

An Analysis of the Curative Effects of Proton Therapy in 66 Cases of Intracranial Tumors

Yue-fei Fan

Division of Neurosurgery of Shandong Zibo

Wanjie Hospital.Zibo 255213, P.R.China

Correspondence to: Yue-fei Fan

E-mail: wjfyf@126.com

1. Clinical data:



- 66 follow-up patients, 37 males, 29 females, ranging from 6 to 95 years in age.
- 47 patients (71.2%) received proton therapy as their primary treatment .
- 19 (28.8%) received it for recrudescence subsequent to other forms of radio-therapy, 3 of whom had suffered such recrudescence twice before they received proton therapy.

1. Clinical data :

- 46 patients developed glioma, among them were 11 cases of thalamus glioma and 8 cases of brain stem glioma; 8 of them had recrudescence after surgery and 17 had received other forms of radio-therapy before they accepted our treatments.
- There are still another two cases of malignant tumor: a lymphoma and a sphenoidal sinus squamous papilloma .

1. Clinical data :

- 18 cases of glioma were diagnosed by clinic methods, CT, MR, and PET.
- 30 cases were established as glioma by surgery and biopsy.



1. Clinical data :

- There were 5 cases of meningiomas, 8 cases of chordomas.
- There were still 5 cases of another benign tumors, such as craniopharyngioma, acoustic schwannoma, and neurofibromatosis.
- Among all the 18 cases of benign tumors, 13 were post-surgery recrudescence, 3 cases of meningiomas and 2 cases of chordomas were diagnosed by MR.

2. Localization Methods



- Localization by CT horizontal scan and intensified imaging by MR were used for all the cases before fusing the resulting images, and the tumor contour can be shown as precisely as possible.

2. Treatment Methods:



- The overall dose for malignant tumor was 54-70 CGE, and a single dose ranged from 1.8 to 5 CGE.
- The overall dosage for homeopathy against recrudescient Glioma after radio-therapy was 54-60 CGE.
- The overall dose for a benign tumor ranged from 45 to 72 CGE, with a single dose amounting to 1.8-5 CGE, and the dose administered to a recrudescient patient after radio-therapy was 45-50 CGE.
- Small meninges tumors (less than 4cm in diameter) were treated by hypo fractionation: 45 CGE/15F.

Follow-up :



- The observing time for the malignant tumors all of ranged from 1 to 24 months and that for benign tumor cases ranged from 3 to 25 months.



The criteria for evaluating curative effects



(1) Remarkably effective: Clinical symptoms were significantly relieved; the tumors decreased noticeably in size or disappeared according to CT and MR inspection. And a central putrescence formed. Hydrocephalus were relieved significantly or disappeared ; PET shows the metabolizing rate of the whole tumor dropped sharply and a putrescent non-metabolizing area formed in the center. There were no annular area of high metabolism on the edge.

The criteria for evaluating curative effects



(2) Effective: By this we mean stable clinical symptoms; MR and CT show that the tumor stopped growing. A putrescent area formed in the center and the hydrocephalus stopped expanding; PET showed that the whole tumor metabolized slower and a putrescent non-metabolizing area formed in the center. But the annular area of the high metabolism still existed.

The criteria for evaluating curative effects



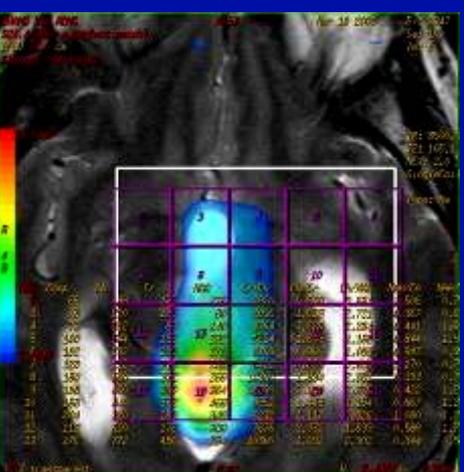
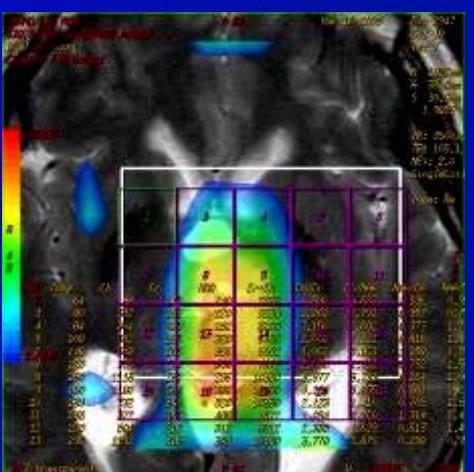
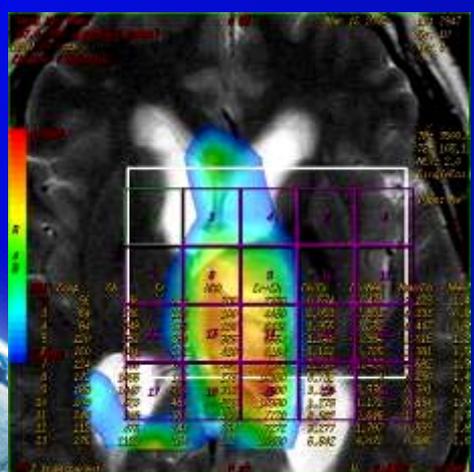
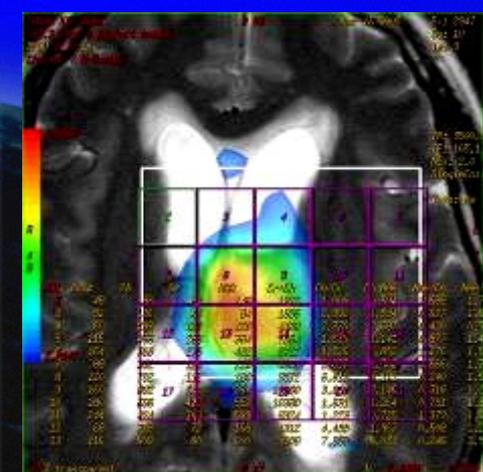
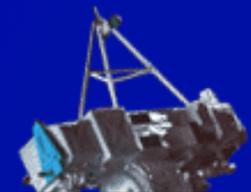
(3) Ineffective: Clinical symptoms continued to display aggravating ; MR and CT show that the tumor continued to grow; there was a presence of putrescent area in the center and the hydrocephalus continued expanding; PET showed that the central part of the tumor had slower metabolism, but the whole tumor was still metabolizing rather fast; an expanded annular area of high metabolism could be detected at the edge .

