

Development and clinical acceptability of a pre-operative risk stratification tool of cerebellar mutism syndrome in children with posterior fossa tumour

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AIMS

Despite identification of numerous pre-operative cerebellar mutism syndrome (CMS) clinical and radiological predictors, a unifying pre-operative risk stratification model for use during surgical consent is currently lacking. The aims of the project are (1) to develop a simple, easy to implemented risk scoring scheme to flag patients at higher risk of post-operative CMS; and (2) to assess its clinical acceptability amongst medical professionals.

METHODS

The combined cohort consists of 89 patients from two major treatment centres (age: 2-23yrs, gender 28M,61F, MRI pathology estimate 36 medulloblastoma, 40 pilocytic astrocytoma, 12 ependymoma, 1 non-committal); 26 (29%) of whom developed post-operative CMS. Post-operative CMS status was ascertained from clinical notes and pre-operative MRI scans, blinded to CMS status, underwent structured evaluation for 21 tightly-defined candidate imaging risk markers based on prior literature. All variables were first screened based upon results from univariate analysis and C4.5 decision tree. Stepwise logistic regression was then used to develop the optimal model, and multiple logistic regression coefficients for the predictors were converted into risk scores.

RESULTS

Univariate analysis identified five significant risks and C4.5 decision tree identified six predictors. The final model (Table 1) has an accuracy of 88.8% (79/89), with a

sensitivity of 96.2% (25/26) and specificity of 85.7% (54/63). Using risk score cut-offs 203 and 238 permit discrimination into low (38/89, predicted probability < 3%), intermediate (17/89, predicted probability 3-52%) and high-risk (34/89, predicted probability \geq 52%), respectively (Figure 1). Three illustrative cases from these categories will be used to collect clinicians' opinion on surgical treatment decision and the acceptability of using this risk stratification for decision making and surgical consenting process. A web-based voting app will be used.

CONCLUSIONS

A risk stratification model for post-operative CMS could flag patients at increased risk pre-operatively and may influence strategies for surgical treatment of cerebellar tumours. Following future testing and prospective validation, this risk scoring scheme may be utilized during the surgical consenting process.

Table 1. Variables in the risk prediction model and risk score

Predictors	Regression coefficient	Adjusted OR (95% CI)*	Risk Score
MRI primary location			0
Cerebellar hemisphere, CH invasion (+) ^	--	1.0	218
Midline/other non-CH sites, CH invasion (-)	21.76	--	183
Midline/other non-CH sites, CH invasion (+)	18.26	--	
MCP invasion and/or compression, bilateral	2.30	10.0 (1.9-51.6)	23
DN invasion	1.98	7.2 (1.6-32.7)	20
Age at imaging > 12.4 yrs	1.96	7.1 (1.2-39.9)	20

^ no CMS event . *Adjusted for all variables included in the model

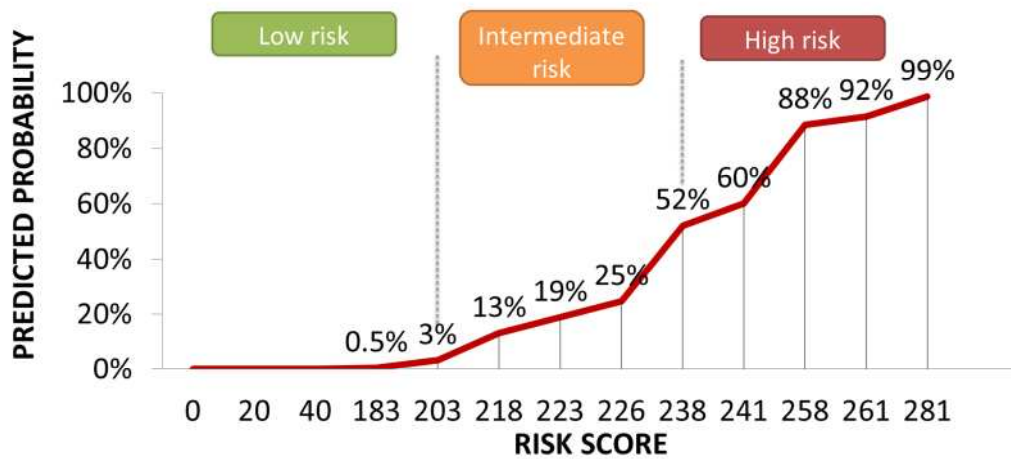


Figure 1. Predicted post-operative CMS probability by risk score