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XIANGYA HOSPITAL CENTRAL SOUTH UNIVERSITY

A machine learning model for predicting prognostic survival status of patients with meningiomas based on MRI radiomics and clinical features

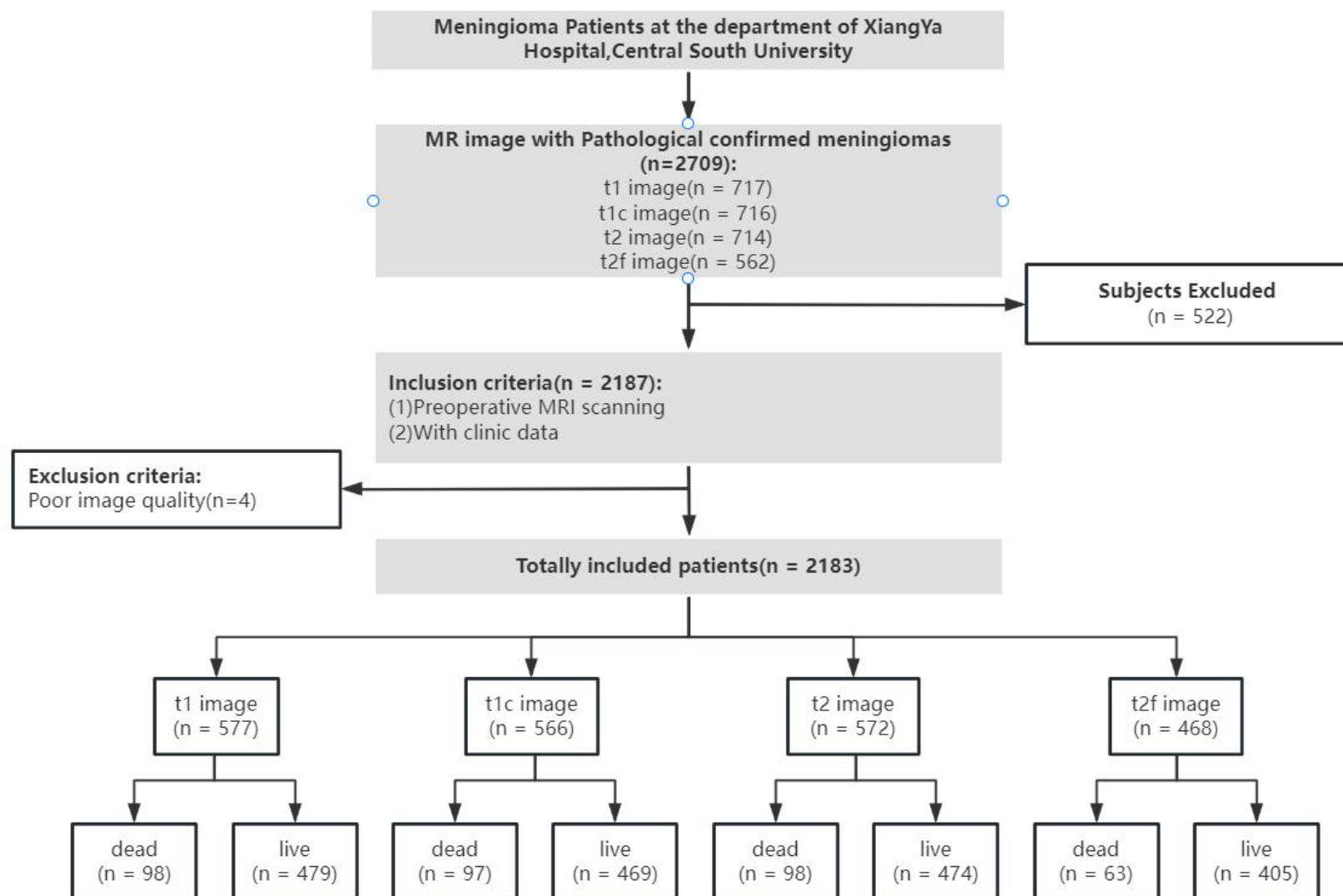
付钰

中南大学湘雅医院药学部

2024-10-27



Sample screening process



Study framework



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Feature Extraction

Feature Selection

Model Building

Clinical information

Clinical baseline data

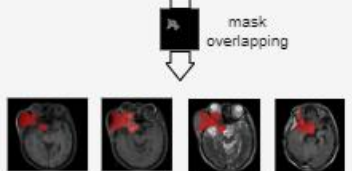
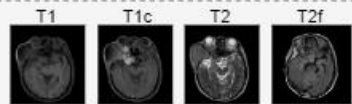
Preoperative PS, Extent of resection,
Postoperative radiotherapy, Tumor location,
Number of tumors, Tumor size, Ki-67, Age,
Gender, Medication history

Inspection data

WBC, RBC, HGB, PLT, HCT, NE#, LY#, EO#, BA#,
MO#, NE, LY, BA, EO, MO, MCV, MCH, MCHC, RDW,
PCT, MPV, SG, PH, TP, ALB, GLB, A/G, TBIL, DBIL,
TBA, ALT, AST, BUN, CREA, UA, K, NA, CL, Color,
Clarity, BLD, LEU, GLU, KET, PRO, UBIL, UBG, NIT,
VITC

60 Clinicopathological features

Preoperative MRI radiomics



Pyradiomics

1052 radiomics features

Extracted features

Clinical features

Radiomics features



Univariate analysis

$P < 0.05$

Multivariate analysis

$P < 0.05$

✓ Selected Clinical features

- Clinical baseline data (7)
- Inspection data (14)

✓ Selected radiomics features:

- T1 image (15)
- T1c image (19)
- T2 image (43)
- T2f image (25)