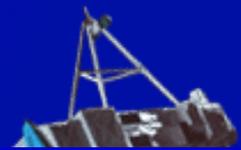


Representative cases

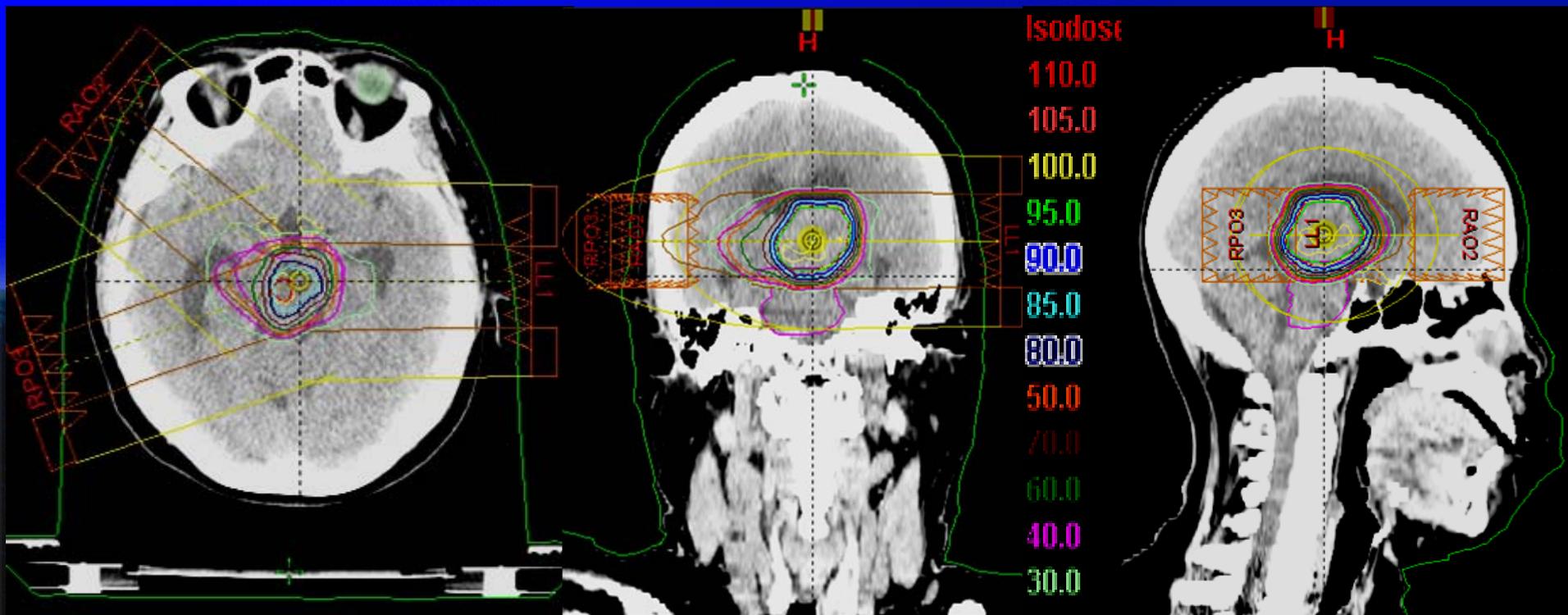


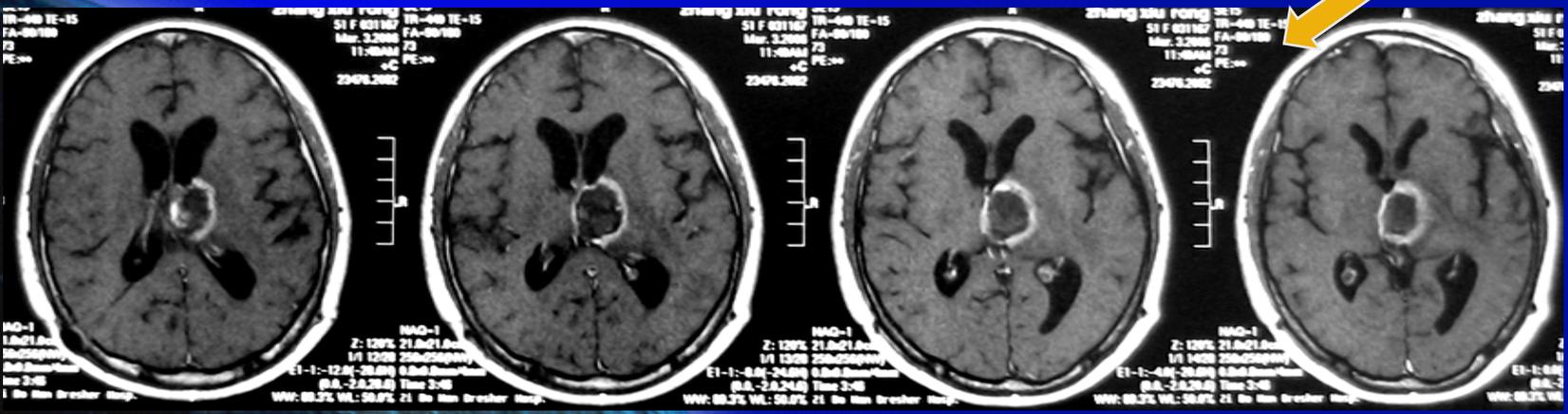
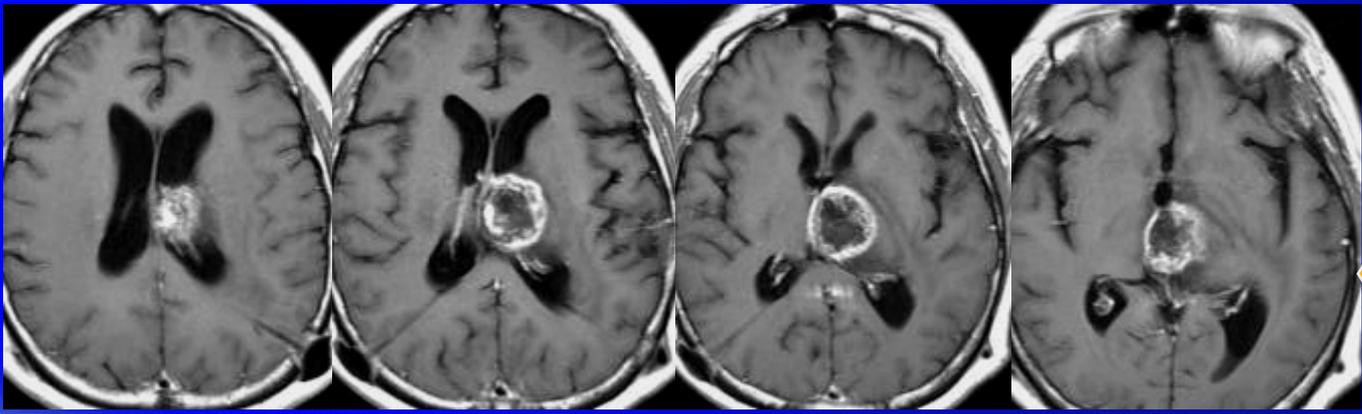
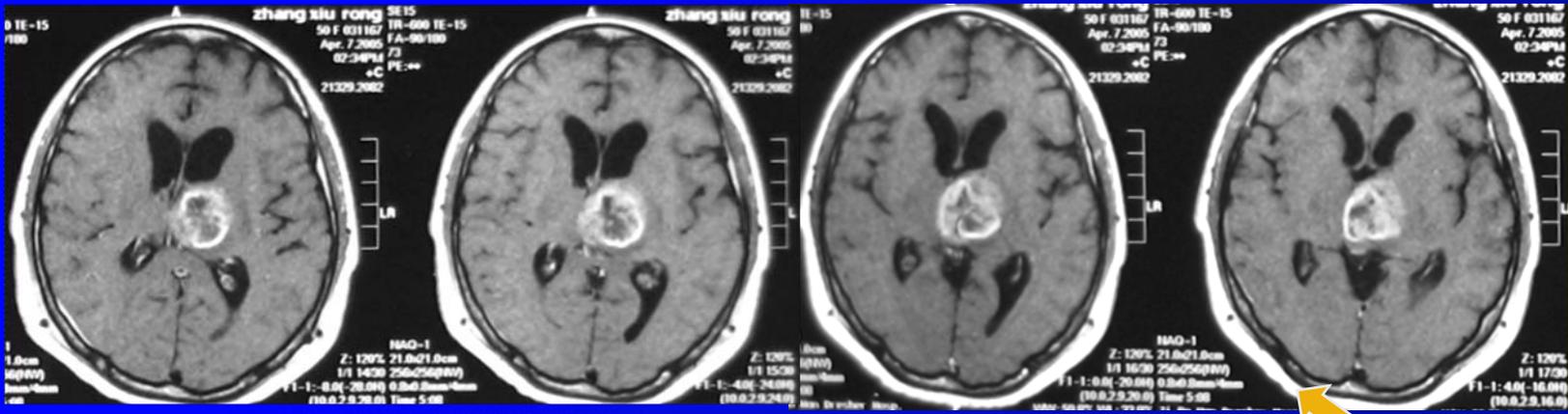
Thalamus Glioma case, female, 52 in age.





- Novalis set 9 beam for CTV ,and photon dose:40GY/20F
- Proton set 3 beam for GTV :30CGE/15F/90%/qd/5f-W
- GTV total dose: 70GY/90%

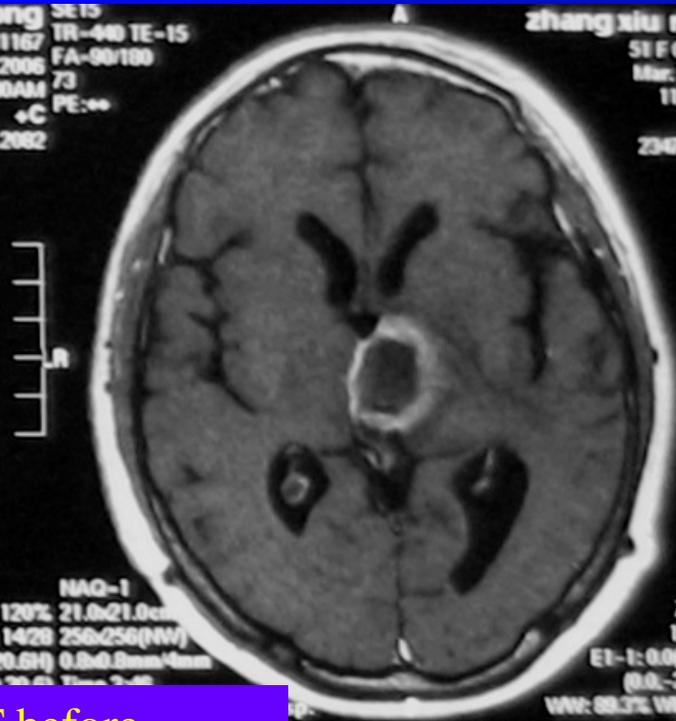
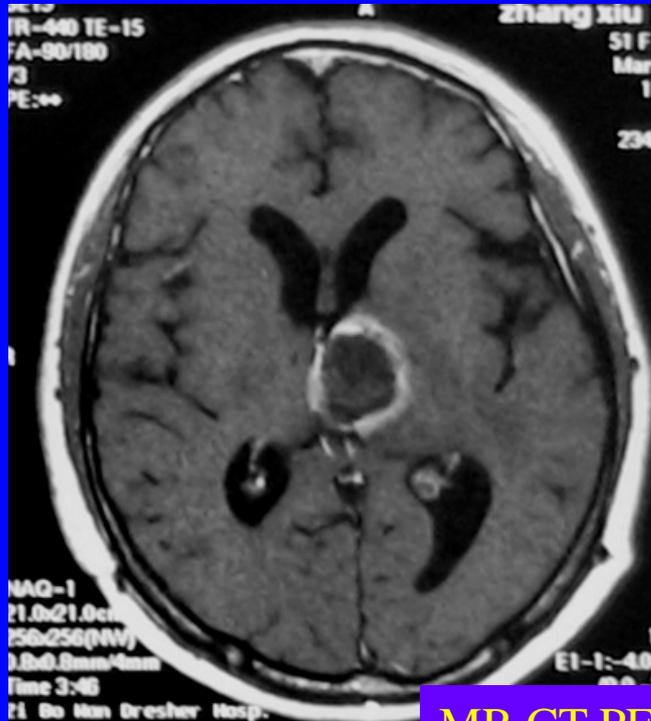




