Assessment of Neurovascular Contact Using MR Fusion Imaging in Patients with Trigeminal Neuralgia

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Introduction

Vascular compression of the trigeminal nerve at the root entry zone is a common cause of idiopathic trigeminal neuralgia (TGN) with neurovascular contact noted in 96% of cases with typical TGN and 3% without TGN. We describe our experience with an imaging technique utilizing coregistration and fusion imaging of MR cisternogram and MR angiography sequences in order to pre-operatively predict and grade degree of neurovascular contact on both the affected and non-affected sides in patients with TGN prior to microvascular decompression.

Methods

An IRB-approved, retrospective review of patients that received microvascular decompression for TGN between May 2011 and December 2014 was completed. Fusion of 3D magnetic resonance cisternography and 3D time-of-flight MR angiography acquisitions was performed on a postprocessing workstation using coregistration software (Synapse 3D®, Fujifilm Medical Systems U.S.A., Inc.). Neurovascular compression was graded from 1-4: 1(no contact), 2(contact with no mass effect), 3(mild mass effect), 4(moderate/severe mass effect). Twenty-five patients were included in our analysis. The student's t-test and z-test were used as indicated.

Figure 1a: MR Fusion Image of Patient with Right Trigeminal Neuralgia
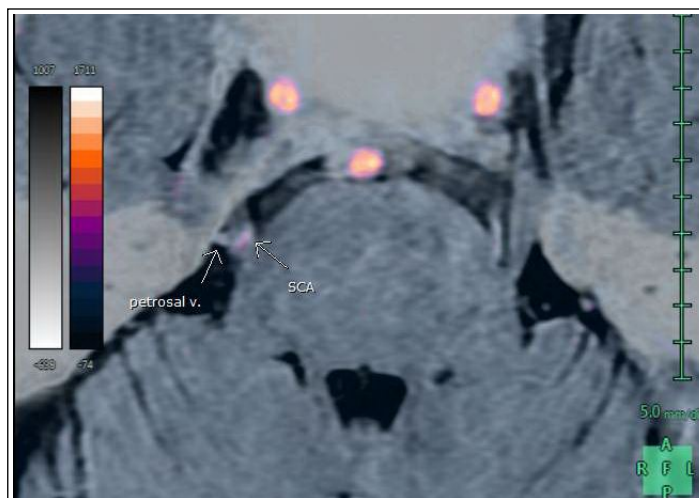

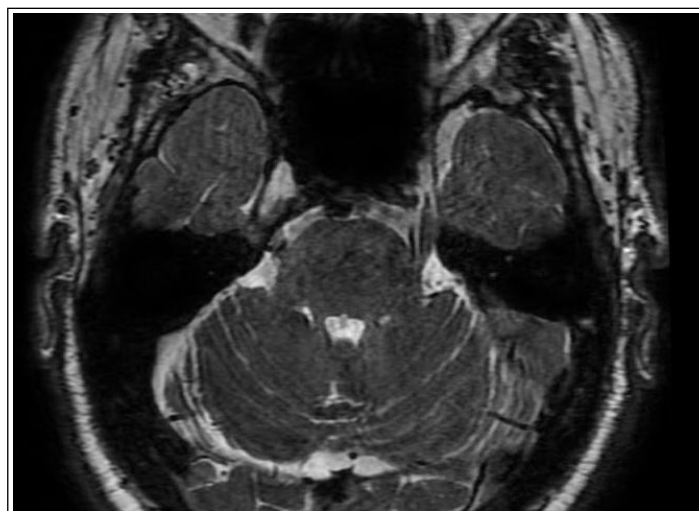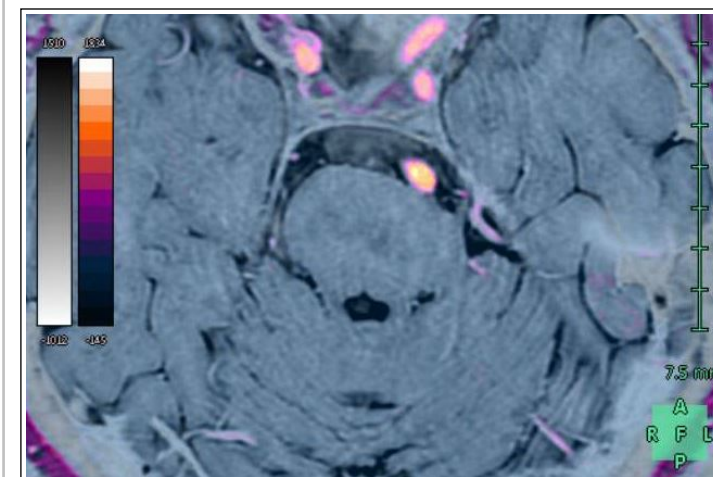
Figure 1b: MR Cisternogram of the same patient

Figure 2: MR Fusion Image of Patient with AICA and petrosal venous compression of the left TGN

Results

MR Fusion imaging predicted vessel impingement in 100% of cases. The asymptomatic side had vessel impingement in 14/25 (56%) cases. Laterality was predicted accurately in 84% of cases: the remaining 4 patients had more severe compression on the asymptomatic side. ***Mean neurovascular compression score on the affected side was 3.2 and 1.9 on the asymptomatic side ($p < 0.01$)***. Trigeminal nerve atrophy was present in 21/25 (84%) on the affected side and 0/25 (0%) on the asymptomatic side ($p<0.01$).

Conclusions

We describe our experience with a novel imaging method that accurately predicts vessel impingement and nerve atrophy. Larger studies are required to validate our technique and grading system with treatment outcomes.