

# Comparison of Intensity Modulated Stereotactic Radiosurgery (IMRS) with Conventional Stereotactic Conformal Beam Radiosurgery (CBRS) in Vestibular Schwannomas

**Niteen More(1) \*** Vijay Anand Reddy(1) Karthikeyan Srinivasan(2) Kausik Bhattacharya(1) Vinitha Reddy(1)  
Revathy Kesavan(2) Sajal Kakkar(1) Padma Ganesan(2) Tamilselvan Kasirajan(2) Muthulingam Shunmugavel(2)  
(1) Dept of Radiation Oncology, (2) Dept of Medical Physics, Apollo Health City, Hyderabad, India

Background

- Preservation of serviceable hearing (Gardner-Robertson Scales I & II) is a major concern the stereotactic radiosurgery of Vestibular schwannomas
- Factors affecting hearing preservation are
  - volume of intracanalicular part of tumor,
  - dose heterogeniety of intracanalicular part of tumor
  - distance of tumor from cochlea
  - mean and maximum doses to cochlea

Objective

To compare the treatment plans using conventional stereotactic conformal beams and intensity modulated beams with inverse planning software on BrainLab, iPlan planning system for the stereotactic radiosurgery treatment of vestibular schwannomas

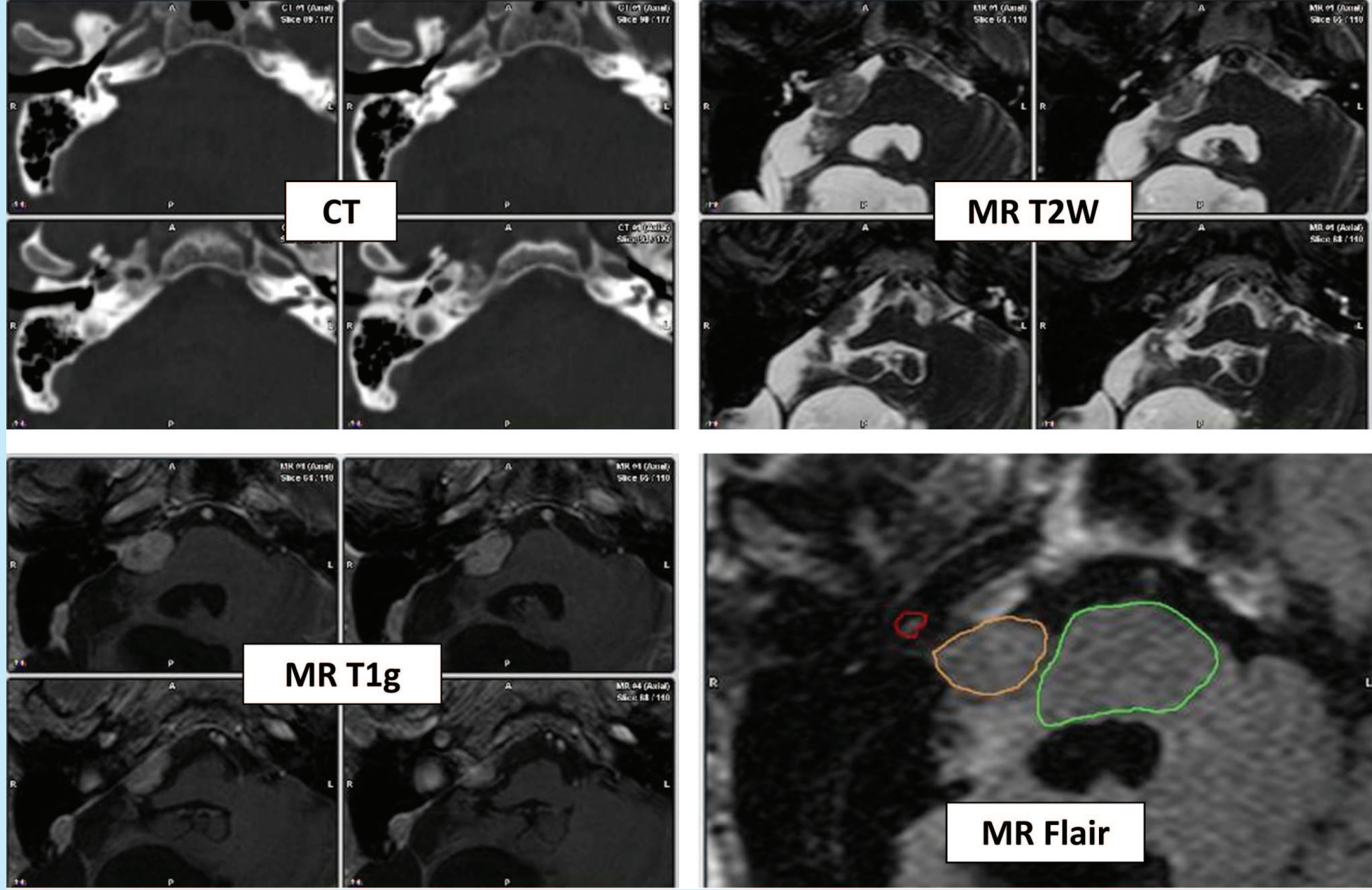
Patient Characteristics

Translational Deviations (mm)			
Sr No	Gardner-Robertson Hearing Level (Grade)	Volume (cc)	Prescribed Dose in Single fraction SRS
Case 1	III	2.158	12 Gy
Case 2	II	0.344	12 Gy
Case 3	IV	1.768	13 Gy
Case 4	III	3.916	12 Gy
Case 5	III	3.115	12 Gy

