



PRECISE CYBERKNIFE® TREATMENTS MAXIMIZE SUCCESS FOR THIS CENTER

Established in October 2007, the Huashan Hospital CyberKnife® Center at Fudan University is one of China's earliest facilities of its kind. The Center treated its first patient in December 2007, and since then has treated more than 4,000 patients, the majority (69 percent) with intracranial lesions. The patients come from across China, including Hong Kong and Macau.

Case Study – Pituitary Tumor

Gender: Male

Age: 35

Marital status: Married

Pathology: Pituitary tumor

Location: Sellar region

Date of treatment: June 28, 2010

History of Present Illness

The patient was diagnosed with a pituitary tumor in November 2009 after experiencing symptoms such as enlarged hands and feet for one year, as well as headaches coupled with blurred vision over a three-month period. The growth hormone level rose markedly, reaching as high as 13 ng/ml. On November 26, 2009, transsphenoidal hypophysectomy was performed under general anesthesia, and the post-operative pathology report confirmed the diagnosis of a pituitary adenoma. The growth hormone level remained elevated at post-surgery follow-ups. MRI re-examination showed there was a residual tumor. The patient visited Huashan Hospital for additional examination and chose to receive CyberKnife® therapy.

Past Medical History

The patient was generally in good health with no history of hypertension, coronary heart disease and diabetes, nor did he have infectious diseases, such as hepatitis, tuberculosis and exposure to such diseases. No history of drug sensitivity was recorded. Additionally, he had no childhood diseases or bad habits. And his family members were in good health and had no history of infectious or genetic diseases either.

Indications for CyberKnife Treatment

Professor Wang chose CyberKnife treatment for this patient because the CyberKnife System is well suited for treating patients who have a residual pituitary tumor after surgery. CyberKnife therapy is indicated if the residual tumor has invaded the cavernous sinus, but has not involved the optical nerve.

CyberKnife Treatment Parameters

Tumor size	10002.63 mm ³
Total dose	2100 cGy
Number of fractions	3
Isodose line	64%
Localized by	CT, MRI
Size of collimator	10 mm
Number of beams	180
Slice thickness	CT: 1mm; MRI: 2mm
Image guidance	6D skull tracking

“CyberKnife treatment does less damage to surrounding tissues, therefore Improving patient quality of life.”

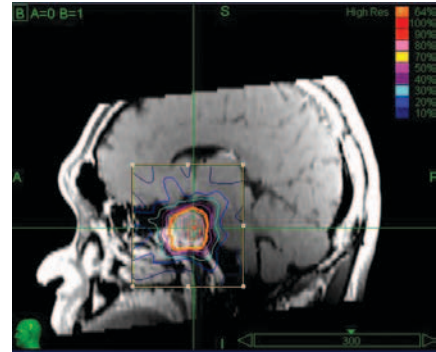
- Huashan Hospital CyberKnife Center, Fudan University, Prof. En Min Wang (M.D.)

CyberKnife® Treatment Process

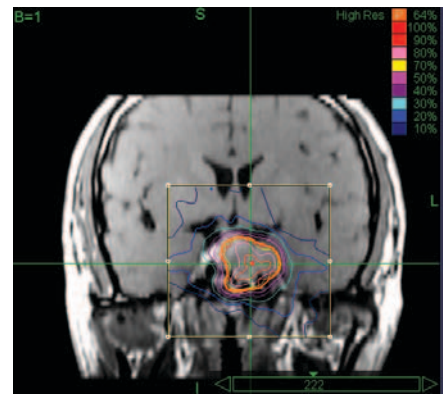
- 1 The patient was immobilized using a custom fitted face mask.
- 2 Enhanced CT and MRI scans of the head were performed.
- 3 A treatment plan was generated using fused CT and MRI scan data to accurately delineate the target volume in the MultiPlan® System.
- 4 The CyberKnife® procedure employed 6D skull tracking, which uses frameless image guidance with robotic translational and rotational position corrections as required to deliver radiation to the tumor in the sellar region with sub-millimeter accuracy.

Follow-up:

After CyberKnife treatment, the patient's vision was not compromised. The growth hormone level returned to normal in one year and MRI re-examination two years after CyberKnife treatment showed the residual tumor had almost disappeared.



Maximum dose delivered to left optic nerve limited to 4.46Gy per fraction.



Maximum dose delivered to optic chiasm limited to 4.02Gy per fraction.

Figure 1, CyberKnife treatment planning

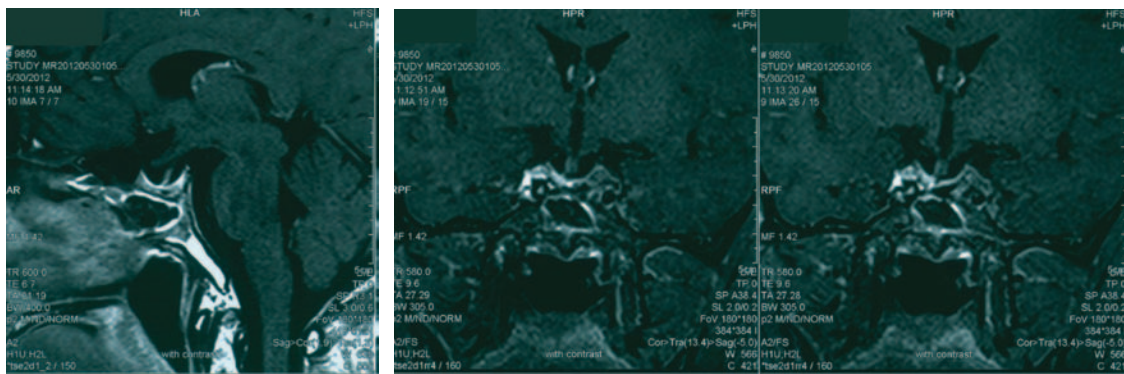


Figure 2, MRI, two years after CyberKnife treatment.