Univariate analysis

$P < 0.05$

LASSO



Clinical Model and Radiomics Model

Selected clinical features
Clinical baseline Inspection

Selected radiomics features
T1 T1c T2 T2f



MLR



Clinical baseline model



MLR



Inspection model



MLR



T1 model



MLR



T1c model



MLR



T2 model



MLR



T2f model



DIABLO



Radiomics model

Predict by
Clinical baseline model

Predict by
Inspection model

Predict by
Radiomics model

Voting

Final predict

High risk

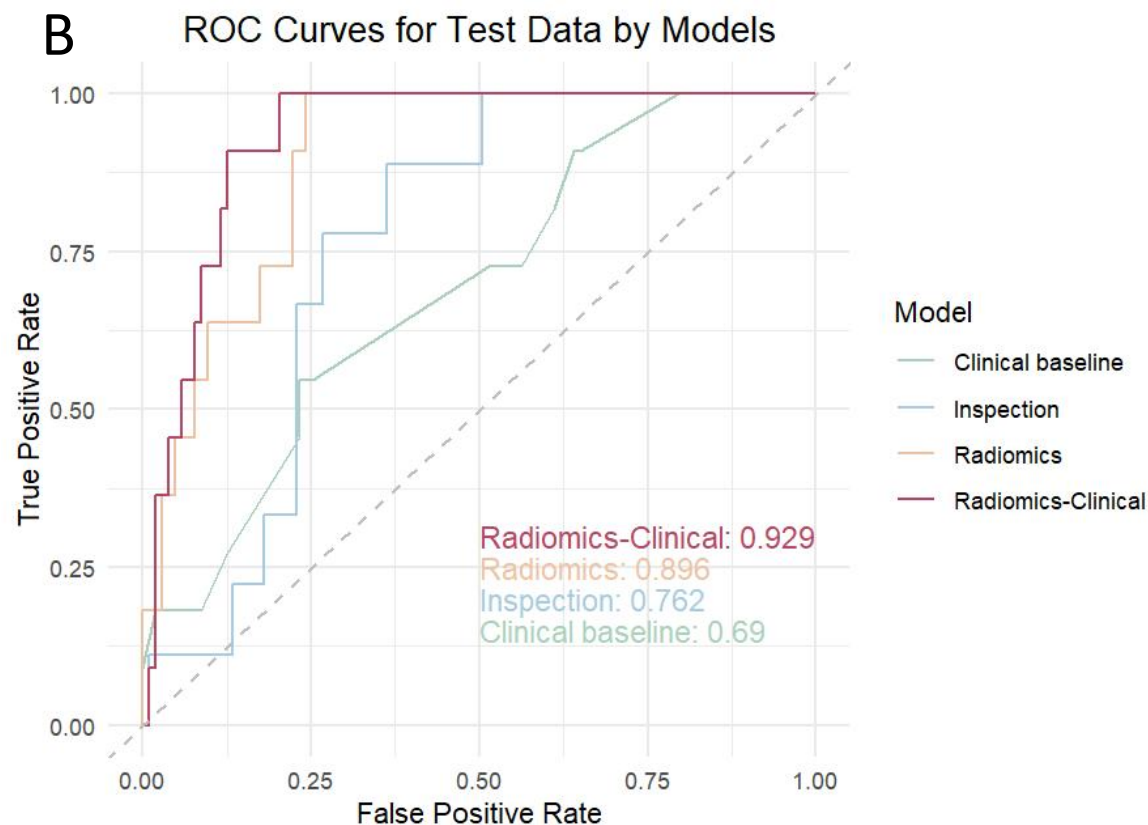
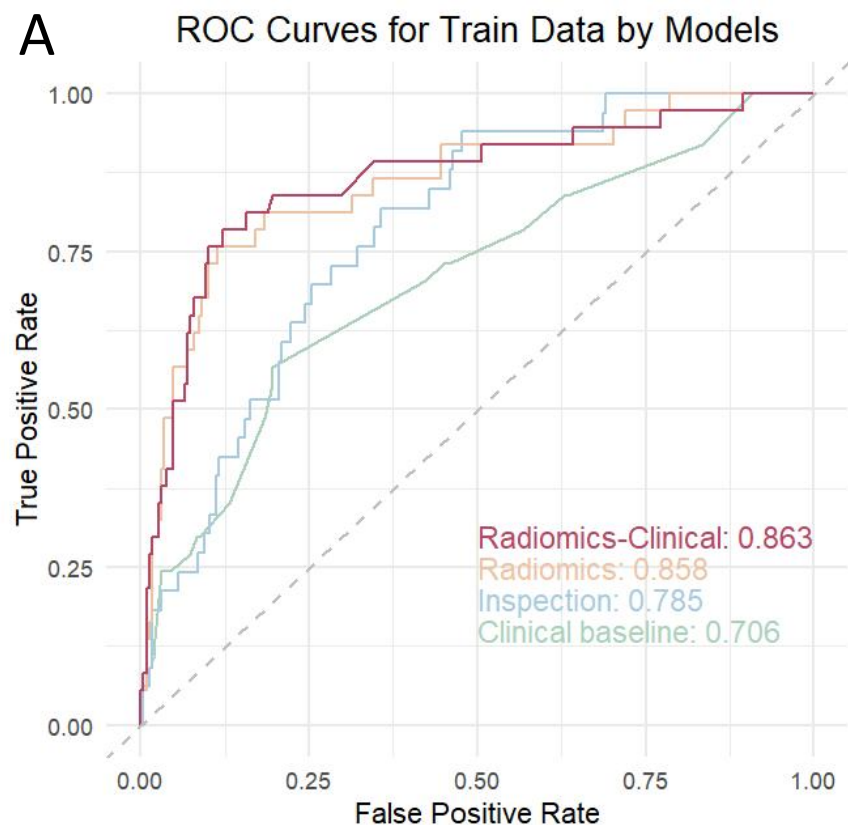
Low risk