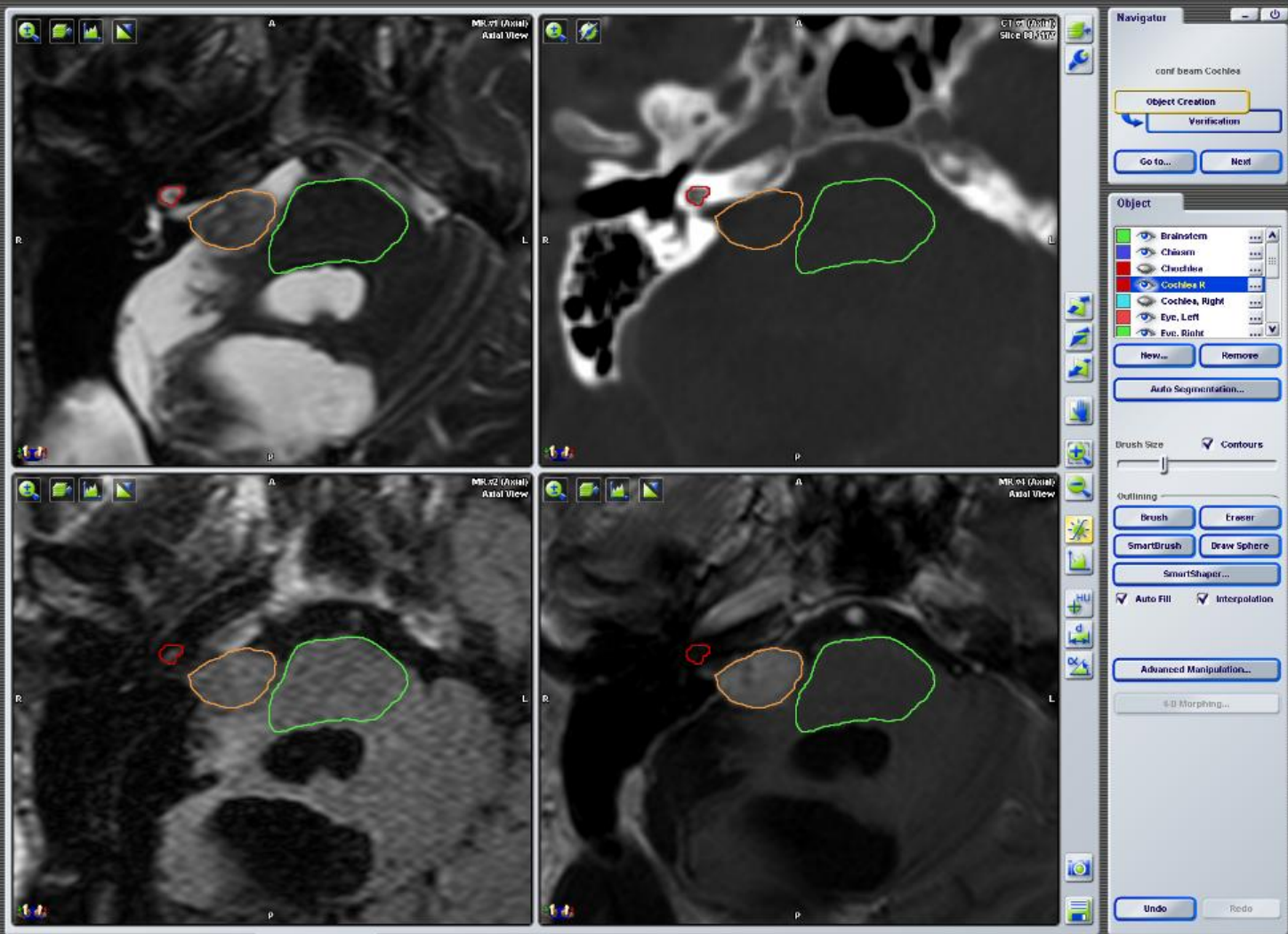
Immobilization



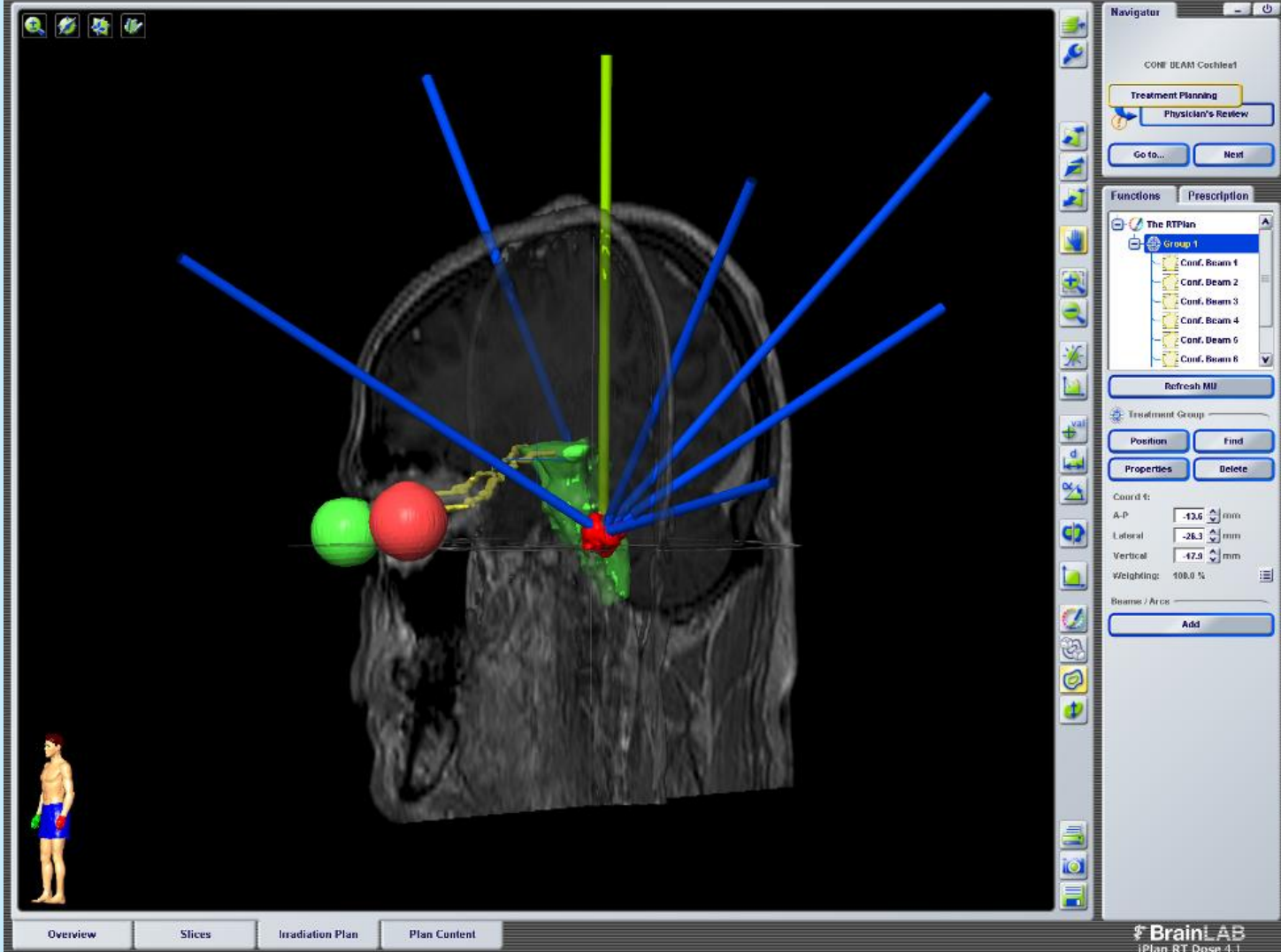
