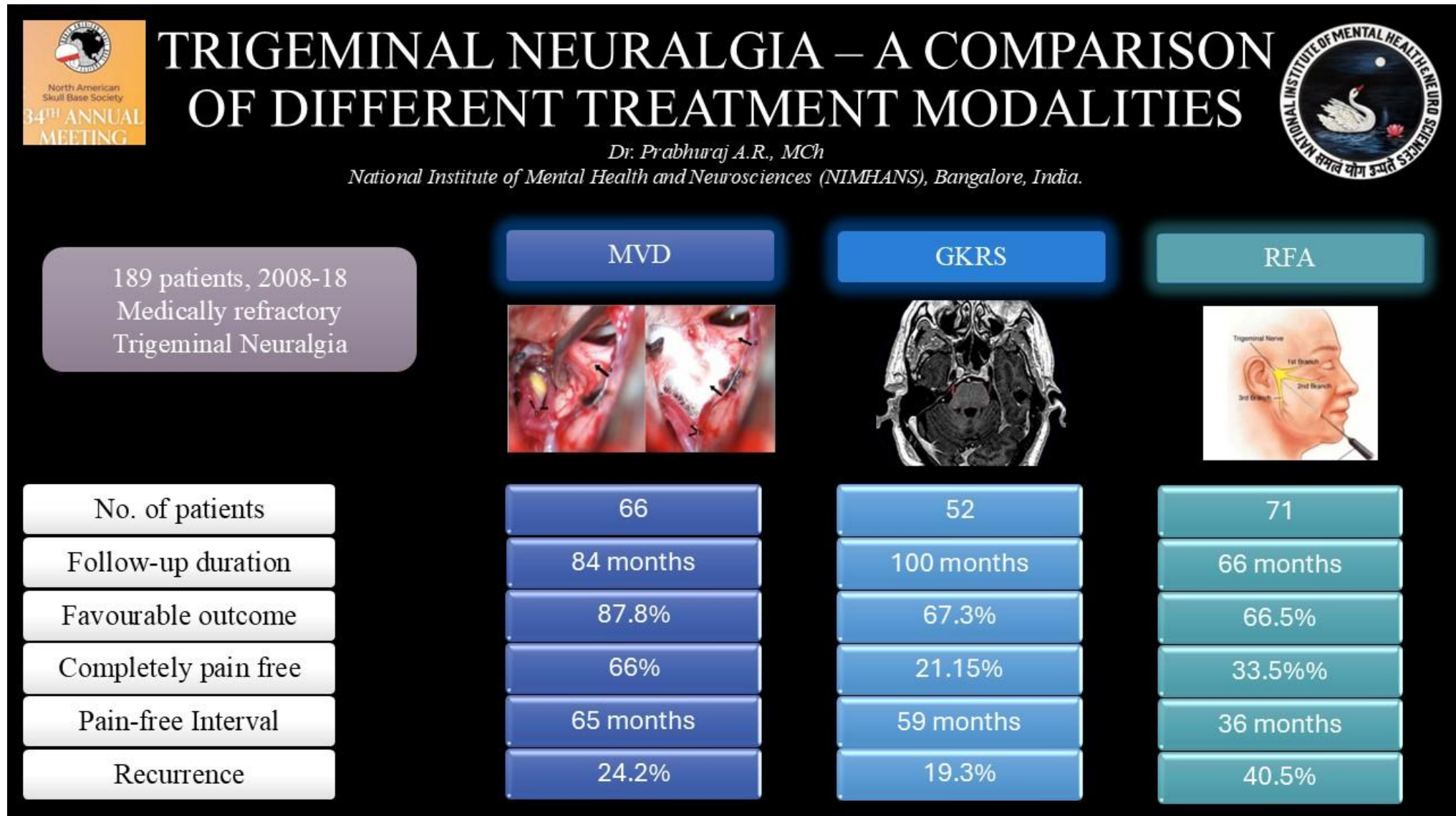


Graphical Abstract



Introduction

The treatment of medically refractory Trigeminal Neuralgia (TN) remains controversial, with multiple available treatment options including ablative and anatomical surgical therapies, neuromodulation, subdermal therapy and others including cryotherapy¹. There has been no consensus on the ideal management strategy for TN, with the most common procedures being performed being Microvascular decompression (MVD), Gamma Knife Radiosurgery (GKRS) and Radiofrequency Ablation (RFA)^{2,3}.