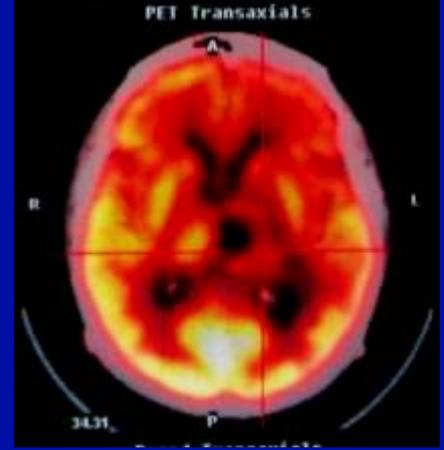
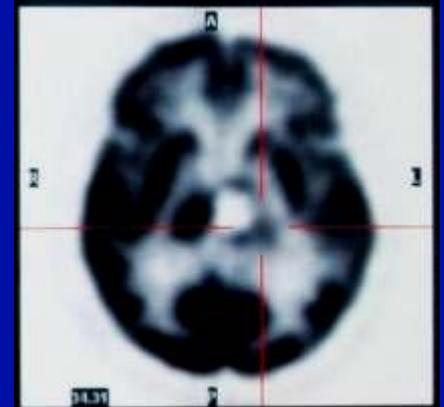
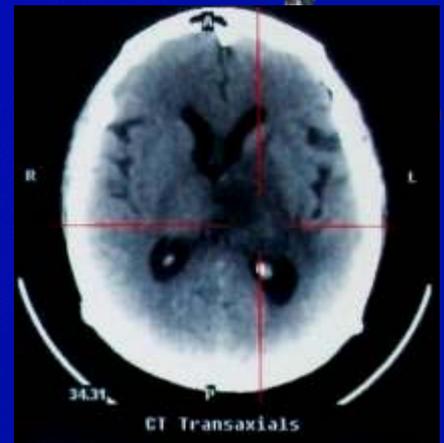
Before treatment

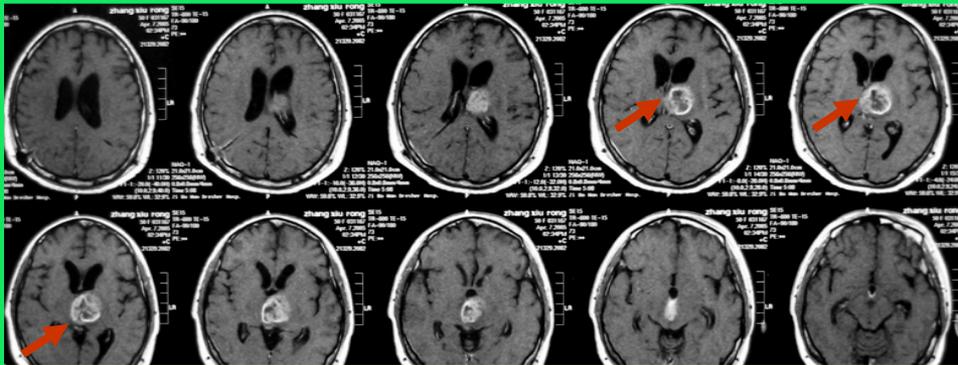
6 months later

1 year later

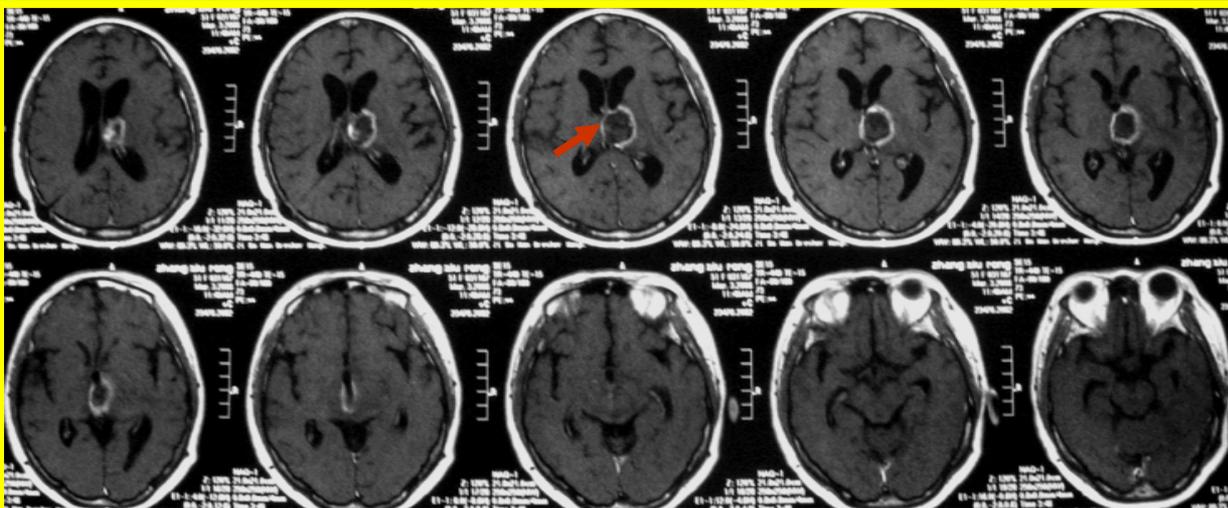


MR CT PET before treatment in contrast with those one year after treatment



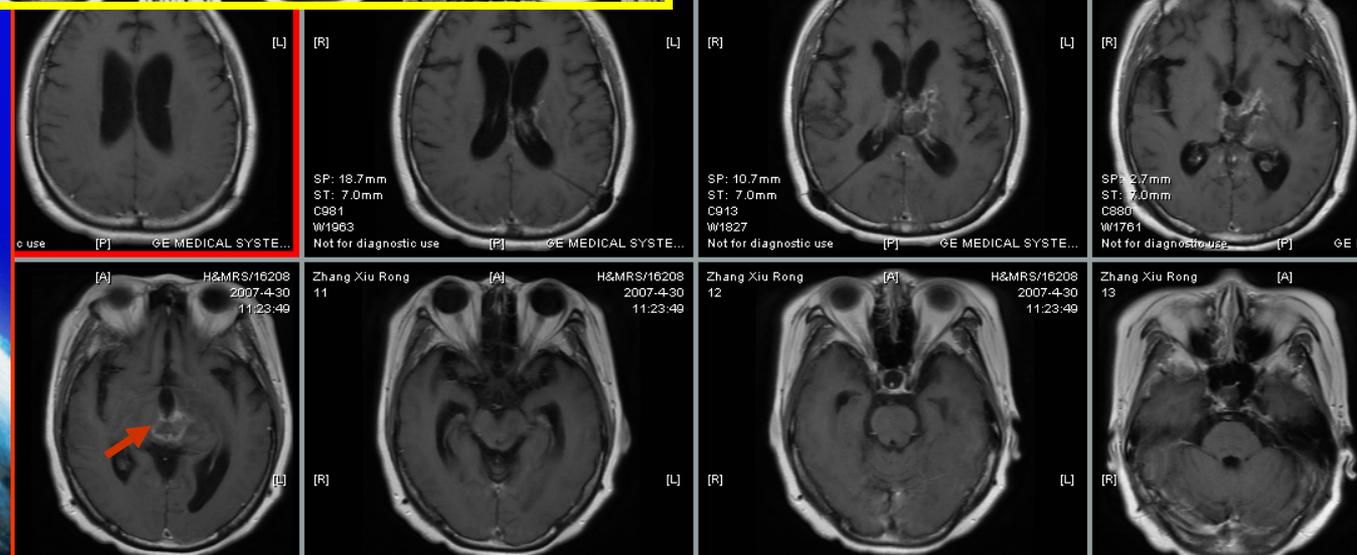


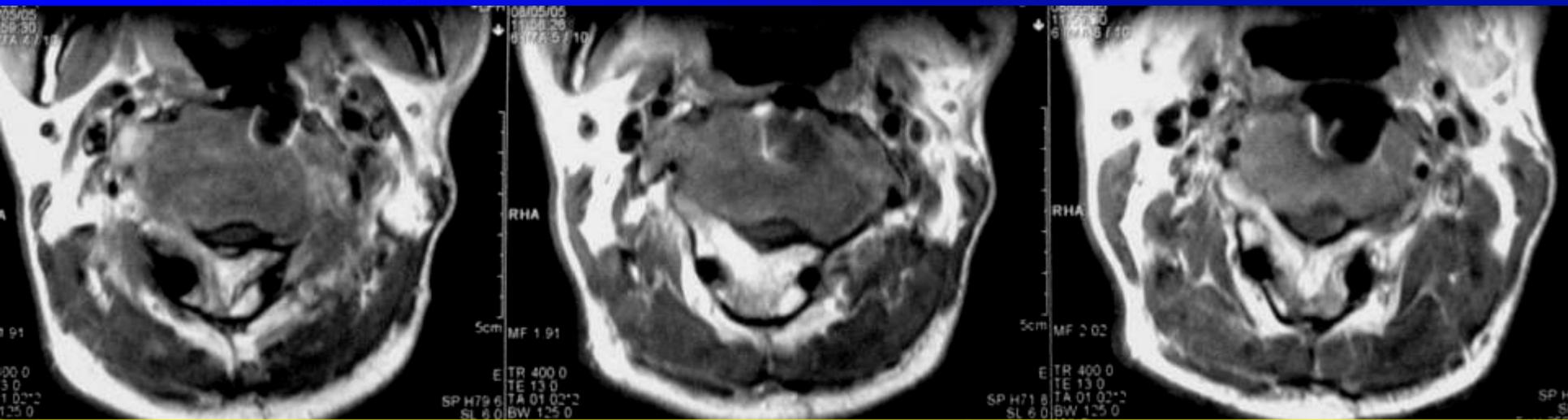
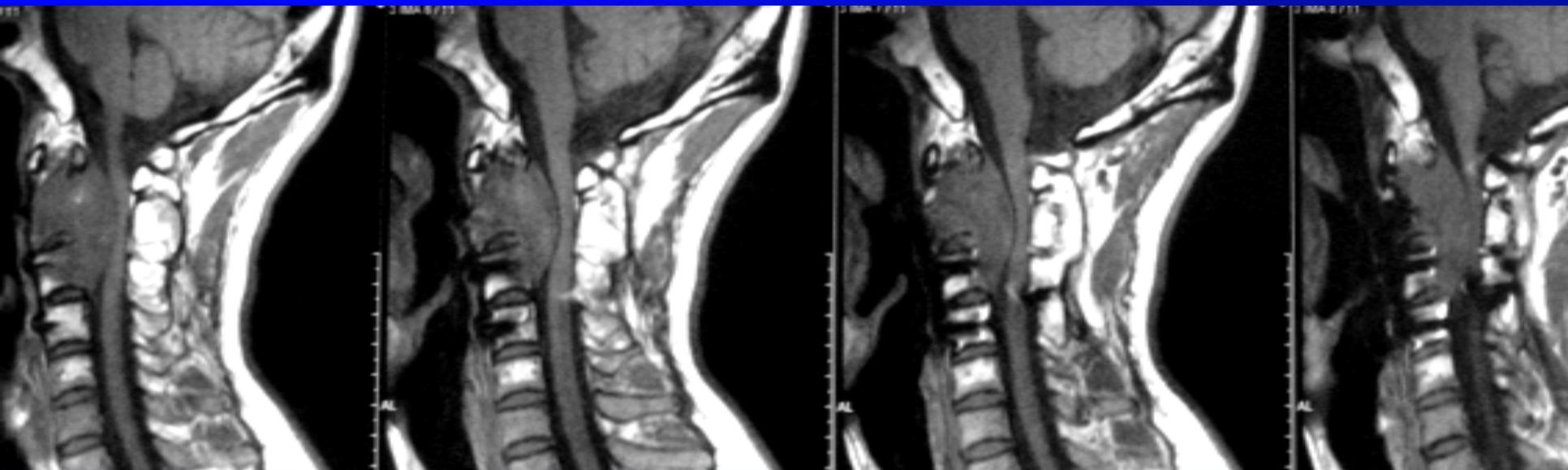
When doing
proton therapy
(2005-04-07)



