.01$)—whereas new RRT showed no clear gradient (Figure 1). No perioperative strokes occurred.

Predictive value of hepatic scores versus EuroSCORE II

On univariate logistic regression, the Child-Pugh score (OR 4.03 per point, 95% CI 1.68–9.70, $p=0.002$) and MELD (OR 1.16 per point, 95% CI 1.05–1.29, $p=0.005$) were strong predictors of 30-day mortality, with MELD-Na performing similarly (Table 3). EuroSCORE II was not predictive (OR 1.04, 95% CI 0.88–1.22, $p=0.65$). Discrimination was excellent for the hepatic scores (AUC 0.89 Child-Pugh, 0.85 MELD, 0.83 MELD-Na) and no better than chance for EuroSCORE II (AUC 0.51). In bivariate models, each hepatic score remained an independent predictor while EuroSCORE II did not contribute (Table 4).

Discussion

In this single-centre study of 104 patients undergoing isolated pericardiectomy, preoperative hepatic dysfunction was a strong determinant of early outcome and was more predictive of 30-day mortality than EuroSCORE II. Patients in Child-Pugh class B or C carried a high risk of perioperative death despite low EuroSCORE II predictions. To our knowledge, this is the first study to directly compare hepatic scoring systems with EuroSCORE II for early risk stratification in pericardiectomy, and the first such comparison in a UK cohort.

Our population is consistent with the contemporary literature. The meta-analysis by Tzani and colleagues, which pooled 2,114 patients across 27 studies, reported a predominantly male population (76%), a mean age of 58 years, advanced symptoms (NYHA III/IV in 70.1%), idiopathic aetiology in roughly half of patients, and an operative mortality of 6.9% with a 5-year mortality of 32.7% [2]. Our cohort shows comparable demographics and symptom burden, with a slightly lower early mortality (4.8%), likely reflecting the exclusion of concomitant procedures and the

contemporary, single-centre nature of our practice. While that meta-analysis and earlier series have characterised the overall outcomes of pericardiectomy, they did not stratify early risk by hepatic function; our findings extend this body of work by quantifying the prognostic contribution of liver scores in this specific setting.

The findings align with and extend earlier observations linking hepatic status to outcome. Komoda et al. reported that a Child-Pugh class of B or C was associated with markedly worse long-term survival after pericardiectomy [1]; our data demonstrate that this hazard is already evident at 30 days, with all three Child-Pugh C patients dying within a week of surgery. This pattern is consistent with the concept that advanced congestive hepatopathy identifies an “end-stage” constrictive physiology in which end-organ damage and depleted physiological reserve limit the benefit of surgical decompression. Beyond pericarditis, Suman et al. showed that operative mortality after cardiac surgery rises sharply in patients with Child-Pugh B/C or MELD >13, and that liver scores outperform conventional cardiac risk models [11]—a parallel that our disease-specific results reinforce.

EuroSCORE II was derived in broad cardiac surgical populations and weights factors such as age, ejection fraction, and procedural complexity [6]. In constrictive pericarditis, however, much of the operative risk is driven by the systemic consequences of chronic constriction—cachexia, congestive cirrhosis, renal impairment, and coagulopathy—which EuroSCORE II does not capture. The Child-Pugh and MELD scores, by contrast, directly reflect these features, which explains their superior discrimination here. Including serum sodium (MELD-Na) did not improve prediction, probably because hyponatraemia was uncommon in this diuresed cohort.

Clinically, these results support routine assessment of liver function during the preoperative evaluation of constrictive pericarditis. We suggest calculating the Child-Pugh class and MELD score for all pericardiectomy candidates; a Child-Pugh class C (or markedly elevated MELD) should prompt recognition of very high operative risk, consideration of preoperative optimisation (diuresis and nutritional support), escalation of perioperative care, and, where appropriate, referral to a high-volume centre, given the known volume–outcome relationship for this procedure [12].

Limitations

This study is limited by its retrospective, single-centre design. Only five mortality events occurred, concentrated in Child-Pugh class C (n=3), which limits statistical power and precludes robust

multivariable modelling; the bivariate estimates should therefore be interpreted cautiously given wide confidence intervals. Aetiology was not analysed in detail—tuberculous cases were not separately coded—and long-term survival and quality of life were not assessed. Larger, prospective, multicentre studies are required to validate the magnitude of risk associated with each hepatic score.

Conclusions

In patients undergoing pericardiectomy for constrictive pericarditis, the preoperative Child-Pugh and MELD scores were strongly associated with 30-day mortality and provided superior discrimination to EuroSCORE II, reflecting the impact of congestive hepatopathy on surgical outcome. A Child-Pugh class of B or C should alert clinicians to substantially elevated operative risk. Incorporating structured hepatic assessment into routine preoperative risk evaluation may improve perioperative planning, patient counselling, and outcomes, but these findings require prospective validation in larger cohorts.