As a tertiary neurosurgical center offering all the 3 above mentioned treatment modalities individualized to each patient, the aim of this study was to evaluate and compare the pain-free period and time to recurrence for patients who underwent MVD, GKRS and RFA at our center.

Methods and Materials

This was a retrospective review of patients with medically refractory trigeminal neuralgia, managed at our hospital over a 10-year period from 2008-2018. Patients who had undergone either MVD, RFA or GKRS for trigeminal neuralgia with at least 1 year follow-up were included in the study.

Patient demographics, intraoperative findings, GKRS parameters, RFA parameters and follow-up details from retrospective chart review as well as telephonic follow-up were recorded. Patients with trigeminal neuralgia associated with Multiple Sclerosis were excluded.

Pain was assessed using the Barrow Neurological Institute Pain Intensity Score (BNI)⁴, with BNI 1,2 and 3a at follow-up considered as good outcomes, while BNI 3b,4 and 5 were considered as poor outcomes. The other primary outcomes assessed were recurrence of pain and pain-free interval.

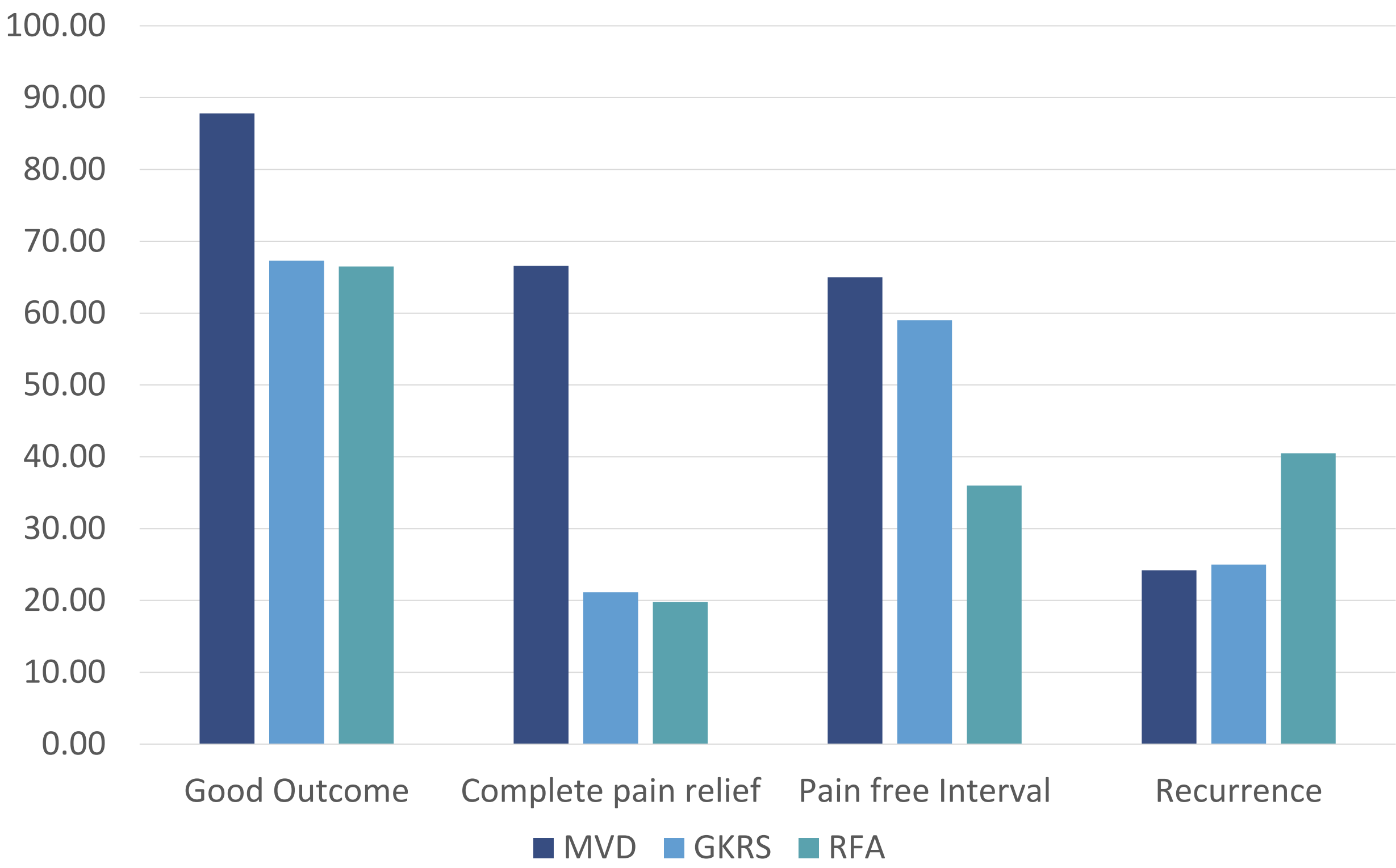
Table 1. Results - Comparison of MVD, GKRS and RFA for Trigeminal Neuralgia