The CyberKnife Advantage

Fractionated CyberKnife radiotherapy delivers beams of high-dose radiation to the tumor, minimizing damage to surrounding tissues, such as the trigeminal, oculomotor and abducent nerves. As a result, CyberKnife treatments can improve quality of life by achieving excellent patient outcomes with minimal adverse effects.

Case Study – Meningioma

Gender: Female
 Age: 42
 Marital status: Married
 Pathology: Meningioma
 Location: Sellar region
 Date of treatment: June 4, 2008

History of Present Illness

The patient visited a local hospital in 2000 with headaches, vomiting and impaired vision in her left eye and was diagnosed with a meningioma in the sellar region. Resection was performed, and the post-operative pathology report confirmed the diagnosis. After surgery, vision improved in the left eye, although no visual acuity test was conducted. In May 2007, the patient complained of blurred vision and gradual vision loss in the left eye, but was not experiencing headaches and vomiting. In April 2008, an MRI scan of the head suggested there was recurrent meningioma in the sellar region. The visual acuity was 0.7 in the right eye, and limited to light perception in the left eye. The patient visited Huashan Hospital for additional examination and chose to receive CyberKnife® therapy.

Past Medical History

The patient was generally in good health with no history of hypertension, coronary heart disease, diabetes, or infectious diseases such as hepatitis and tuberculosis. Additionally, she had no history of drug sensitivity, serious injuries or habits considered harmful to her health. Her family members also were in good health and had no history of infectious or genetic diseases.

Indications for CyberKnife treatment:

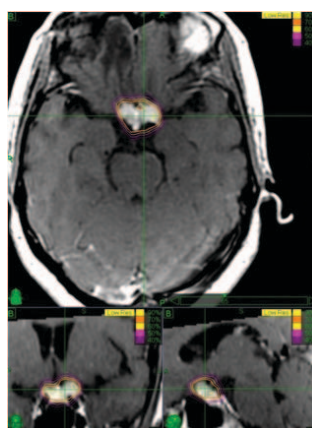
Recurrent meningioma in the sellar region invaded the optical nerve; and surgery posed a risk to the patient maintaining the same level of visual acuity. CyberKnife therapy was a viable option for recurrent meningioma in the sellar region because its ability to deliver fractionated radiotherapy can minimize dose to the optic nerve, thereby leading to control of the tumor while maintaining visual acuity.

CyberKnife Treatment Parameters

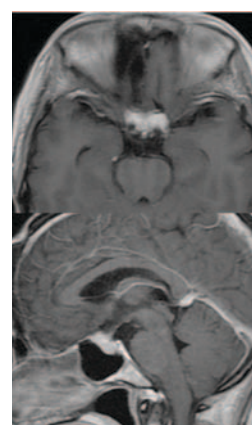
Tumor size	1503 mm ³
Total dose	1850 cGy
Number of fractions	3
Isodose line	75%
Localized by	CT, MRI
Size of collimator	5 mm
Number of beams	178
Slice thickness	CT: 1mm; MRI: 2mm
Image guidance	6D skull tracking

Treatment Process

- 1 The patient was immobilized using a custom fitted face mask.
- 2 CT and MRI scans of the head were performed.
- 3 A treatment plan was generated using fused CT and MRI scan data to accurately delineate the target volume in the MultiPlan® System.
- 4 The CyberKnife treatment employed 6D skull tracking to ensure delivery of radiation to the tumor in the sellar region with sub-millimeter accuracy.



CyberKnife treatment planning



18 months after CyberKnife treatment

“CyberKnife treatment improved tumor control while reducing adverse effect to the optic nerve.”

- Huashan Hospital CyberKnife Center, Fudan University, Prof. Li Pan (M.D.)



Tumor well controlled with no enlargement after more than five years.

Follow-Up

The visual acuity in the left eye improved from light perception only, to perception at one meter away from an eye chart, 18 months after CyberKnife® treatment. The right eye maintained the same visual acuity value of 0.7, and there was no enlargement of the tumor. Five years after CyberKnife treatment, an MRI suggested that the tumor remained stable. The visual acuity in the right eye remained the same as before treatment, and that in the left eye maintained the perception level at one meter away from an eye chart.

The CyberKnife® Advantage

For tumors in the sellar region, CyberKnife - delivered fractionated radiotherapy results in an increase in radiation dose, delivered precisely to the tumor. As a result, doctors achieved tumor control without adversely affecting the optic nerve.



CyberKnife®

FULL BODY RADIOSURGERY

Precisely maximize dose, minimize side effects and maximize patient comfort



Precise, innovative tumor treatments™

PRECISION MATTERS