Iamging



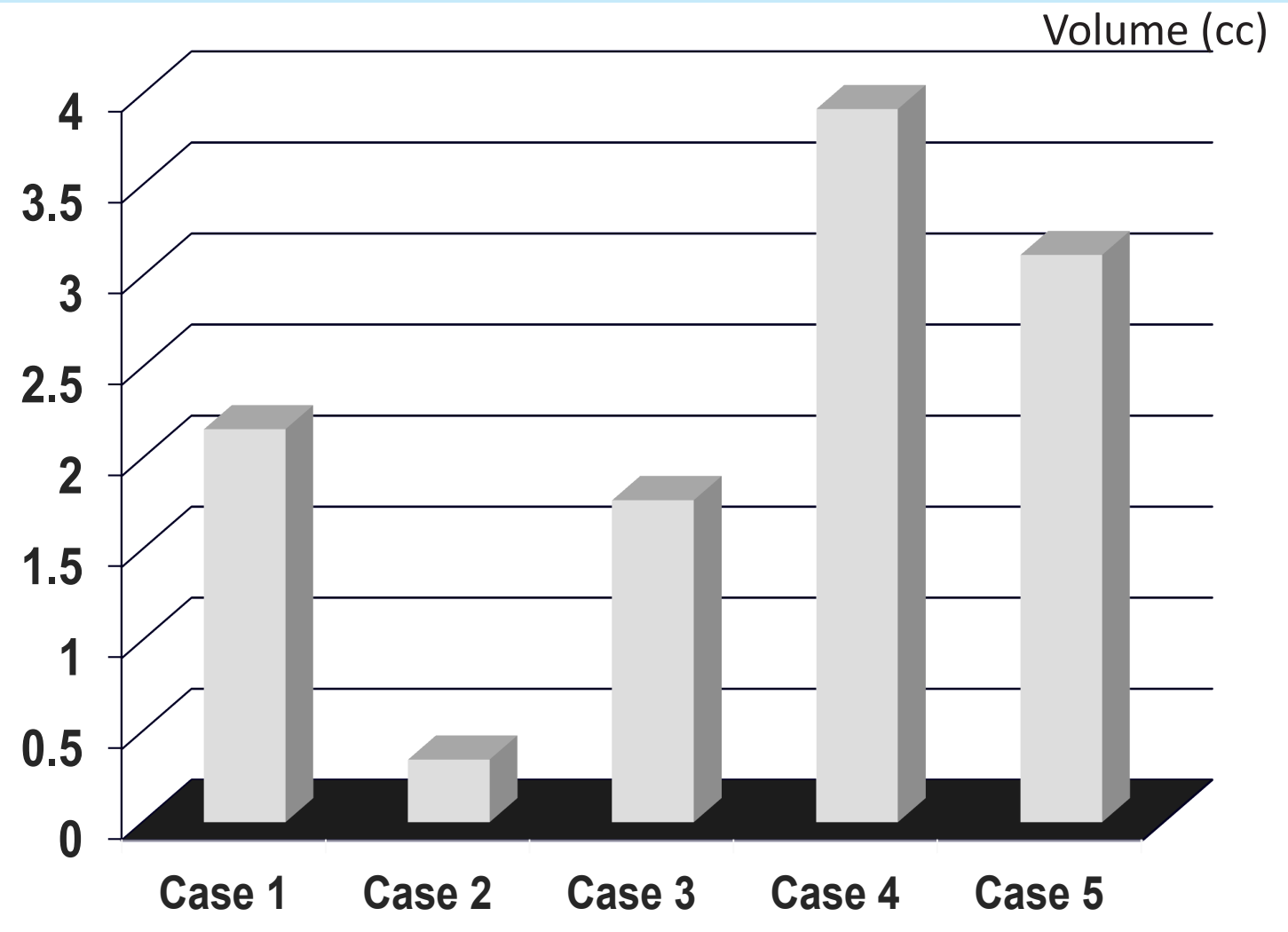
Volume Delineation