	MVD	GKRS	RFA
No. of patients	66	52	71
Mean follow up duration	84 months	100 months	66 months
Favorable outcome (BNI I-IIIa)	87.8%	67.3%	66.5%
Unfavorable outcome (BNI IIIB-V)	12.1%	32.7%	33.5%
Complete pain relief(BNI I)	66.6%	21.15%	19.8%
Pain free interval	65 months	59 months	36 months
Recurrence of pain	24.2%	25%	40.5%
Time for recurrence	36 months	34 months	12 months
Repeat procedure	12%	19.3%	37.8%

Results

A total of 189 patients who satisfied the study criteria were included, with the individual modalities of MVD, GKRS and RFA split comparably among the study population. The mean age of the study population was 52.54 years, with a male: female ratio of 1.52:1. The mean duration of symptoms at presentation was 63.81 months (~5.3 years), with 86.3% (163) patients presenting with Type 1 neuralgia and the remaining with Type 2 neuralgia. The median follow-up duration was 84 months for MVD, 100 months for GKRS and 67 months for RFA. The median dose of GKRS was 80 Gy, with the most common target being the Root entry zone (REZ) of the trigeminal nerve. The incidence of post-procedure complications was 12% in the MVD group, <1% in the GKRS group and 14.8% in the RFA group. The individual results for primary outcomes are summarized in Table 1.

Chart 1. Graphic Comparison of Treatment Modalities for Medically Refractory TN.



Discussion

In line with evidence from previous series, MVD had the highest percentage of patients with favorable BNI scores at the end of follow-up (87.8%) and complete pain relief (66.6%), along with the longest pain free interval of 65 months, and the least proportion of recurrences (24.2%). GKRS was found to be a useful treatment option in elderly patients, as well as a second-line treatment following of MVD or other ablative treatments, providing an acceptable pain-free interval with low risk of recurrences. RFA was noted to have a shorter pain free interval, with the highest recurrence of pain, and therefore appears to be useful mainly in those not fit or not willing for MVD or GKRS. Notably, our series is the only one in published literature, comparing MVD and GKRS with the most commonly used percutaneous ablative treatment, i.e. RFA.

