Proposed Grading System for Trigeminal Neuralgia to Predict Outcome Following Microvascular Decompression

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Introduction

Microvascular decompression(MVD) can be an effective intervention for trigeminal neuralgia(TN). Clinical and imaging predictors of surgical outcomes help guide candidate selection and optimize operative results. The purpose of this study was to create and validate utility of a simple preoperative TN grading system to predict long-term pain relief after MVD.

Methods

This retrospective cohort study included consecutive patients suffering unilateral TN who underwent MVD over a 5.5-year period. Exclusion criteria were prior MVD or ablative procedure and lack of follow up. A grading system was formulated using three preoperative characteristics(Table 1). The primary end-point was pain-free status without use of medication. Ability to predict long-term postoperative pain relief was analyzed by multiple regression and assessed by area under the receiver operating characteristic curve(AUC). Clinical utility to predict MVD success and reduce unnecessary surgeries was assessed by decision curve analysis.

Table 1

TABLE 1	
Determination of trigeminal neuralgia grade	
Graded Factor	**Points Assigned**
Trigeminal neuralgia type	
Classic	2
Non-classic	1
Response to carbamazepine/oxcarbazepine	
Response	1
No response	0
Neurovascular compression of trigeminal nerve	
Deformation by artery	2
Contact by artery	1
No arterial contact or venous contact only	0

Grade = sum of the three factors, i.e. (1 or 2) + (0 or 1) + (0, 1, or 2)

Results

One-hundred and nineteen patients were analyzed. Median follow up was 45 months(IQR 19). At last follow up, 77% remained pain-free without medication. Factors predicting surgical success included classic TN(84%), positive response to carbamazepine and/or oxcarbazepine(87%), and presence and nature of neurovascular compression demonstrated on MRI(20% no contact or only venous, 19% arterial contact, 61% arterial deformity). All predictors were significant in both univariate and multivariate analyses($p<0.01$). The composite grading system demonstrated accuracy(Brier 0.11) and good discriminatory ability for prediction of postoperative pain-free status without medications(AUC 0.87, 95% CI 0.80-0.95). Decision-curve analysis demonstrated net reduction of six cases likely to be unsuccessful per 100 patients evaluated with this grading system above a decision threshold of 50%.

Table 2
Long-Term MVD Outcome by TN Grade

Grade	Number of patients	MVD Success (Pain-free without medication) N (%)
I	3	0 (0%)
II	20	4 (20%)
III	31	14 (45%)
IV	47	33 (70%)
V	107	101 (94%)

Long-term pain outcomes for each TN grade. Each successive TN grade demonstrated better long-term outcomes after MVD.

Fig 1
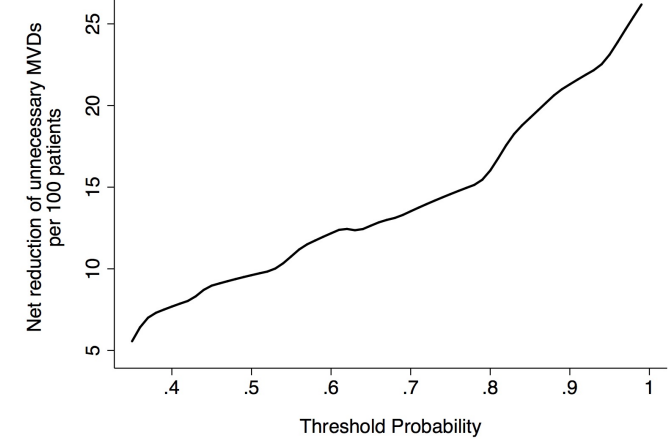
Net reduction of MVDs likely to be unsuccessful by decision threshold probability. MVD success rate standard of the European Federation of Neurological Societies is 80-90%.

Conclusions

Used in conjunction with other clinical information, this grading system is useful for preoperative prediction of both pain-free status without medications and failure following MVD across the spectrum of patients presenting with TN.

Learning Objectives

By the conclusion of this session, participants should be able to:

1) Identify three clinical and imaging factors predictive of pain-free status after microvascular decompression for trigeminal neuralgia.

2) Discuss clinical utility of grading systems and predictive factors in selection of candidates for surgery.

3) Apply a simple grading system to patients with trigeminal neuralgia under consideration for microvascular decompression.