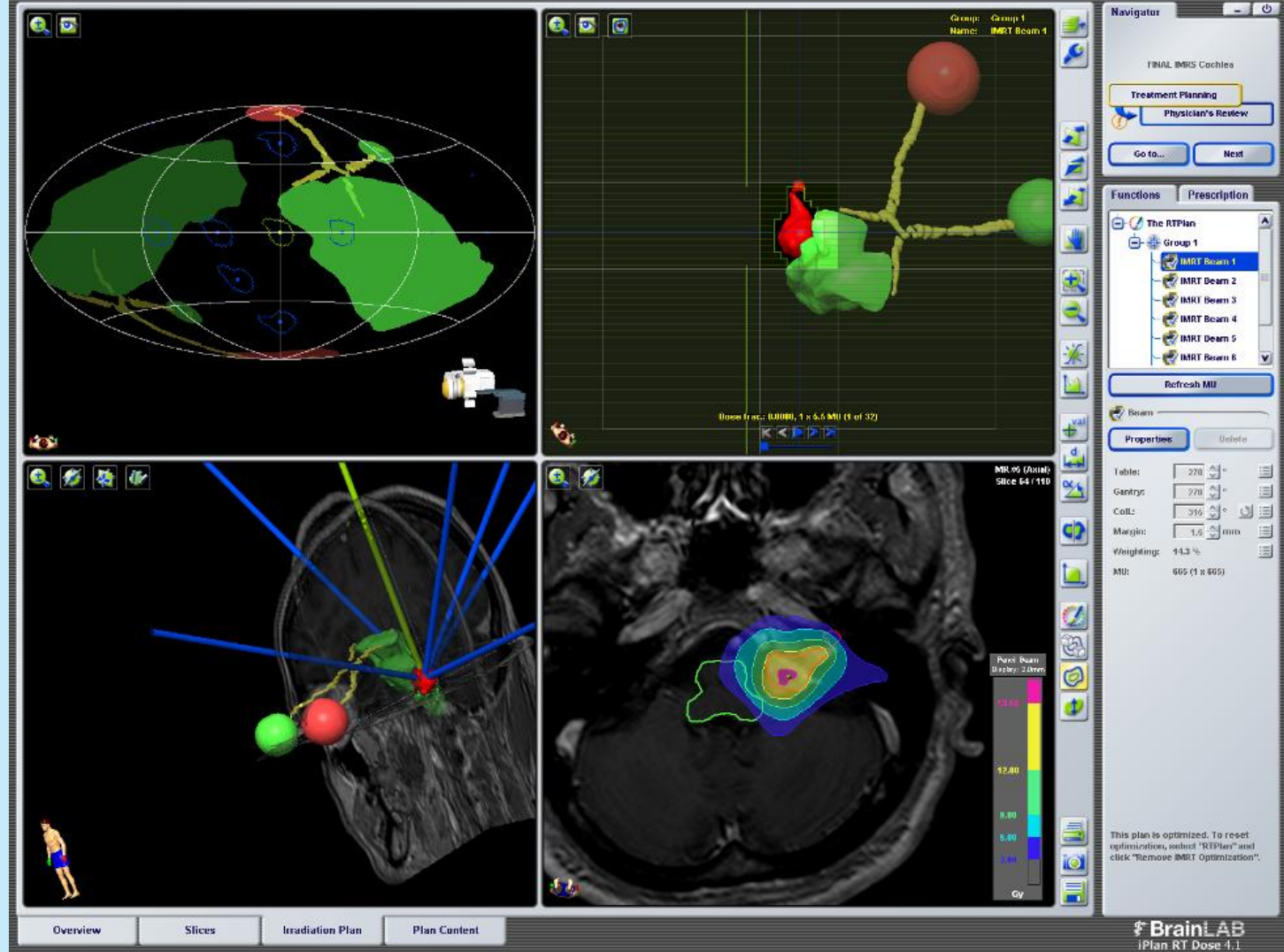
SRS Planning - CBRS



Planning target volume (PTV)