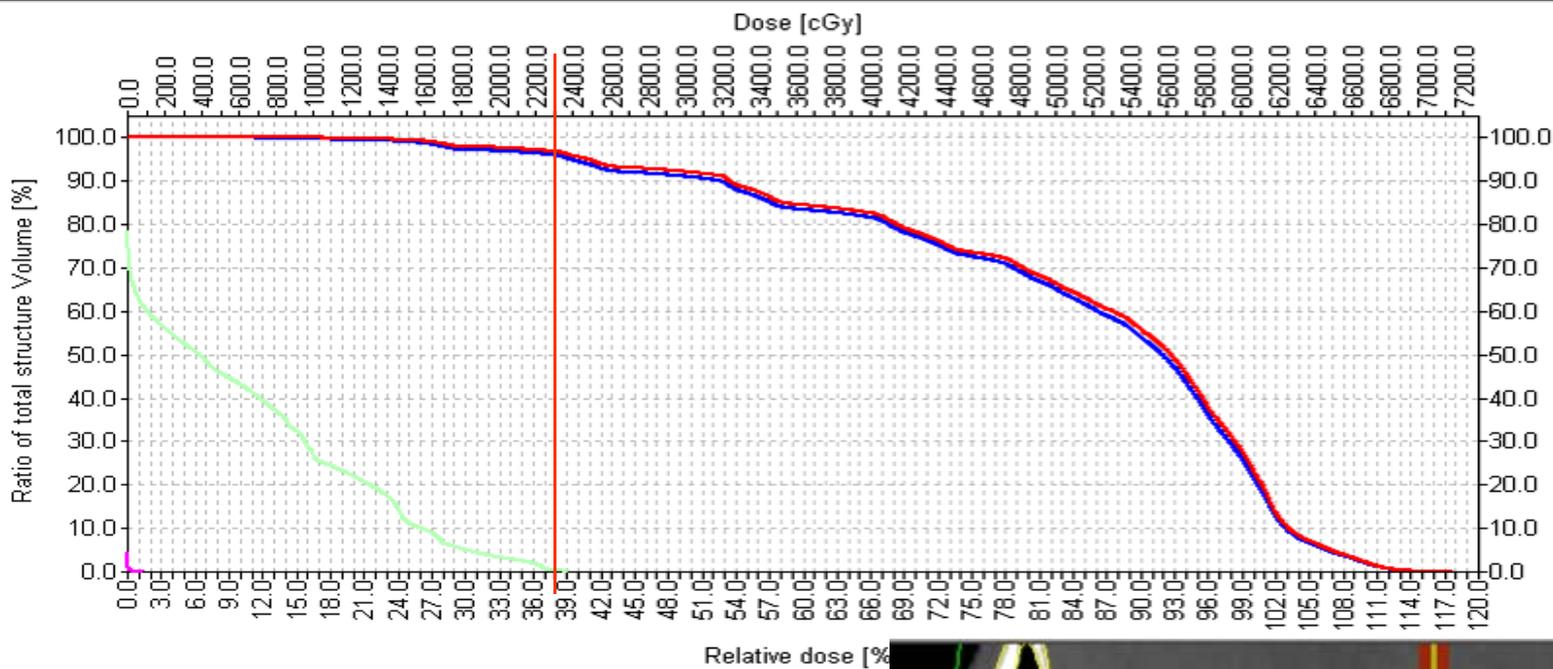
1 year later
(2006-03-06)

2 years later
(2007-04-30)

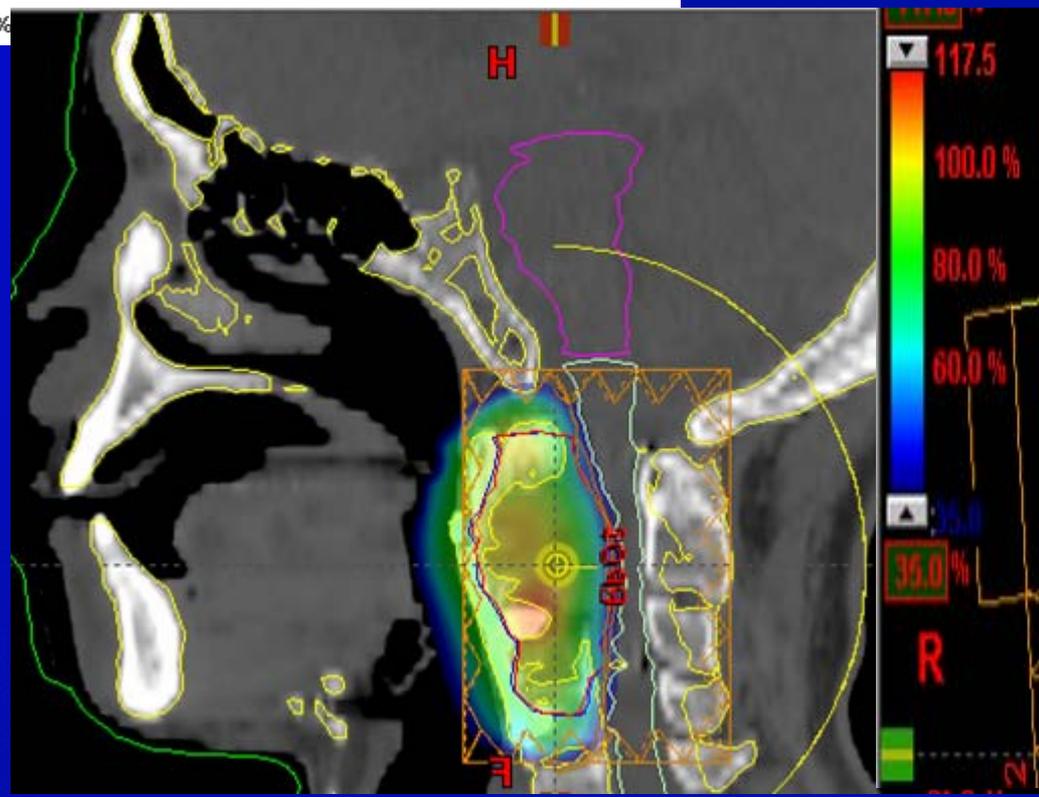




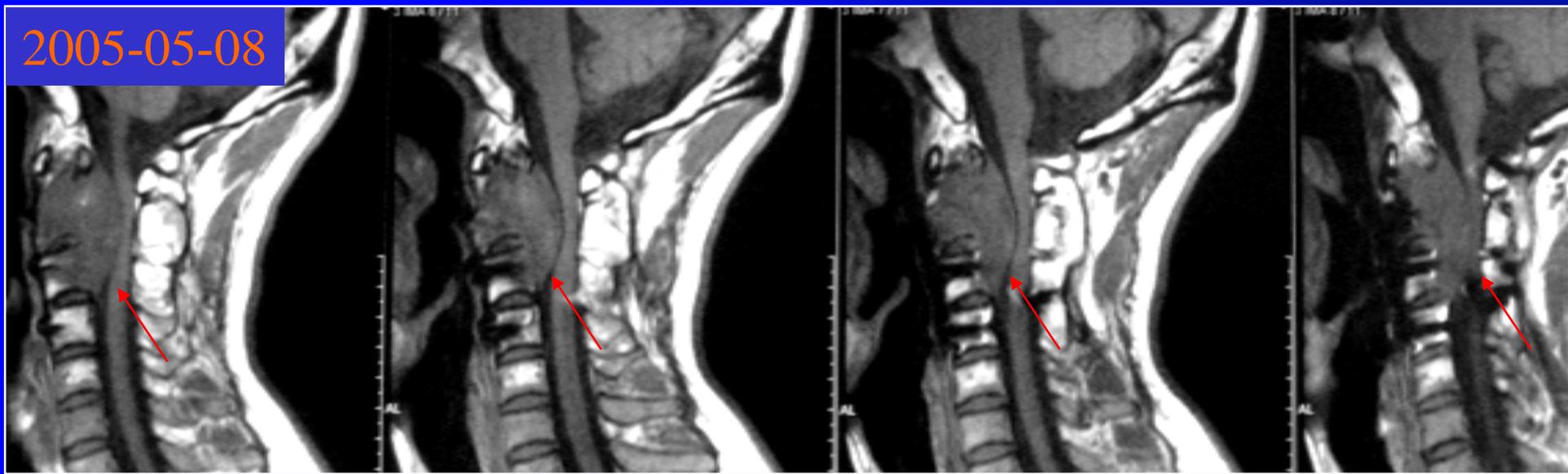
This case is a 40-year-old male who developed neck spinal cord chordomas, which had been confirmed by pathological test and removed by an operation on the 28th, Dec. 2000. The patient received radiation therapy for pathological changes in the neck vertebra ,the dose: $180\text{cGY} \times 24\text{F}$, amounting to 4320cGY , supplemented with 30mg of *cisplatin*, twice a week.