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Table 1. Baseline characteristics of the whole cohort and by Child-Pugh class.

Characteristic	Total (n=104)	Class A (n=66)	Class B (n=35)	Class C (n=3)
Age, years	65 (54-73)	65 (54-72)	66 (59-74)	50 (46-63)
Female sex	20.5%	18%	39%	67%
Diabetes mellitus	26%	29%	24%	0%
EuroSCORE II, %	1.7 (0.9-2.3)	1.66 (0.87-2.20)	1.62 (1.14-2.40)	6.02 (3.79-6.50)
LVEF <40%	24%	16%	33%	100%
NYHA class III/IV	68%	45%	70%	100%

Values are % or median (IQR). Class C patients had notably higher EuroSCORE II despite comparable age, reflecting greater comorbidity. LVEF, left ventricular ejection fraction; NYHA, New York Heart Association.

Table 2. Early postoperative outcomes by Child-Pugh class.

Outcome (30-day)	Class A (n=66)	Class B (n=35)	Class C (n=3)
Mortality	1 (1.5%)	1 (2.9%)	3 (100%)
New RRT (dialysis)	2 (3.0%)	1 (2.9%)	0 (0%)

Thirty-day mortality increased markedly with higher class; new RRT was infrequent and showed no clear trend (no class C patient survived long enough to require RRT). RRT, renal-replacement therapy.

Table 3. Univariate logistic regression for 30-day mortality.

Predictor	OR (95% CI)	p-value	AUC (ROC)
EuroSCORE II (per 1%)	1.04 (0.88-1.22)	0.65	0.51
Child-Pugh score (per point)	4.03 (1.68-9.70)	0.002	0.89
MELD score (per point)	1.16 (1.05-1.29)	0.005	0.85
MELD-Na score (per point)	1.16 (1.04-1.29)	0.007	0.83

Child-Pugh and MELD scores were significant predictors; EuroSCORE II was not. The c-statistic (AUC) for each single-predictor model is shown. OR, odds ratio; CI, confidence interval; AUC, area under the curve.

Table 4. Bivariate logistic regression: EuroSCORE II plus a hepatic score.

Model (2 predictors)	EuroSCORE II OR (95% CI)	p (ES II)	Hepatic score OR (95% CI)	p (hep.)
EuroSCORE II + Child-Pugh	0.99 (0.64-1.54)	0.98	3.95 (1.59-9.79)	0.003
EuroSCORE II + MELD	0.94 (0.64-1.39)	0.77	1.17 (1.04-1.32)	0.009
EuroSCORE II + MELD-Na	0.95 (0.64-1.39)	0.79	1.17 (1.04-1.32)	0.011

Each hepatic score remained an independent predictor of 30-day mortality, whereas EuroSCORE II did not contribute. ES II, EuroSCORE II; OR, odds ratio; CI, confidence interval.

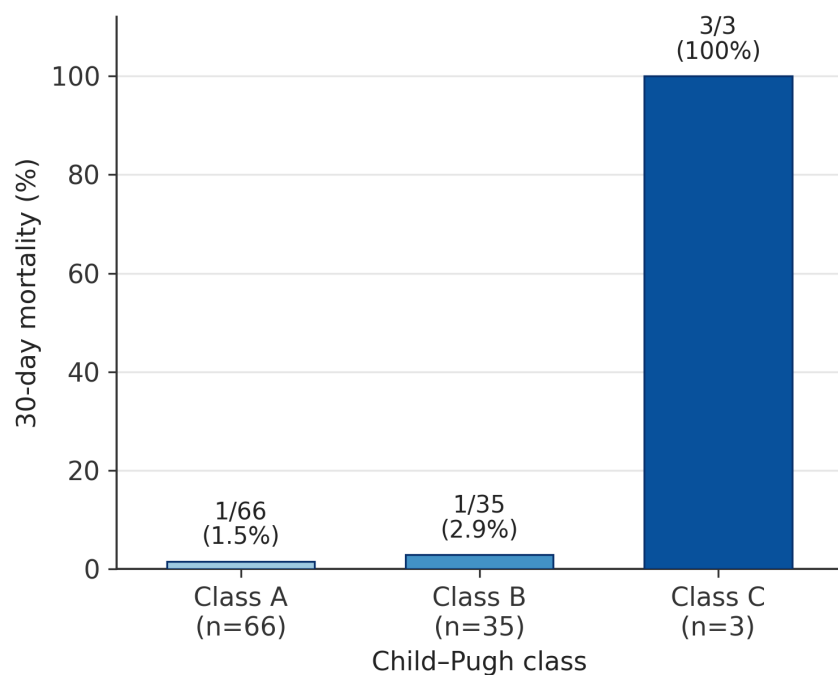


Figure 1. Thirty-day mortality (%) by Child-Pugh class, showing a steep rise from class B to class C. Numerators/denominators above bars indicate deaths out of total in each class; class C comprised only 3 patients, all of whom died.