Survival analysis by risk group

ROC Curve for Models



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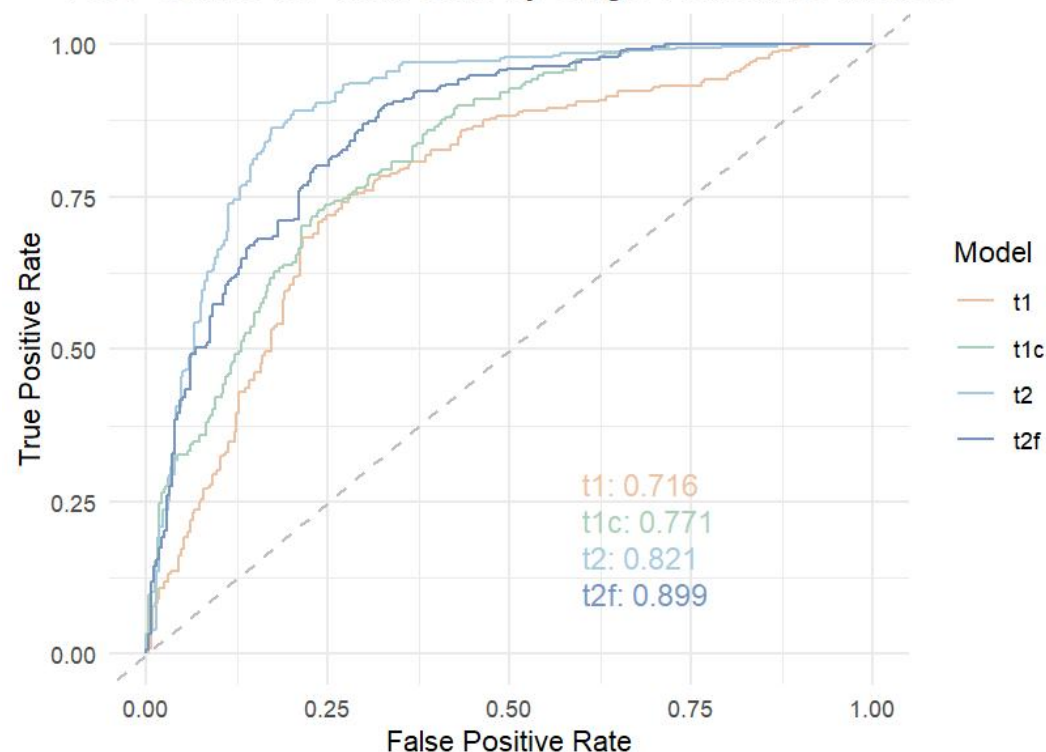