60GY/30F/qd/5f-w/ (50-90%),
 brain stem and spinal cord < 35%
 0.1% V=2372cGy
 5.0% V=1800cGy

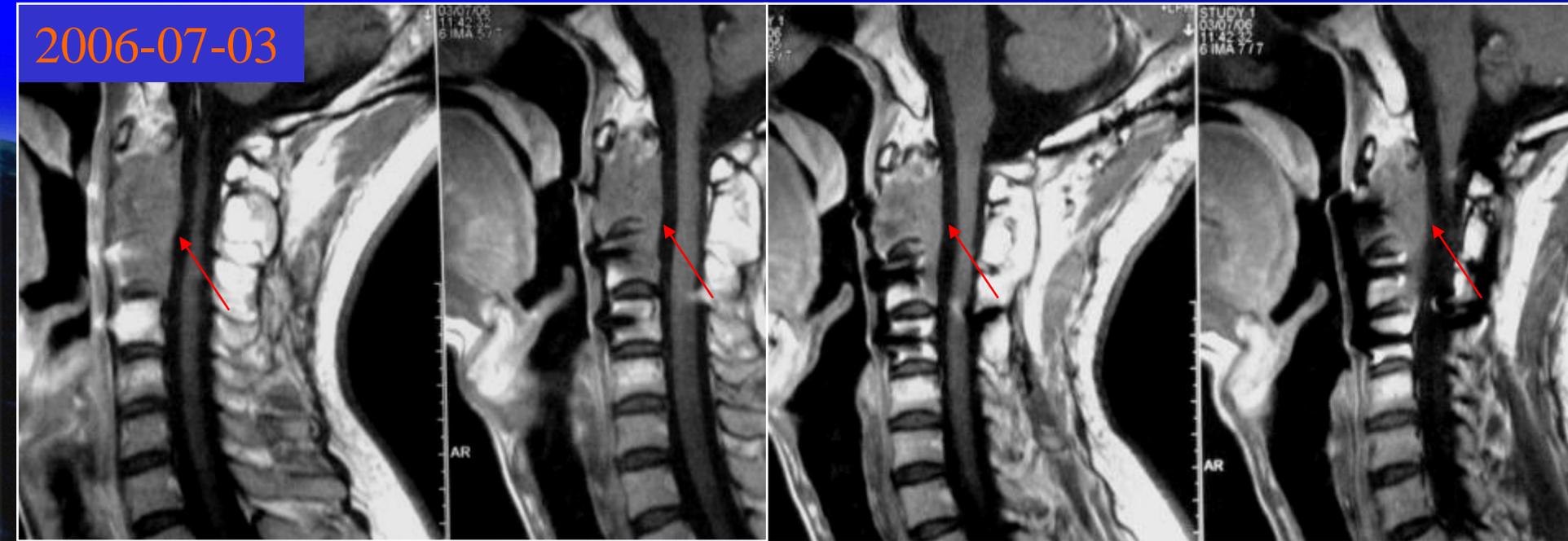


2005-05-08

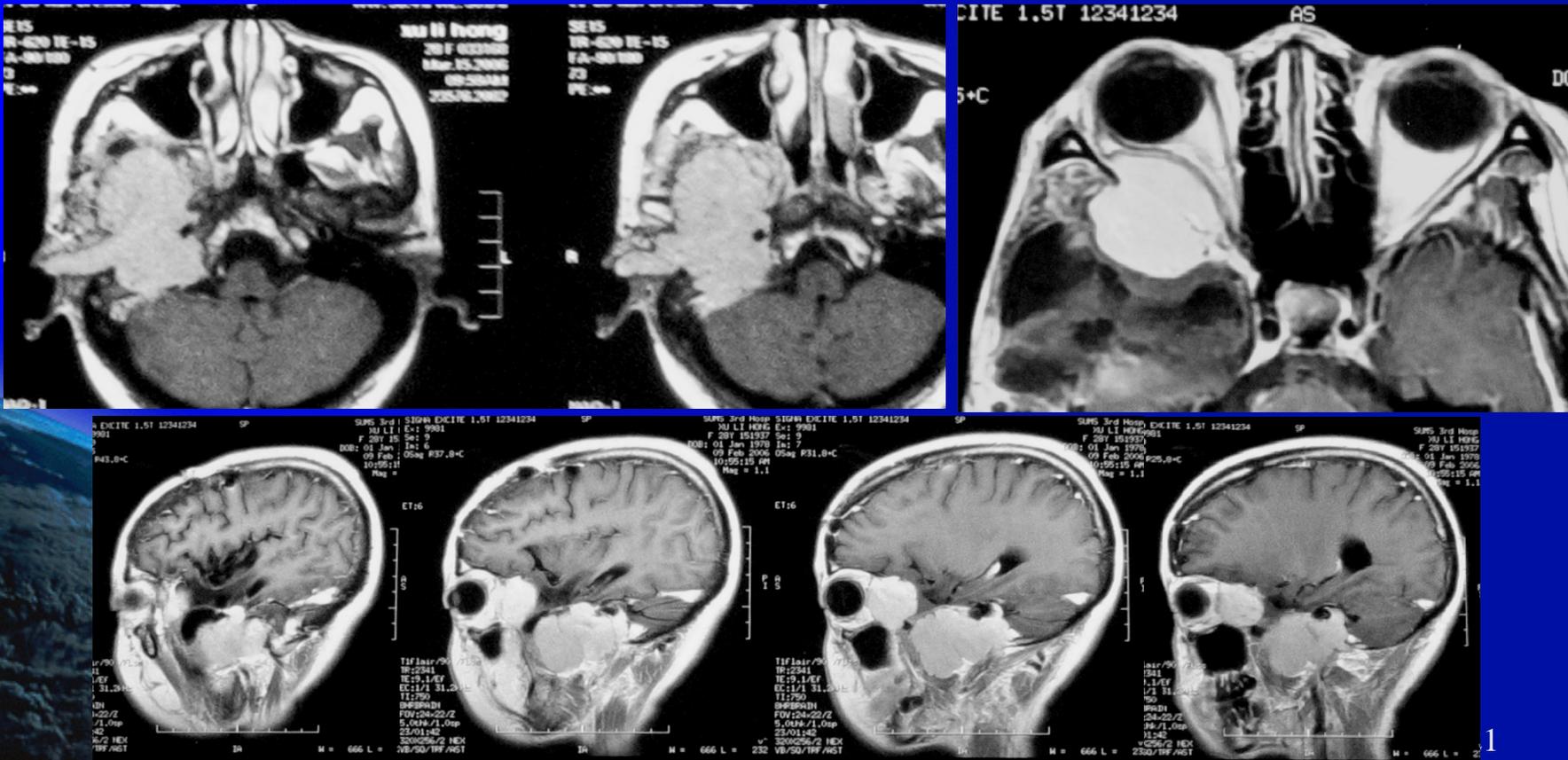


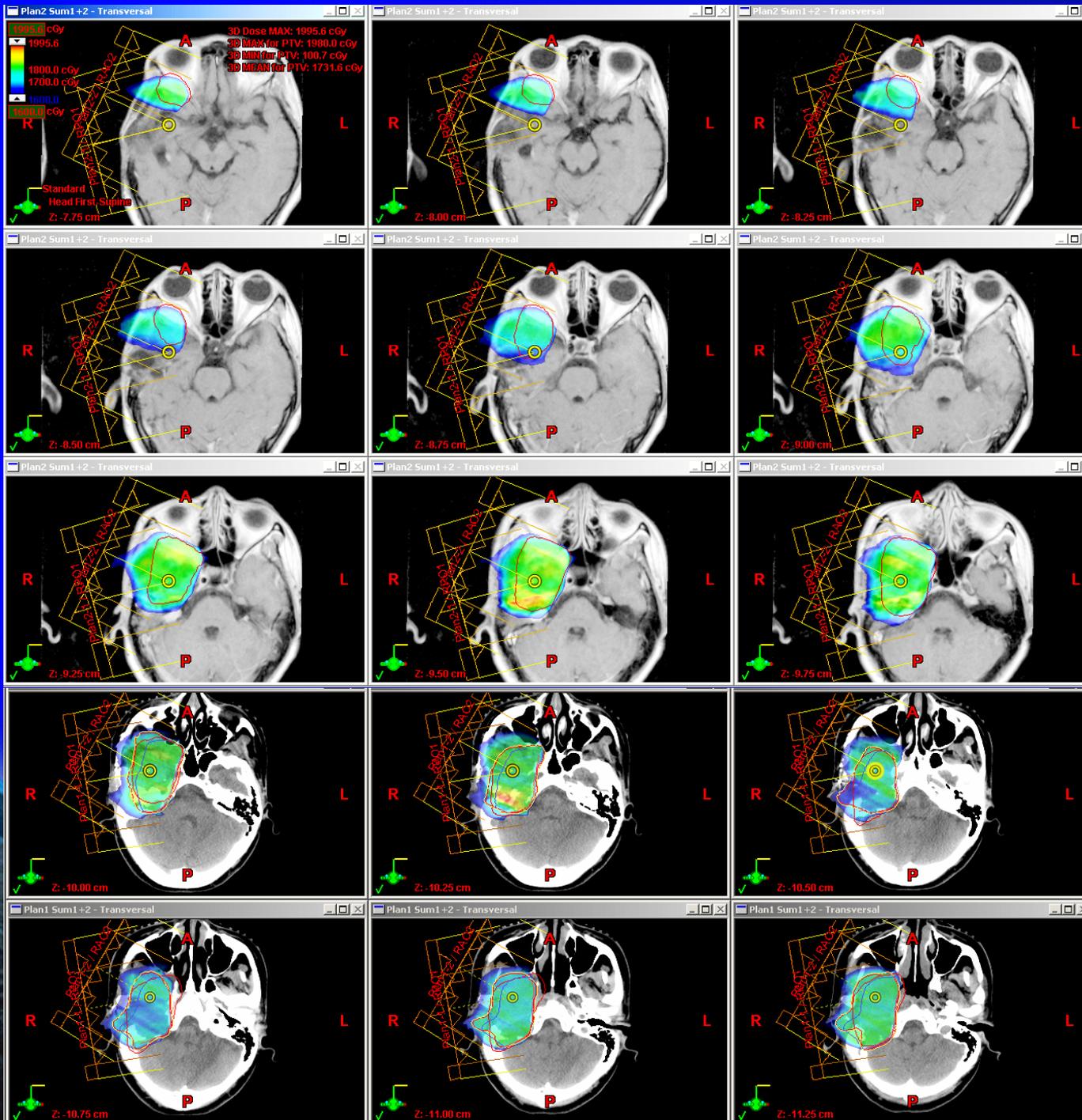
1 year later

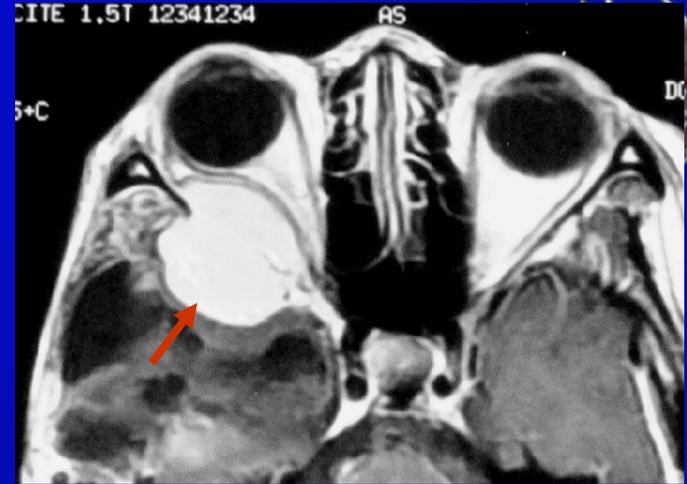
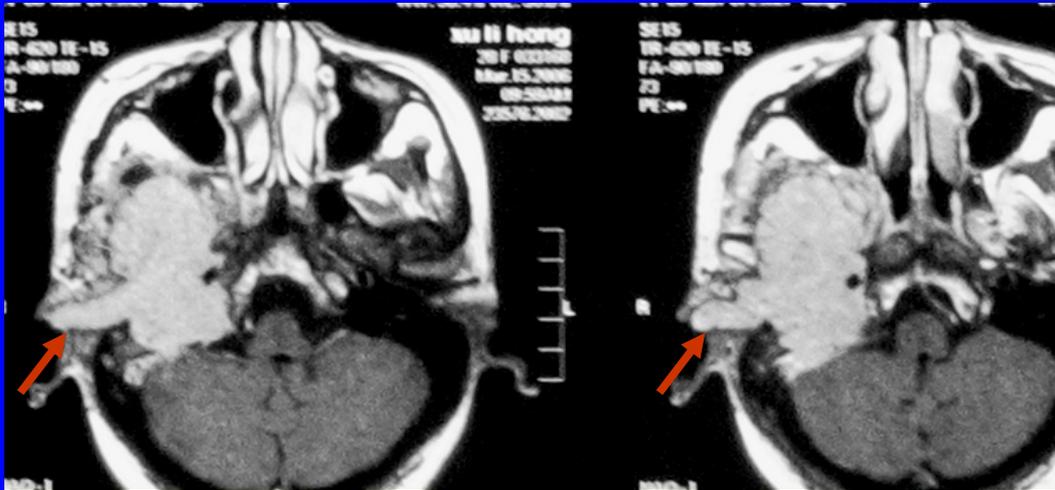
2006-07-03



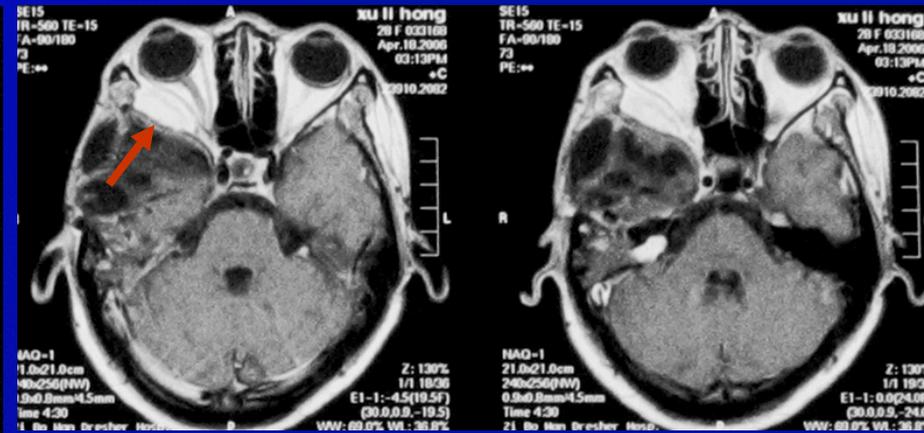
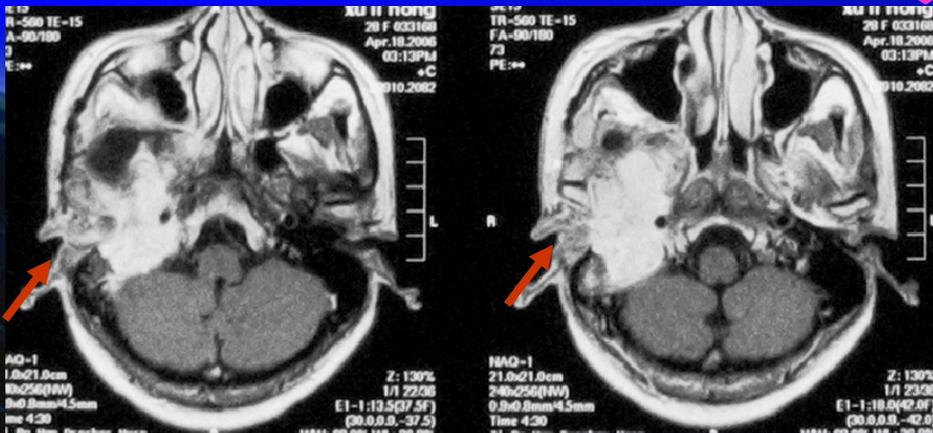
1 case of meningiomas, 29 years old, female. In 2001, she received the first treatment with operation and radiotherapy; In 2004, she underwent the second resection and postoperative using X-knife radiotherapy (20GY/16.75GY). Because of tumor recurrence, the patient received the third operation. And every histological diagnosis was meningioma (WHO III). The clinical manifestations before our proton therapy included: coarse voice, drinking chokes, protuberant right eye, and tumor bulge in the right ear.







