Risk Score Predicts 30-Day Mortality After Emergency Repair for Symptomatic and Ruptured Aortic Aneurysm

Lianglin Wu, MD,[1 2] Zhili Liu, MD,[2] Yuexin Chen, MD,[2] Yuehong Zheng, MD[2].

[1] Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, China

[2] Peking union medical college hospital, Beijing, China

Abstract

Objective: Ruptured aortic aneurysm is one of the most lethal vascular surgery emergencies, requiring urgent treatment. To date, few risk score system has been developed for ruptured aortic aneurysms to predict post-operative 30-day mortality with high accuracy. The purpose of this study was to construct a new risk score and validate its application prospect.

Methods: Between January 2016 and December 2023, 118 patients were diagnosed as (contained) rupture aortic aneurysms at our center and retrospectively reviewed. All perioperative outcomes were recorded up to 30 days postoperative. Risk factors with statistically significance in multivariable analysis were further included for construction of PUMCH risk score system. Area under receiver operating characteristic curves (AUC) was calculated for comparisons between different risk score systems.

Results: Emergency repair was performed on 107 patients with (contained) rupture aortic aneurysms. Preoperative platelet (PLT) (OR: 0.986; p = 0.025), lactic acid (Lac) (OR: 1.864; p = 0.000) and systolic blood pressure (SBP) (OR: 0.963; p = 0.096) were revealed to be predictive for postoperative 30-day mortality. In PUMCH risk score system, for preoperative SBP, 1 point was assigned for SBP≤90mmHg, 0 for 90 - 119mmHg, -1 for 120 – 139mmHg, -2 for SBP≥140mmHg; for preoperative PLT, 3 points for PLT < 100×10^9, 2 for 100 – 228×10^9, 0 for 229 - 300×10^9, -2 for PLT > 300×10^9; for preoperative Lac, -1 point for Lac≤1.6 mmol/L, 0 for 1.6 – 2.3mmol/L, 4 for Lac≥2.4 mmol/L. The total score in PUMCH risk score system ranges from -5 to 8 points, higher score accompanied with higher risk for postoperative 30-day mortality (Table). Traditional and modified Harborview Risk Score (tHRS, mHRS) were included for the accuracy evaluations. PUMCH risk score has the highest value (AUC = 0.9129), followed by tHRS (AUC = 0.7434) and mHRS (AUC = 0.7235) (Figure).

Conclusion: PUMCH risk score system was proved to be applicable in emergency condition for

(contained) rupture aortic aneurysms, which may help clinical decision making in the future.

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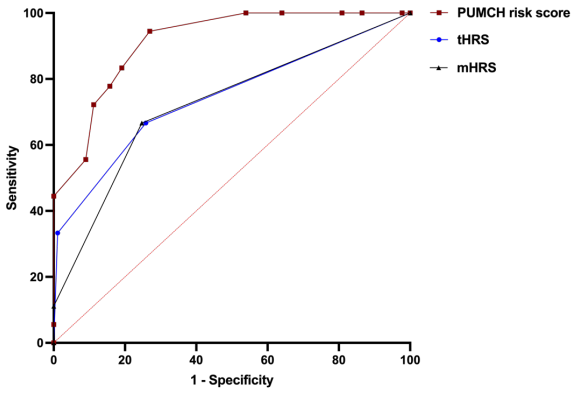
Table Post-operative 30-day mortality by PUMCH risk score

Score	Estimated (%)	Score	Estimated (%)
-5	0.03	2	17.15
-4	0.08	3	34.51
-3	0.19	4	57.29
-2	0.49	5	77.35
-1	1.24	6	89.69
0	3.09	7	95.68
1	7.52	8	98.26

Figure Receiver operating characteristic (ROC) curves comparing the PUMCH risk score, traditional (tHRS) and modified (mHRS) Harborview Risk Score.



	AUC	95% CI	P value
PUMCH risk score	0.9129	0.8514 - 0.9744	< 0.0001
tHRS	0.7434	0.5997 - 0.8871	0.0012
mHRS	0.7235	0.5840 - 0.8629	0.0029

PUMCH risk score: for preoperative SBP, 1 point was assigned for SBP≤90mmHg, 0 for 90 - 119mmHg, -1 for 120 – 139mmHg, -2 for SBP≥140mmHg; for preoperative PLT, 3 points for PLT < 100×109, 2 for 100 – 228×109, 0 for 229 - 300×109, -2 for PLT > 300×109; for preoperative Lac, -1 point for Lac≤1.6 mmol/L, 0 for 1.6 – 2.3mmol/L, 4 for Lac≥2.4 mmol/L.

Traditional Harborview Risk Score (tHRS): the tHRS assigns 1 point for each of the following variables: age >76 years, pH <7.2, creatinine >2 mg/dL, and any episode of severe hypotension (systolic blood pressure <70 mmHg).

Modified Harborview Risk Score (mHRS): the mHRS assigns 1 point for each of the following variables: age >76 years, INR >1.8, creatinine >2 mg/dL, and any episode of severe hypotension (systolic blood pressure <70 mmHg).