ROC Curve for Single Radiomics Models

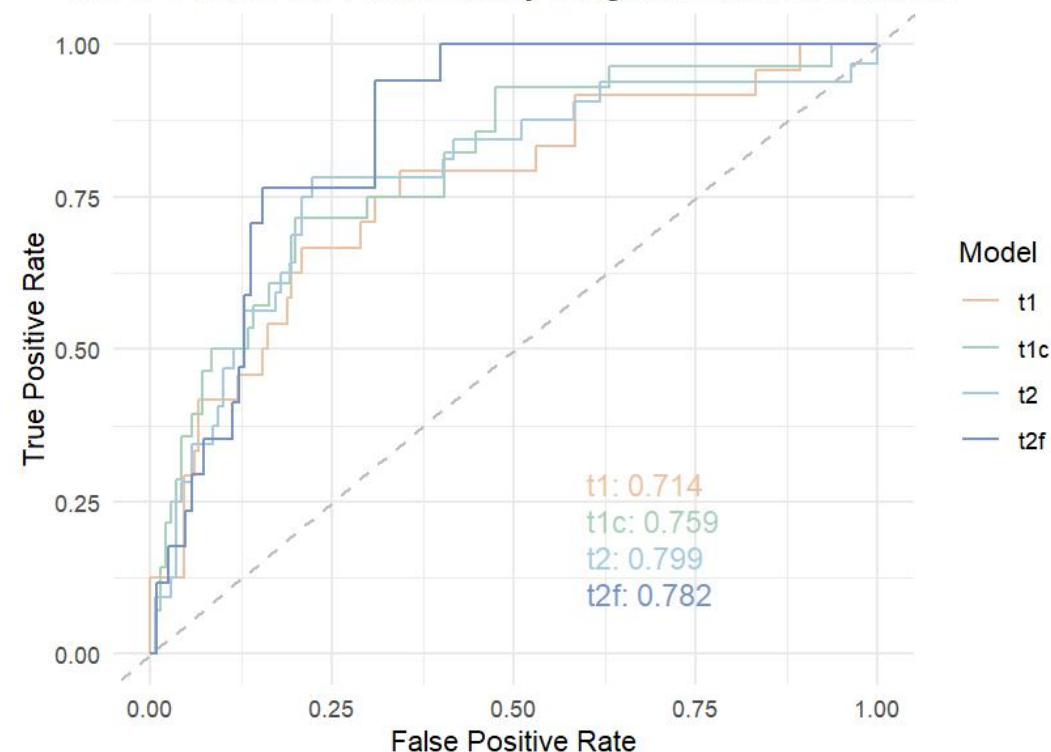


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A ROC Curves for Train Data by Single Radiomics Models