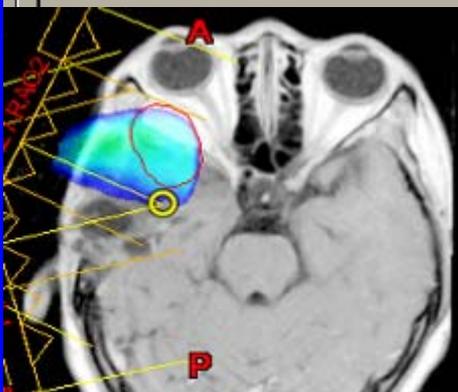
After 21 Proton Irradiate (42CGE)



Dose Volume Histogram

Plan

Plan Sum



Structures and Expressions

Structure	Coverage [%] / [%]	Volume [cm ³]	Min [cGy]	Max [cGy]	Mean [cGy]	Modal [cGy]	Median [cGy]	STD
<input checked="" type="checkbox"/> Brain Stem	100.0 / 99.9	26.5	0.0	4471.2	187.0	0.0	0.0	522.60
<input checked="" type="checkbox"/> Crystal	100.0 / 92.4	0.2	0.0	379.1	146.3	0.0	196.7	136.49
<input checked="" type="checkbox"/> GTV	100.0 / 100.1	110.8	3902.2	7401.0	6508.0	6563.2	6560.2	282.24
<input checked="" type="checkbox"/> GTV 2	100.0 / 99.9	93.8	1625.1	7401.0	6507.5	6702.1	6579.2	432.25
<input type="checkbox"/> Left Eye, NOS								
<input checked="" type="checkbox"/> Optic Nerve	100.0 / 98.5	0.7	0.0	4061.1	768.1	0.0	4.1	1079.9
<input type="checkbox"/> Optic chiasma								
<input checked="" type="checkbox"/> PTV	100.0 / 99.9	118.1	3889.7	7401.0	6492.2	6610.2	6553.8	300.65