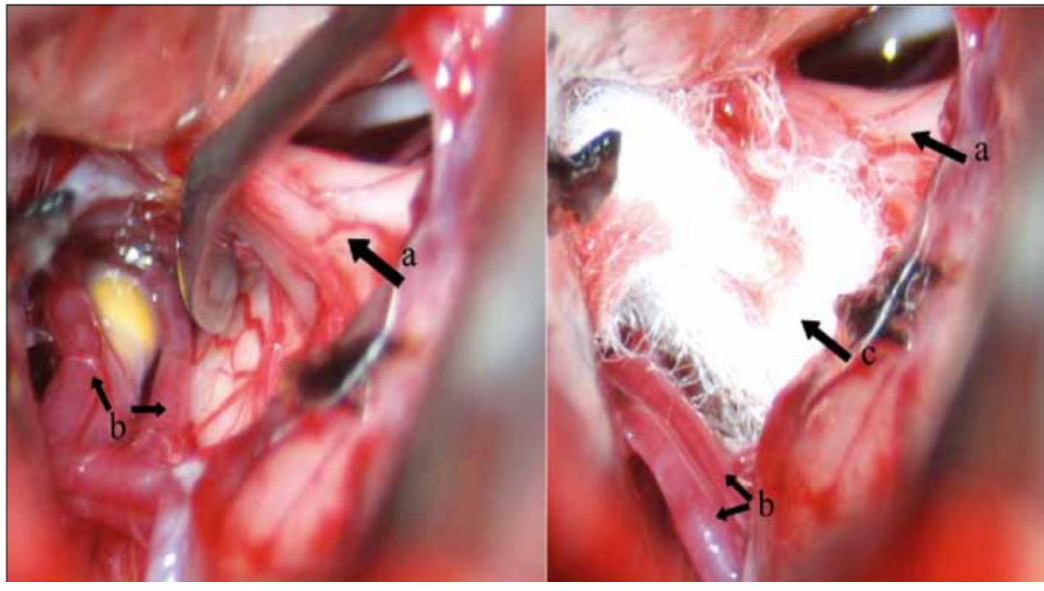


Figure 1. NVC demonstrated during MVD

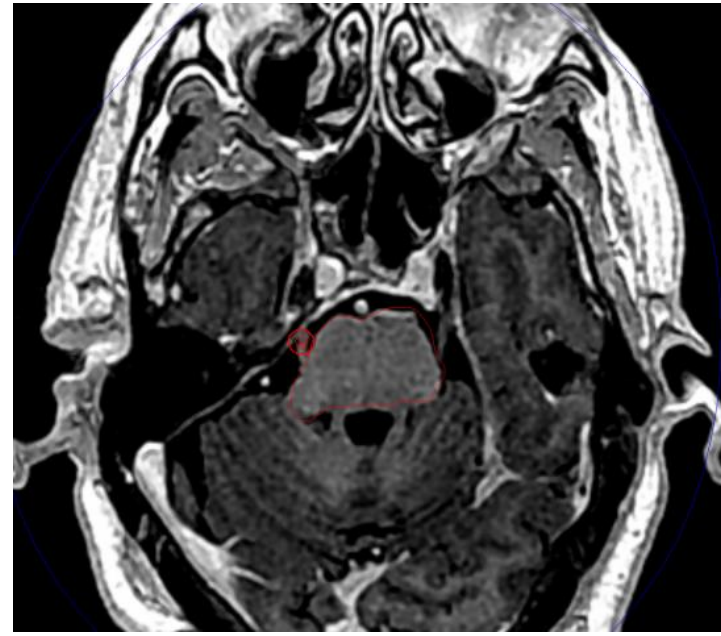


Figure 2. GKRS planning for TN

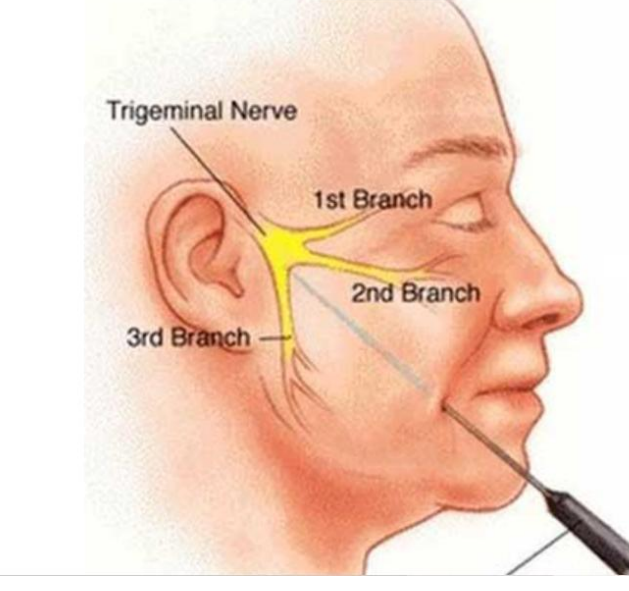


Figure 3. RFA Targeting

Conclusions

This study reaffirms the role of MVD as the best first-line treatment for medically refractory trigeminal neuralgia, with GKRS being a useful alternative in patients who are surgically unfit or unwilling, as well as an optimum second-line treatment for those with recurrence of pain. Percutaneous ablative procedures like RFA should largely be used as adjuncts in patients unfit for surgery and the elderly, for temporary pain relief.

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