B ROC Curves for Test Data by Single Radiomics Models

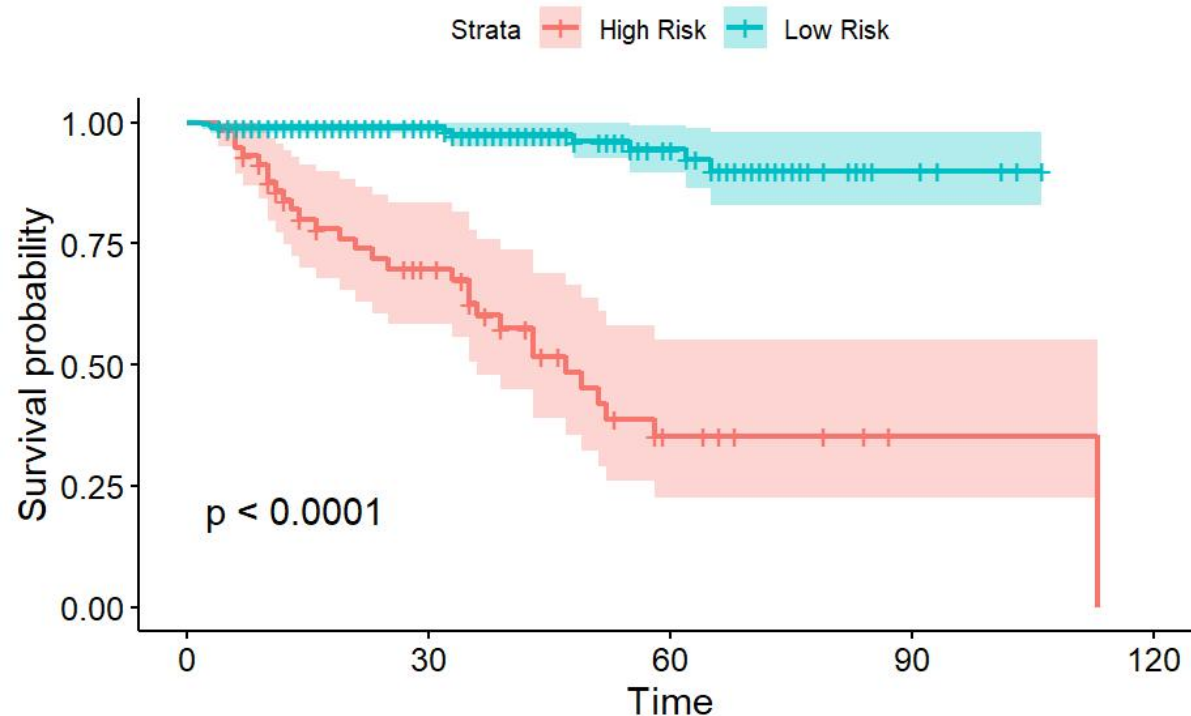


Survival Analysis by Risk Group

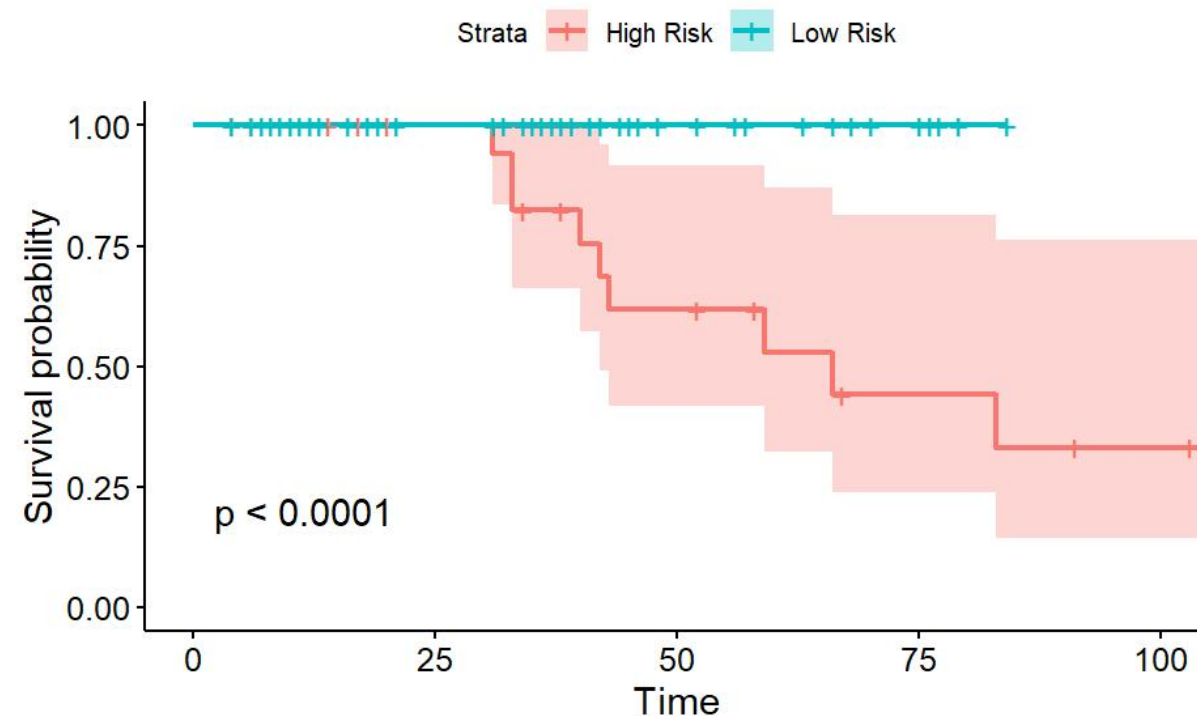


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A Survival Analysis by Risk Group of Train Data