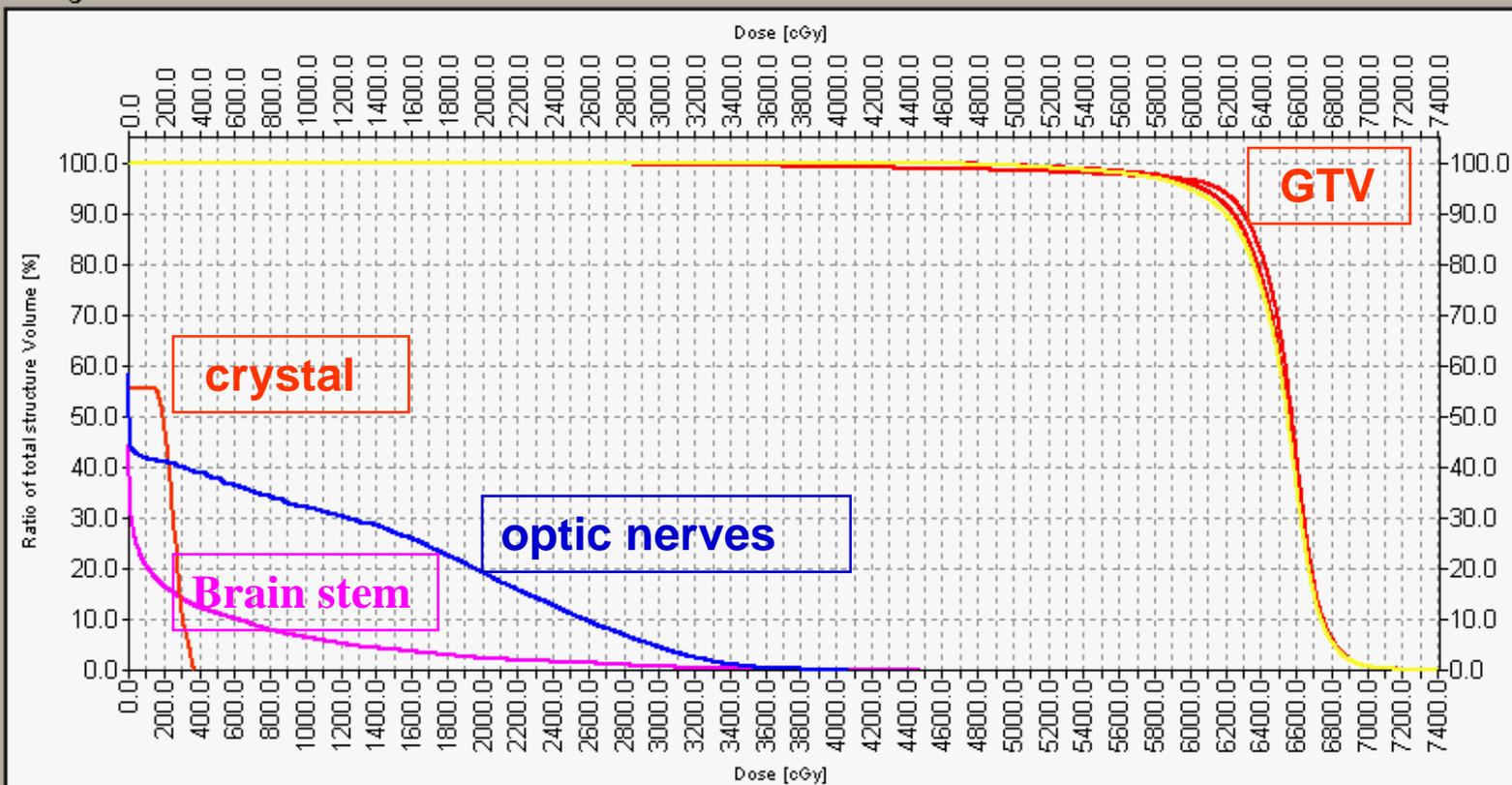
Add...

Edit...

Delete

Contents:

Histogram



Calculate

Print...

Export...

Dose preference:

Relative [%]

Absolute [cGy]

Grid

Type:

Cumulative

Differential

Volume scale:

Relative [%]

Absolute [cm³]

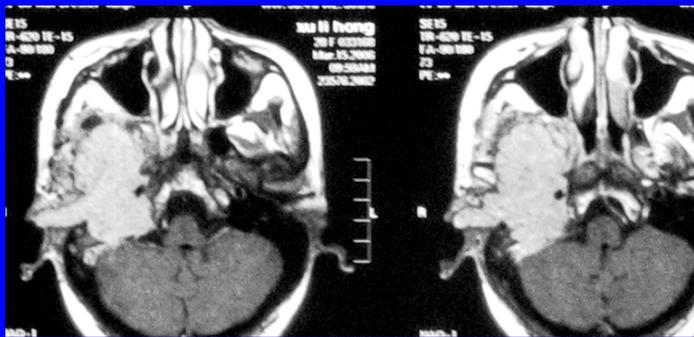
Dose range [cGy]:

0

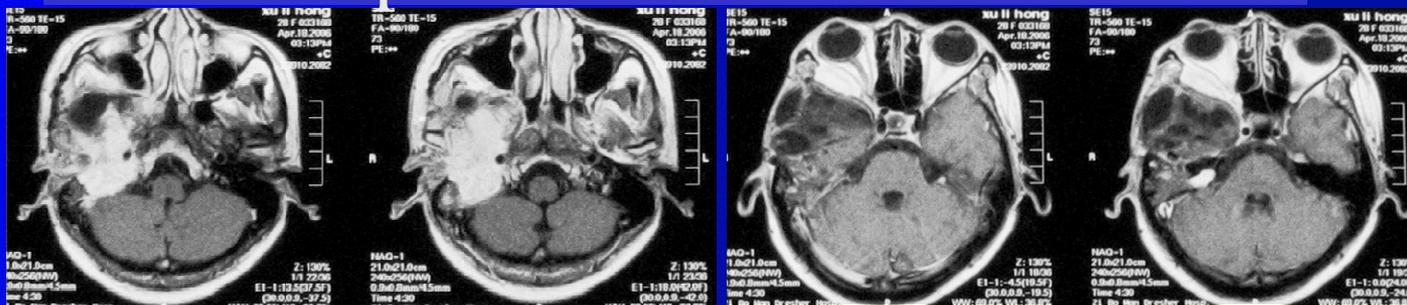
to 7410

Apply Range

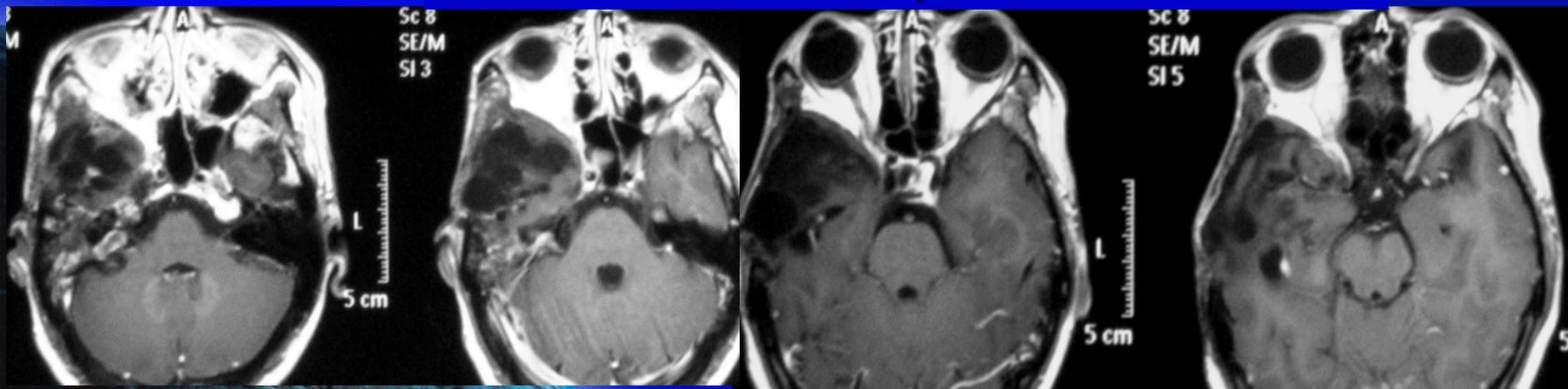
Close

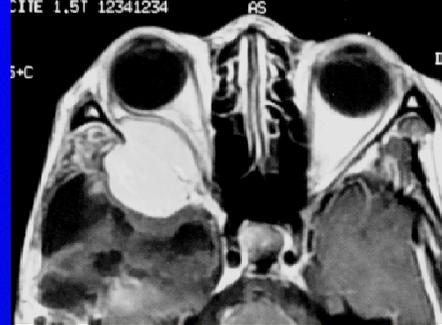
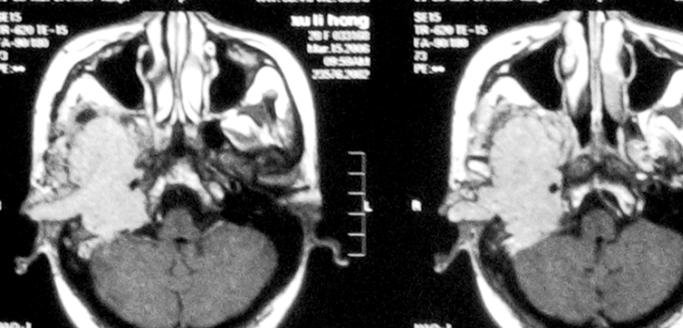


After 21 proton irradiate (42CGE)

