

Initial and Long Term Trigeminal Neuralgia Pain Control Outcomes with Distal Isocenter Placement LINAC Radiosurgery

Edward M Marchan MD; Nelson M. Oyesiku MD, PhD, FACS; Costas George Hadjipanayis MD PhD; Nicholas Boulis; Walter Curran MD; Hui Kuo G Shu MD, PhD; Ian R Crocker MD, FACR

Winship Cancer Institute; Dpt. Of Radiation Oncology and Neurosurgery; Emory University School of Medicine; Atlanta,

Introduction

To assess efficacy of initial and long-term outcomes associated with distal isocenter (ISO) placement in patients treated for trigeminal neuralgia (TN) with LINAC radiosurgery (SRS).

Methods

-Between 2007-2012, 31 cases of TN with distal ISO placement were treated with LINAC SRS. Treatment was delivered with a 4 mm cone using conformal arc therapy. -Fast imaging employing steady state acquisition sequence (FIESTA) MRI sequences were used to outline the target volume. (Fig. 1A & 1B)

-Median prescription dose was 85 Gy (range (r): (75-85), mean isodose line was 100% (r: 80-100), and median number of arcs was 12. (r: 12-12).

-All patients had measurement of the distances from the distal ISO to a) the root entry zone (REZ) and b) a drawn out line tangent to the surface of the brain stem (BS) closest to ISO. We also measured BS (brain stem) V10 (volume receiving 10 Gy or more) values in all patients (Fig. 2A & 2B).

Methods (continued)

-Pain before and after SRS was scored as level I-V per the BNI pain intensity scoring criteria (Table 1).

-Pain relief was graded as an improvement to BNI levels I, II, III from pre-SRS BNI levels IV or V.

-Actuarial analyses on freedom from treatment failure (defined as pain returning to a BNI level of IV or V) were calculated by the product-limit method of Kaplan and Meier.

-Relevant toxicities including post SRS facial numbness were also measured.

Results

Dosimetric Analysis

-Mean distance of ISO to REZ was 10.335 mm (6.6-16.24).

-Mean distance of ISO to tangent intersecting BS surface was 5.02 mm (2.8-7.9).

-Mean maximum BS dose was 14.2 Gy (6.8-22.53).

-Mean BS V10 was 0.062 cc (0-0.208).

Initial Pain Relief Outcomes

-The median follow-up was 20.7 months (2-60 months).

-Total initial pain relief among all patients was 81%.

-The mean time to initial pain relief was 0.827 months (r: 0.03-2)

Results (continued)

Long Term Pain Relief Outcomes

-Median response duration was 35 months (range 2-60 months).

-Figure 3 displays calculated 1-, 2-, and 3- year rates of freedom from severe pain (BNI IV or V) of 82%, 71%, and 33%, respectively, after LINAC SRS for classic TN.

Other complications

-Only one patient (3%) developed bothersome post SRS facial numbness.

-No other morbidities or mortalities occurred as a consequence of treatment.

Conclusions

1. LINAC Radiosurgery with distal ISO placement leads to comparable long term pain control outcomes to most large published series using proximal REZ isocenter placement.
2. The small mean BS V10 value and the lack of significant toxicities observed argue for consideration of this technique in treatment planning.

Tables/Figures

Table 1

Barrow Neurological Institute (BNI)
pain intensity score

Score

- I No trigeminal pain, no medication
- II Occasional pain, not requiring medication
- III Some pain, adequately controlled with medication
- IV Some pain, not adequately controlled with medication
- V Severe pain/no pain relief

BNI TN pain intensity grading
scale

Fig1A&1B

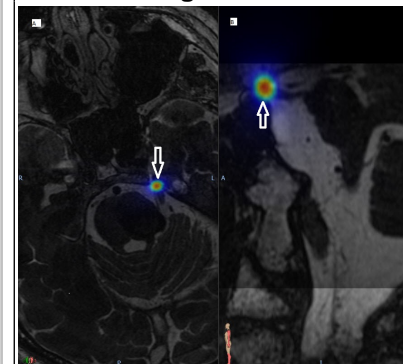


Figure 1. FIESTA scans of a patient with left TN. A. Axial FIESTA MRI image with arrow pointing at location of chosen Distal ISO placement adjacent to meckel's cave. B. This figure shows the corresponding Sagittal image.

Fig 2A&2B

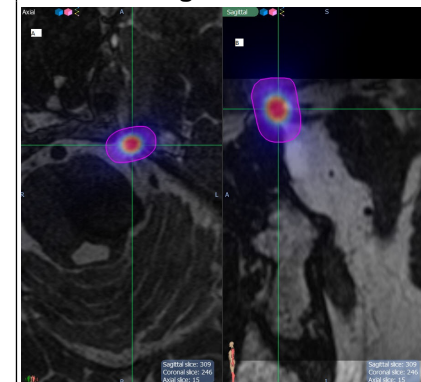


Figure 2 A) Axial and B) Sagittal FIESTA scans of the same patient in Fig. 1 illustrating V10 (shown by dark pink isodose line). The V10 does not intersect nor cross into BS.

Figure 3

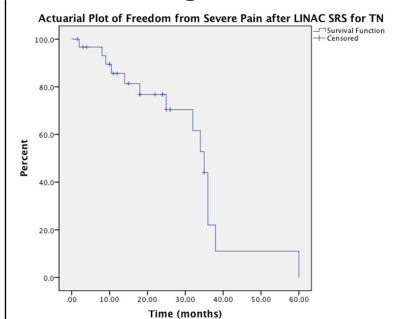


Figure 3. Actuarial plot demonstrating 1-, 2-, and 3- year rates of freedom from severe pain (BNI IV or V) of 82%, 71%, and 33%, respectively, after LINAC SRS for classic TN.