B Survival Analysis by Risk Group of Test Data



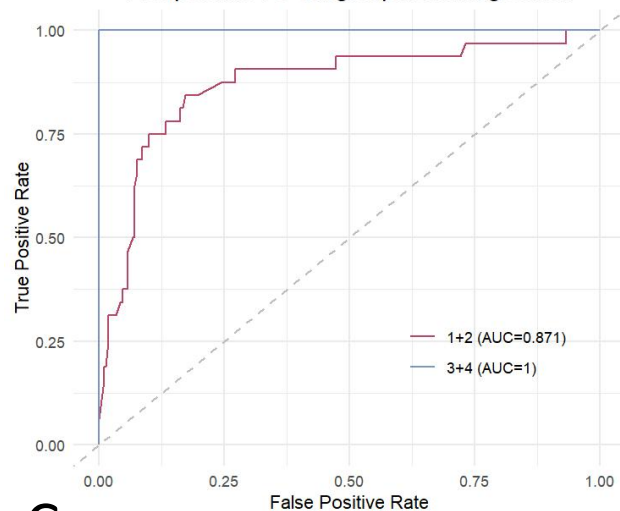
Subgroup analysis



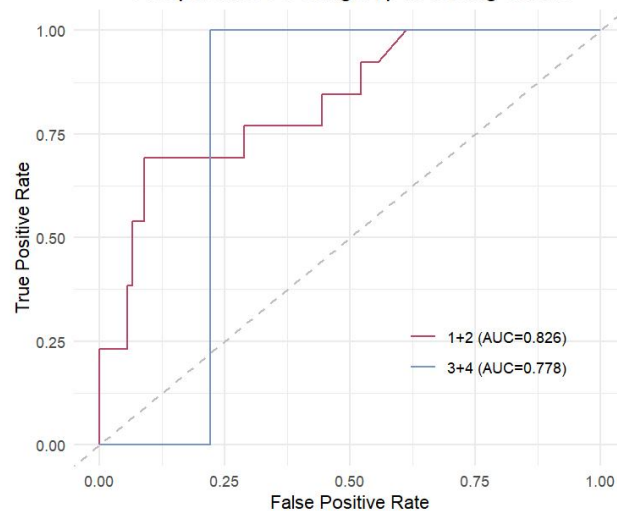
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A