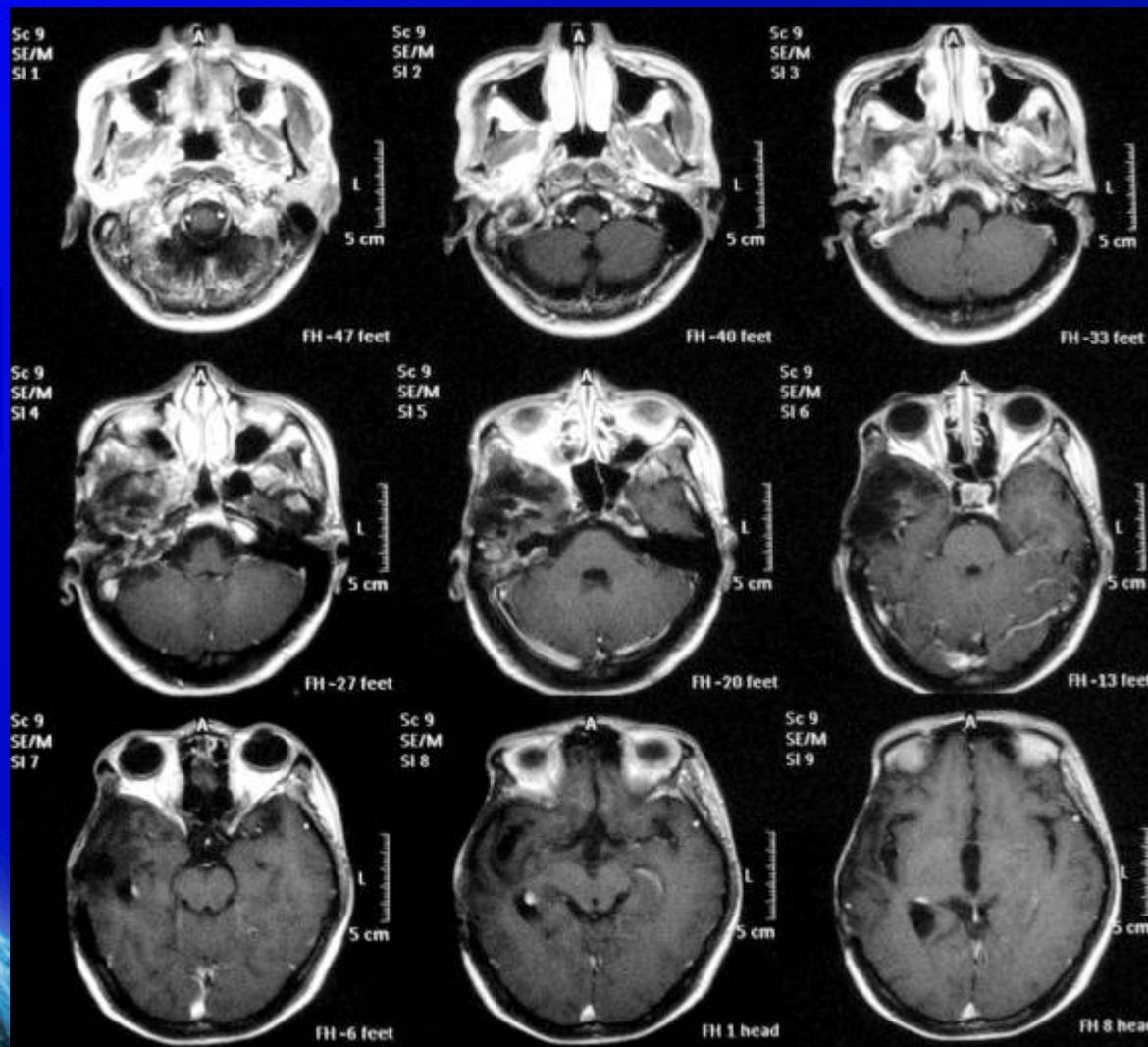


6th months after proton treatment

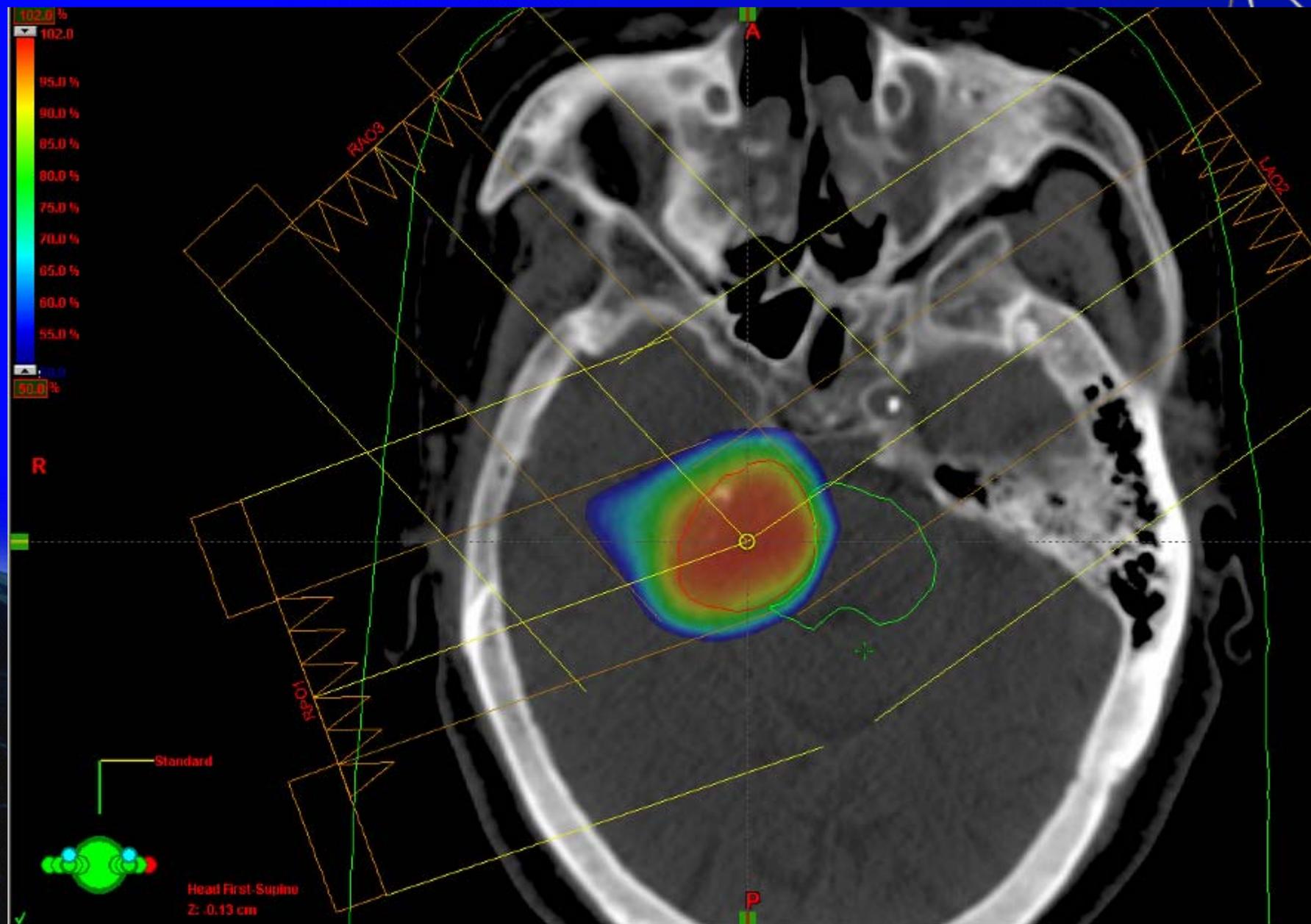




9 months after
proton-treatment



Right CPA meningioma, 95 years old, female.

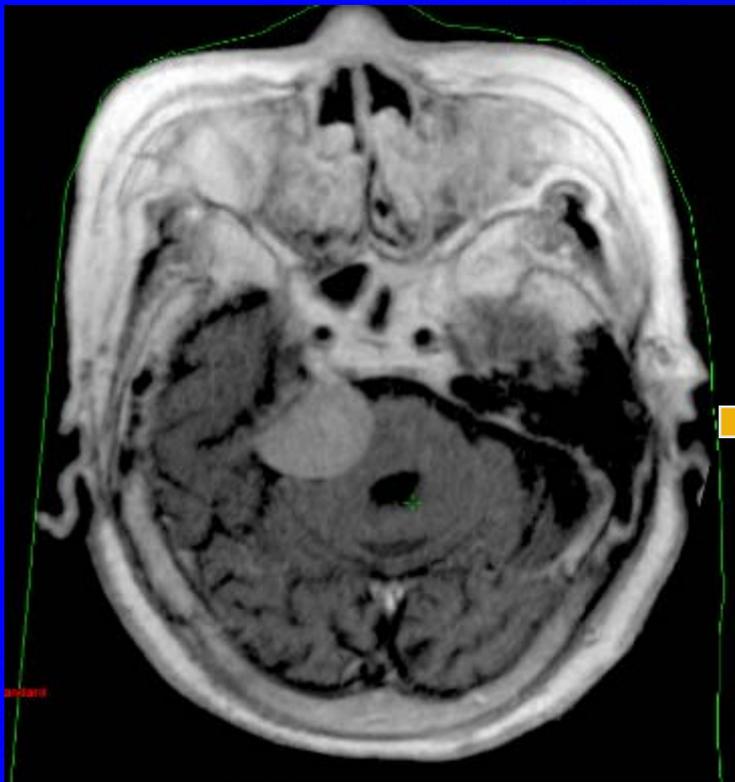




the hardest posturing



6th months after
proton treatment



2005-6-22



2005-11-4

9 months after
proton treatment

The patient was treated before 2 years,
and her is 97 years in age now.



Summary



- The overall effect rate of Glioma is 91.3% (42/46),The effect rate for benign tumor is 94.4%(17/18).
- But due to the limited time of our follow-up, and the survival time of our patients, the long-term curative effects of proton-therapy require further observation.



THANK

YOU!

