



# Advantages of Exoscope for Skull Base Surgery

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## 1. Introduction

Neurosurgery has developed primarily through the use of visual devices that enable the magnification of the surgical field and stereoscopic vision.

The magnification technology in visual devices has seen innovations approximately every 30 years, with the introduction of the microscope in the 1960s and the endoscope in the 1990s. Now, 30 years after the advent of the endoscope, the 2020s have brought the introduction of the exoscope into the neurosurgical field.

In recent years, high-resolution 3D exoscopes have become available and are being used for various scene, though their clinical use remains limited to certain facilities and lesions.

In January 2023, our institution introduced the ORBEYE (Olympus Corporation, Tokyo, Japan ) and since then, we have transitioned from microscopic surgery. This report focuses on our experience with skull base surgery using the ORBEYE.

## 2. Subjects and Cases

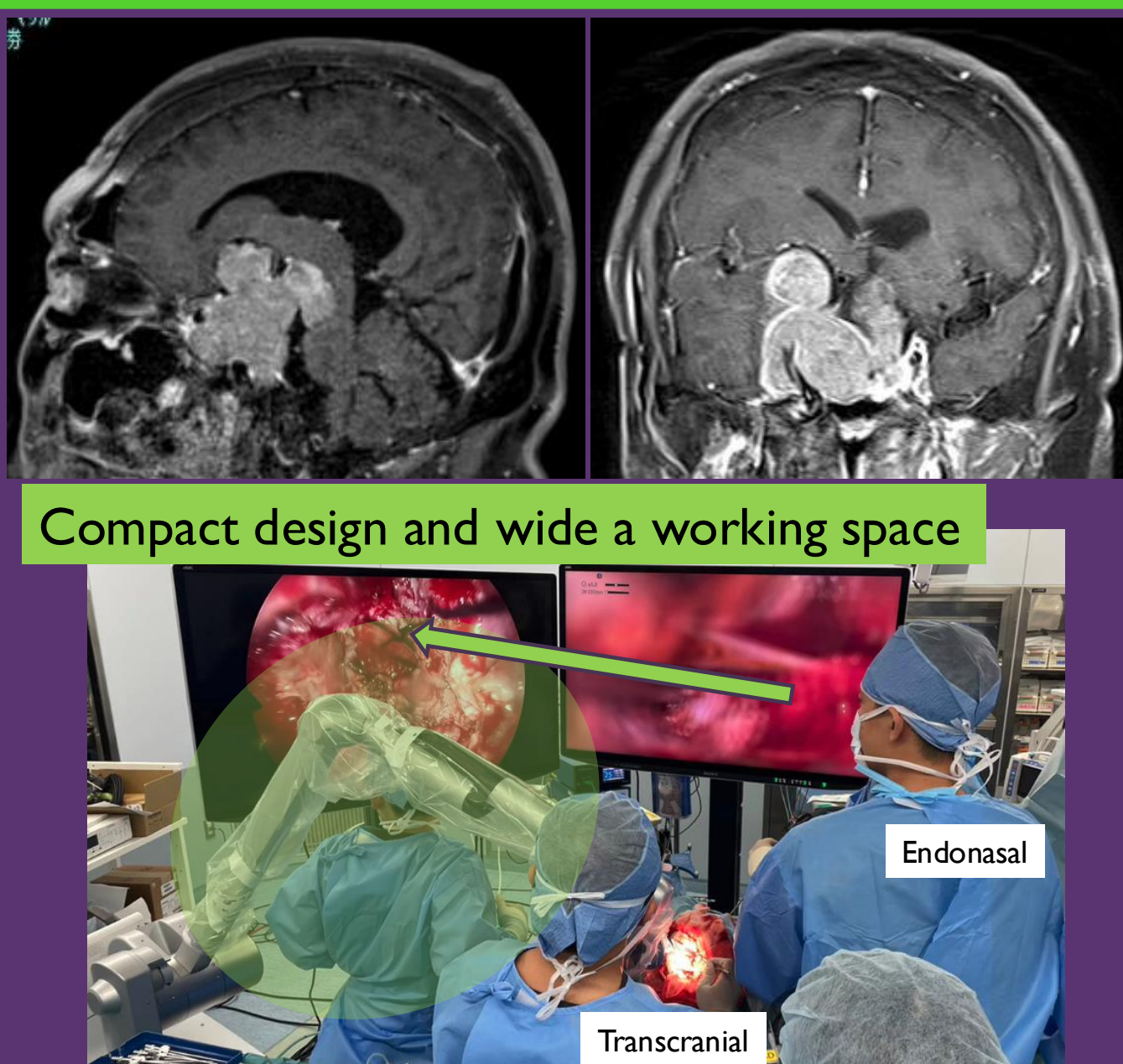
- 350 surgeries for intracranial lesions (Jan. 2023 – Aug. 2024)
- 129 craniotomies using the ORBEYE
  - Meningioma 23 cases
  - Schwannoma 7 cases
  - Neurovascular compression syndrome 7 cases
  - Brainstem cavernous malformation 2 cases
  - Suprasellar arachnoid cyst 2 cases
  - Pituitary Neuroendocrine Tumor 1 case