Preoperative PS subgroup in training cohort

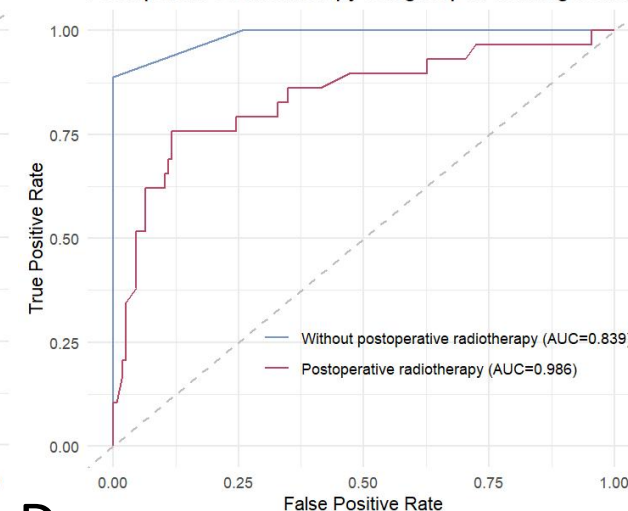


Preoperative PS subgroup in testing cohort

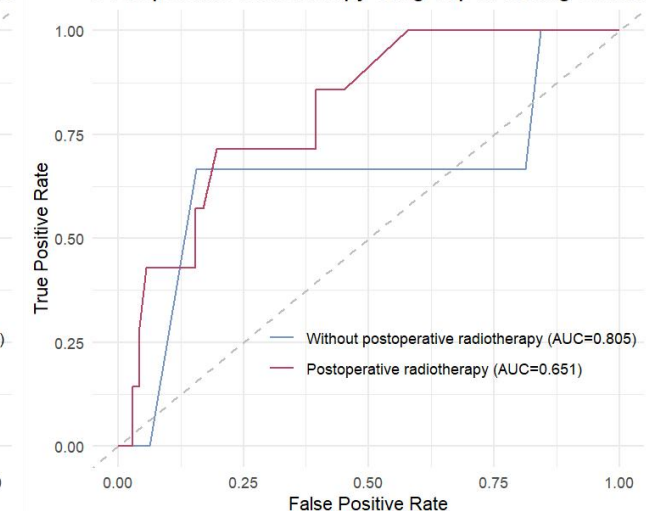


B

Postoperative radiotherapy subgroup in training cohort

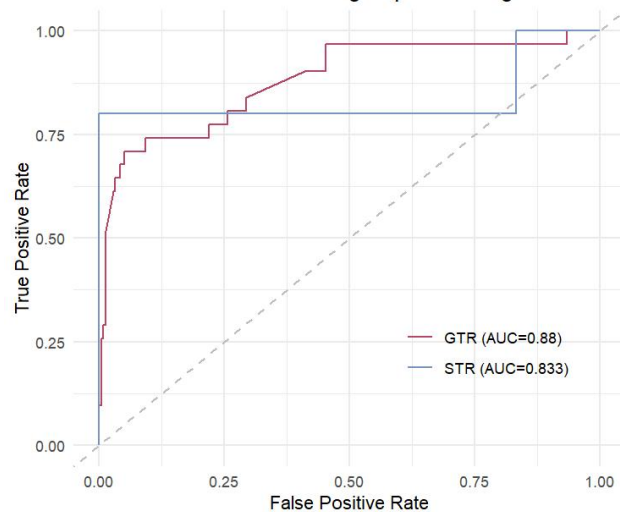


Postoperative radiotherapy subgroup in testing cohort

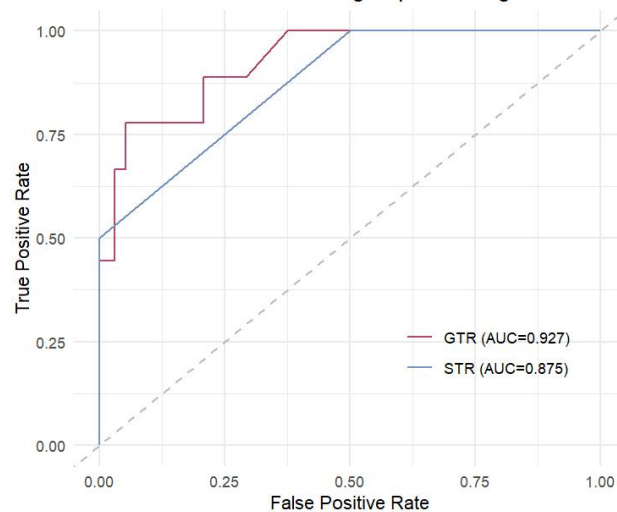