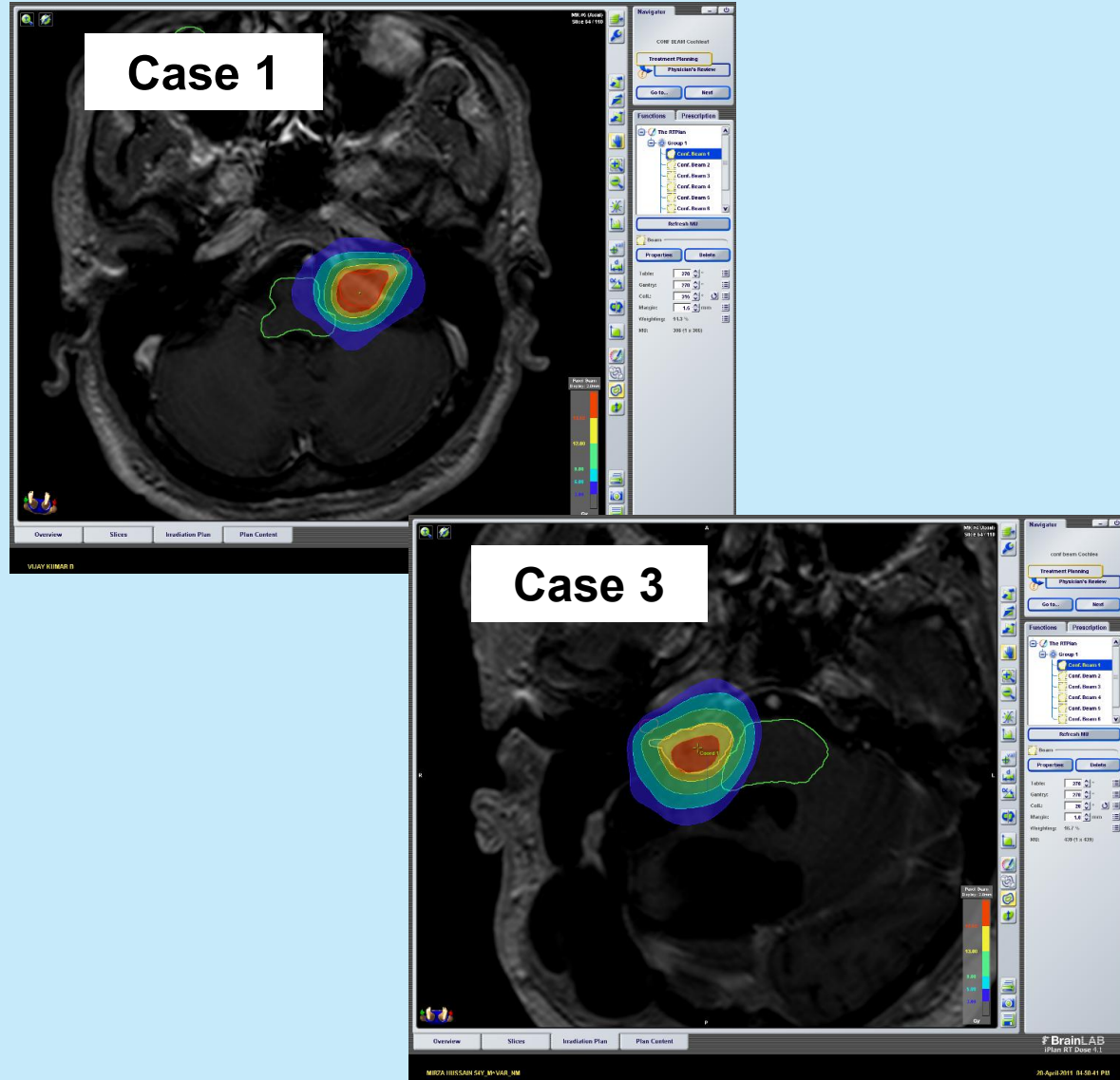


SRS Planning - IMRS



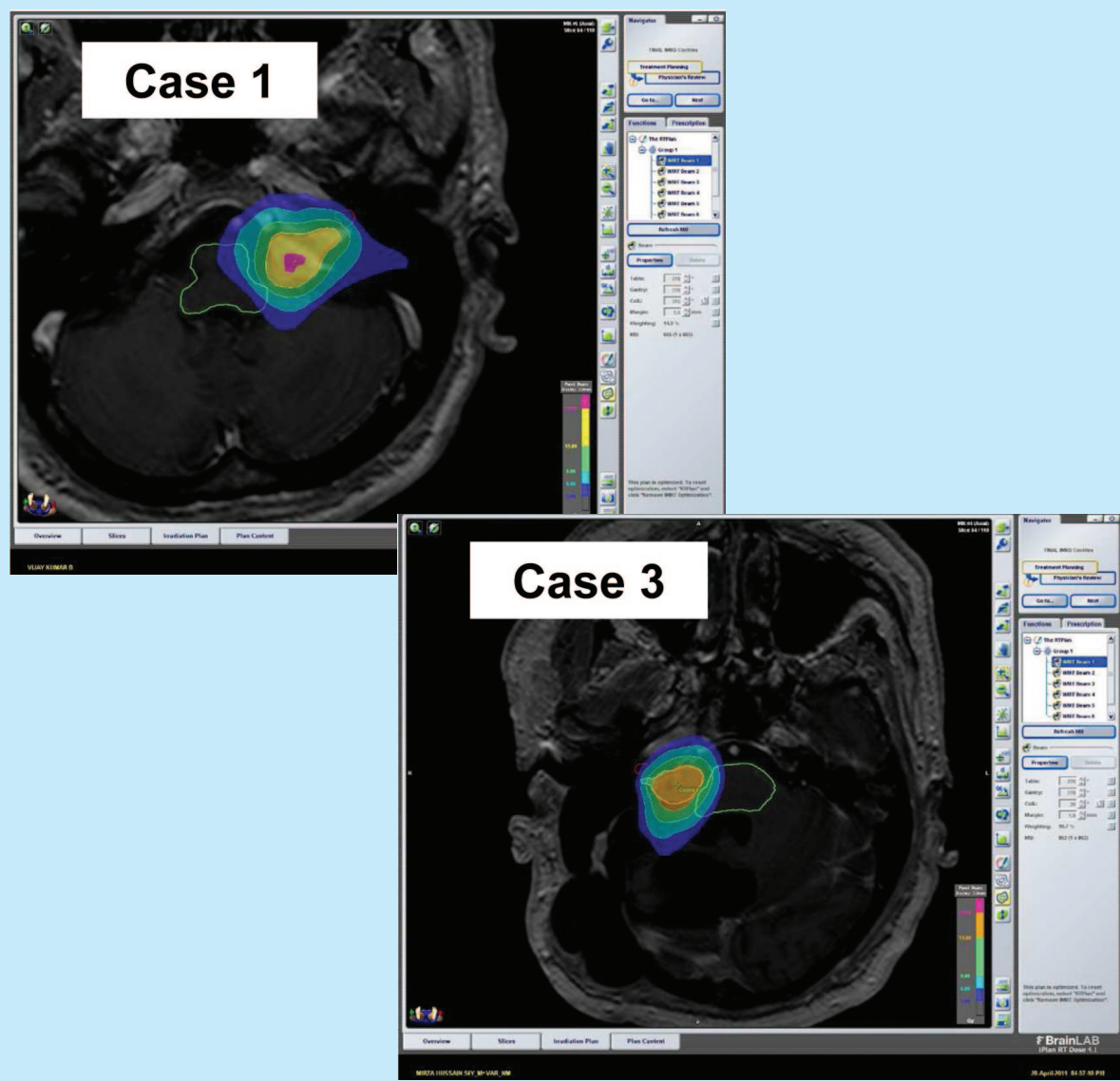
CBRS Plan – PTV coverage

Sr No	Prescribed Dose (Gy)	Iso-dose (%)	Dose (max)	Dose (mean)	Conformity Index
Case 1	12	80	16.01	14.89	2.48
Case 2	12	90	14.17	13.27	2.01
Case 3	13	90	15.34	14.39	1.51
Case 4	12	90	14.3	13.31	1.55
Case 5	12	85	15.41	14	2.4