## 3. Representative cases and Discussion

### 3.1.1. PitNET, Combined endonasal and transcranial approach

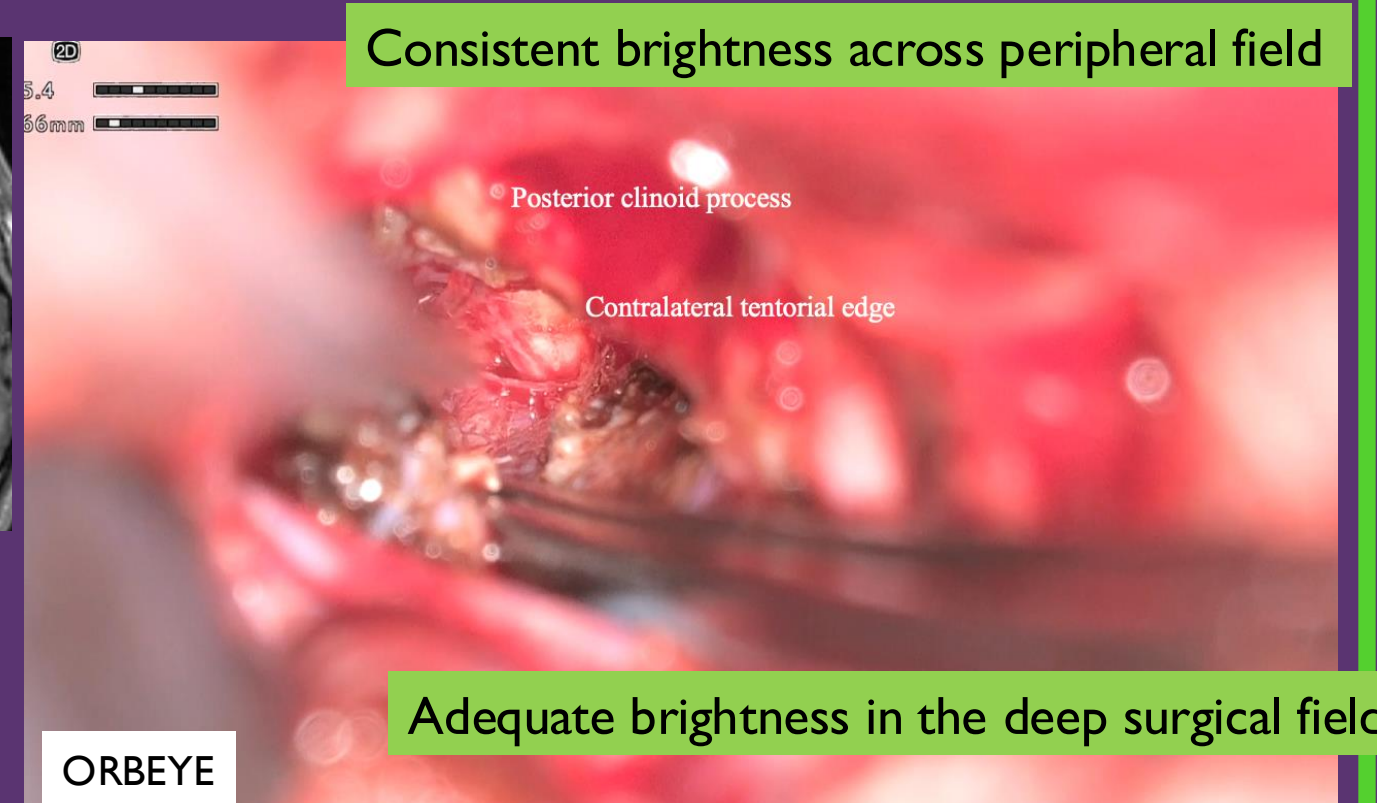
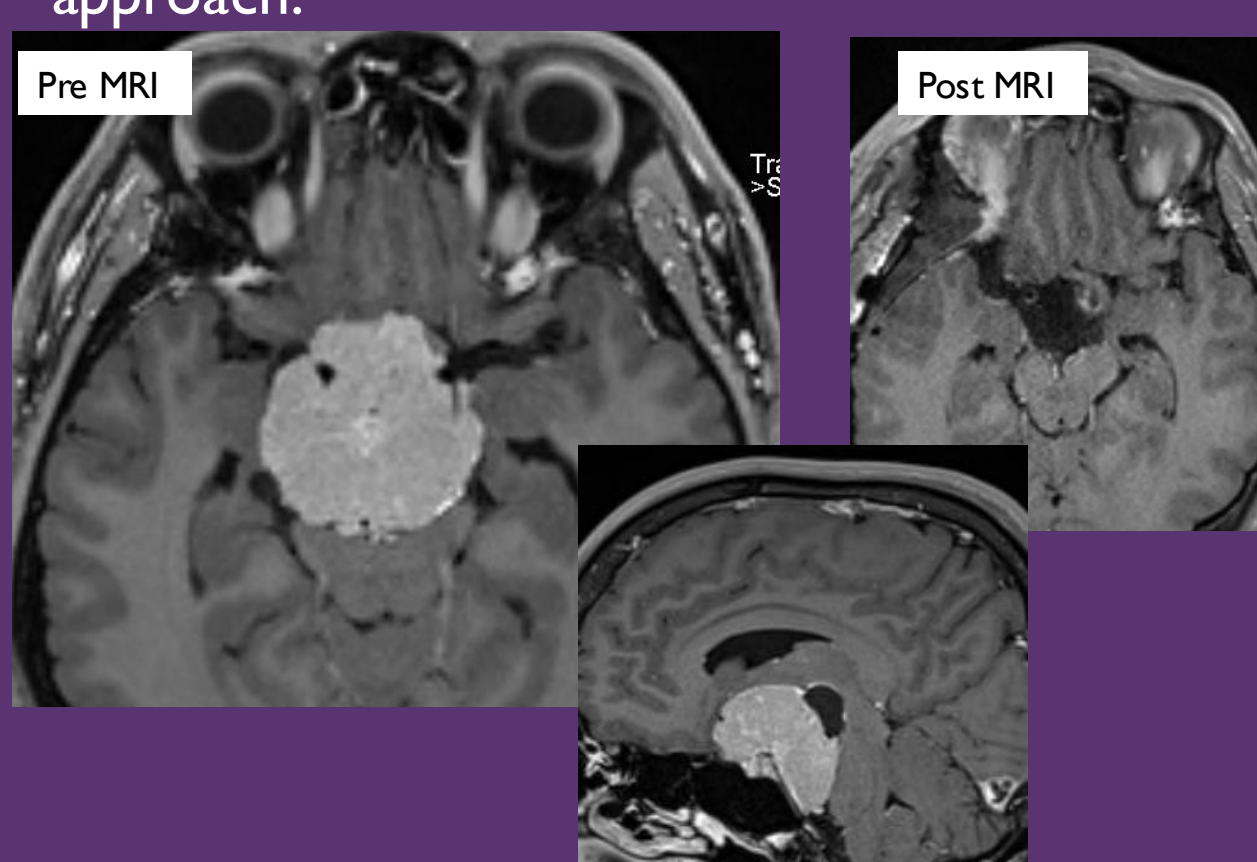
A 77-year-old male had been diagnosed with PRLoma approximately 20 years ago and treated with medication. Initially, the tumor was well-controlled with cabergoline, but resistance to medical therapy emerged two years ago, followed by rapid tumor growth. The tumor had significantly expanded upward, and tumor resection was performed using combined pterional approach and endoscopic transnasal approach.