C

Extent of resection subgroup in training cohort

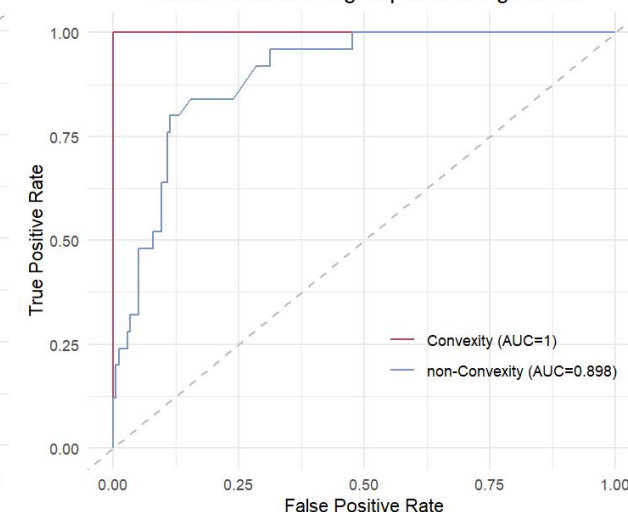


Extent of resection subgroup in testing cohort

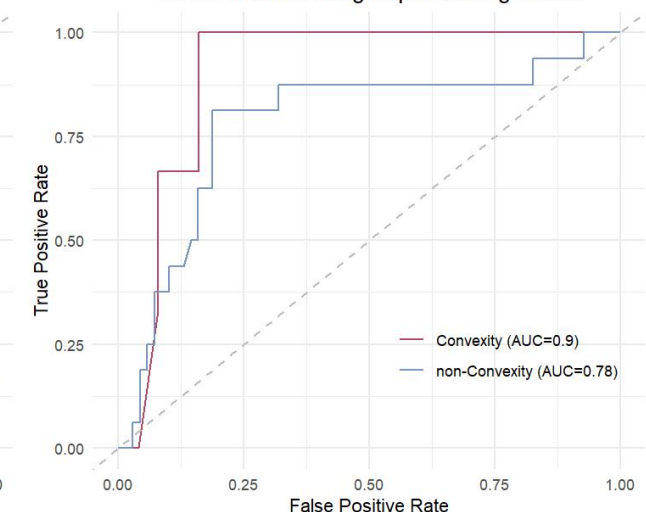


D

Tumor location subgroup in training cohort



Tumor location subgroup in testing cohort



Subgroup analysis



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