IMRS Plan – PTV coverage

Sr No	Prescribed Dose (Gy)	Iso-dose (%)	Dose (max)	Dose (mean)	Conformity Index
Case 1	12	90	13.75	13.23	1.03
Case 2	12	95	12.7	12.48	1.3
Case 3	13	95	14.75	13.96	1.4
Case 4	12	90	14.29	13.52	1.3
Case 5	12	93	14.31	12.94	1.38



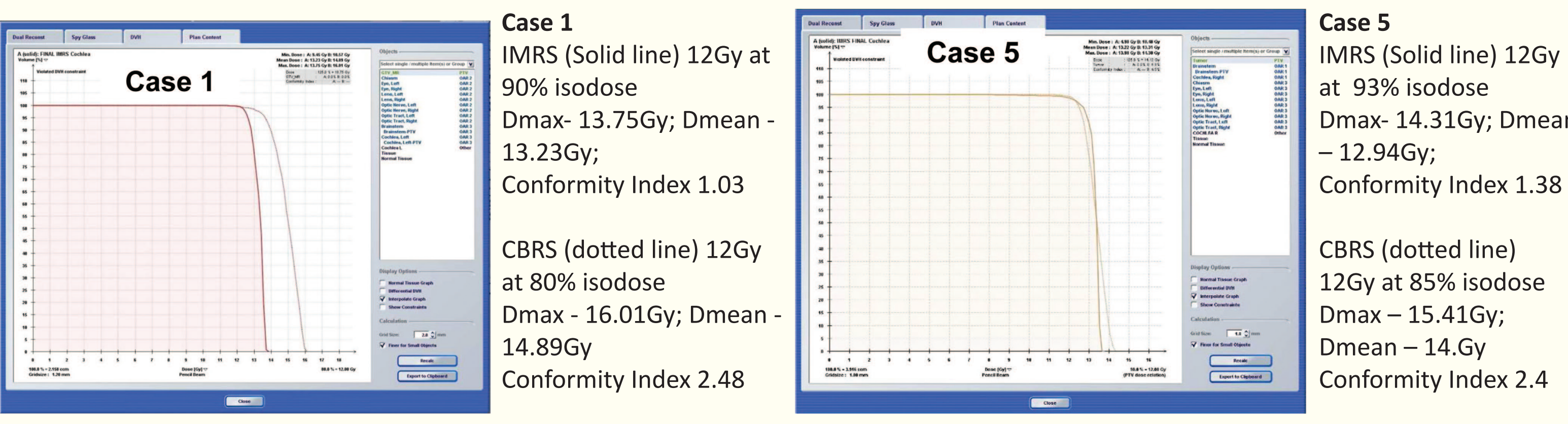
CBRS Plan – Organs at Risk

Sr No	Cochlea (Dose max) Gy	Cochlea (Dose mean) Gy	Brainstem (Dose max) Gy	Brainstem (Dose mean) Gy
Case 1	10.97	5.6	6.43	2.32
Case 2	11.5	9.46	1	0.24
Case 3	10.64	6.63	8	2.02
Case 4	10.75	9.11	8.55	2.2
Case 5	13.95	12.25	8.5	1.62

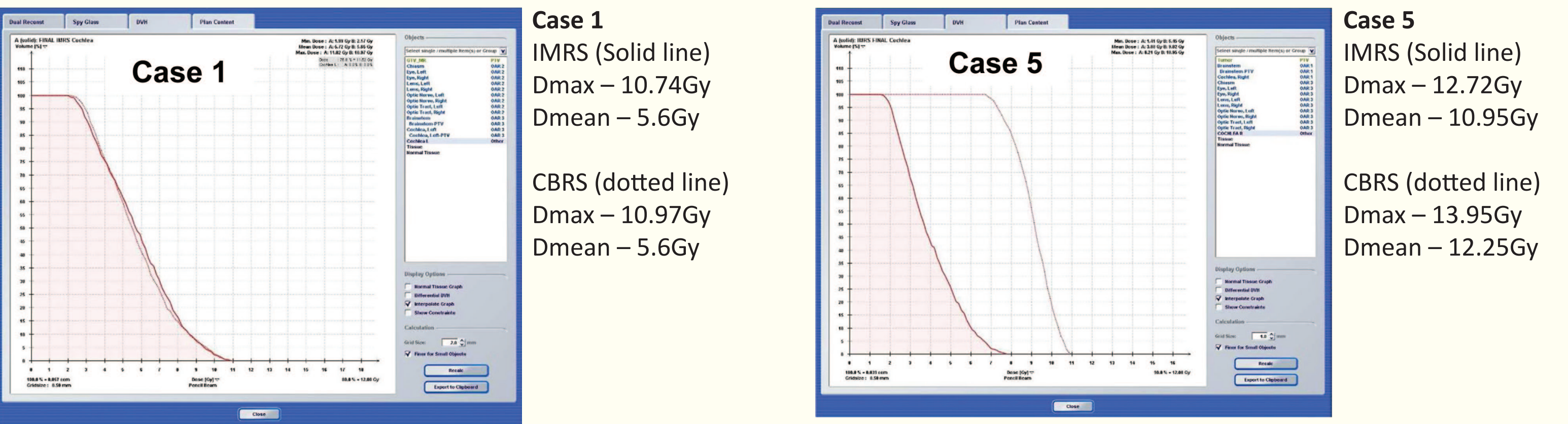
IMRS Plan – Organs at Risk

Sr No	Cochlea (Dose max) Gy	Cochlea (Dose mean) Gy	Brainstem (Dose max) Gy	Brainstem (Dose mean) Gy
Case 1	10.74	5.6	5.48	1.65
Case 2	12	9.94	1	0.24
Case 3	5.78	3.31	7.5	1.94
Case 4	7.6	3.97	7	1.7
Case 5	12.72	10.95	8	1.6

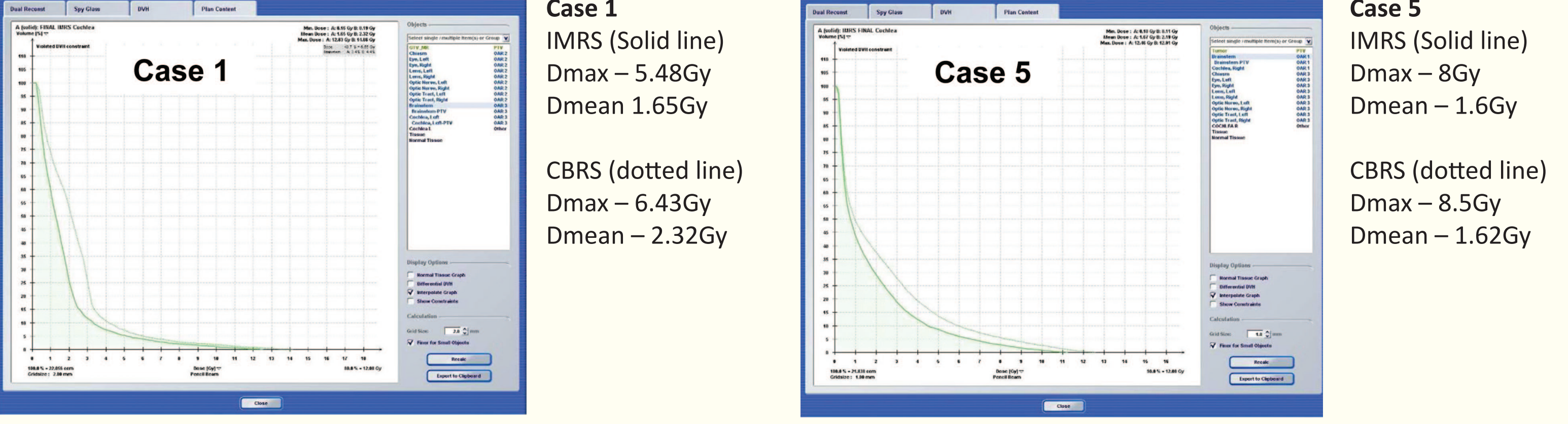
Plan Comparison - PTV



Plan Comparison - Cochlea



Plan Comparison - Brainstem



Plan Comparison – Over all

	Dose description (5 cases)	CBRS Plan	IMRS Plan
PTV	Mean of Dose max. (Gy)	15.04	13.96
	Mean of Dose mean (Gy)	13.97	13.22
	Mean Conf. Index	1.99	1.28
Cochlea	Mean of Dose max. (Gy)	12	9.76
	Mean of Dose mean (Gy)		6.75
Brainstem	Mean of Dose max. (Gy)	6.35	5.79
	Mean of Dose mean (Gy)	1.73	1.42

CONCLUSIONS

- Intensity modulated radiosurgery plans were better as compared to conformal beam radiosurgery plans in terms of homogeneity and conformity of the prescribed dose to PTV.
- There was improvement in doses to normal structures such as brainstem and cochlea.

REFERENCES

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Sharma SD, et al. Does intensity-modulated stereotactic radiotherapy achieve superior target conformity than conventional stereotactic radiotherapy in different intracranial tumors. Clin Oncol (R Coll Radiol). 2009 Jun; 21 (5) 408-16. Epub 2009 Mar 5.