### 3.1.2. Upper clival meningioma

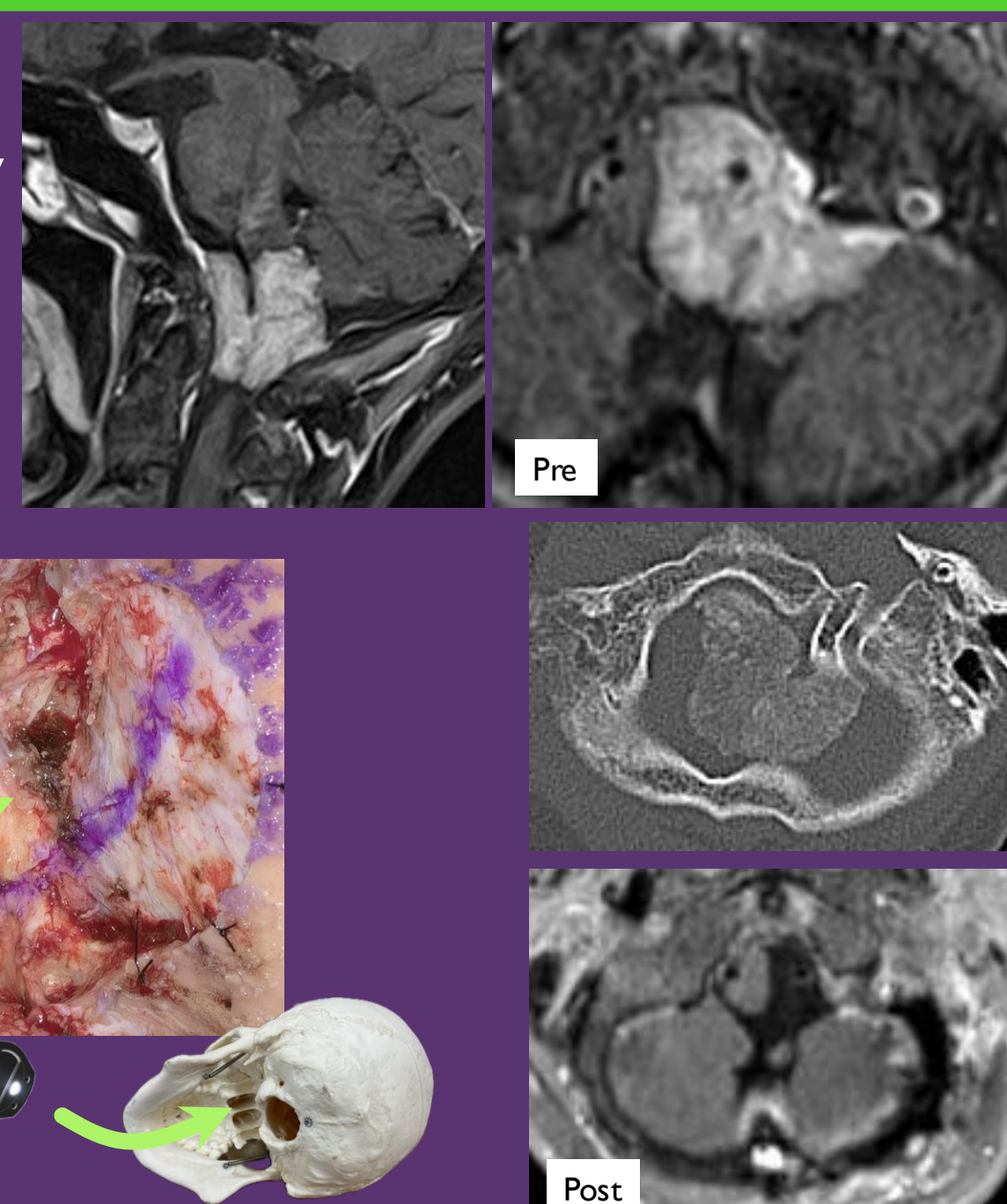
A 31-year-old male presented with gradual vision loss in the right eye over the past year and was diagnosed with central scotoma in the right eye 2 months ago. Head MRI revealed an upper clival meningioma encasing bil. ICA and Pcom. After surgical simulation and considering his main complaint of right eye visual impairment, we performed tumor resection using rt. orbitozygomatic approach.

MOVIE <https://youtu.be/pw17cYFxFLO>



### 3.1.3. Foramen magnum meningioma

A 77-year-old female presented with a one-year history of cold sensation in the right side of her body. MRI revealed a lt. calcified foramen magnum meningioma encasing lt. vertebral artery and causing significant compression of the medulla. Tumor resection was performed using lt. far-lateral transcondylar approach.

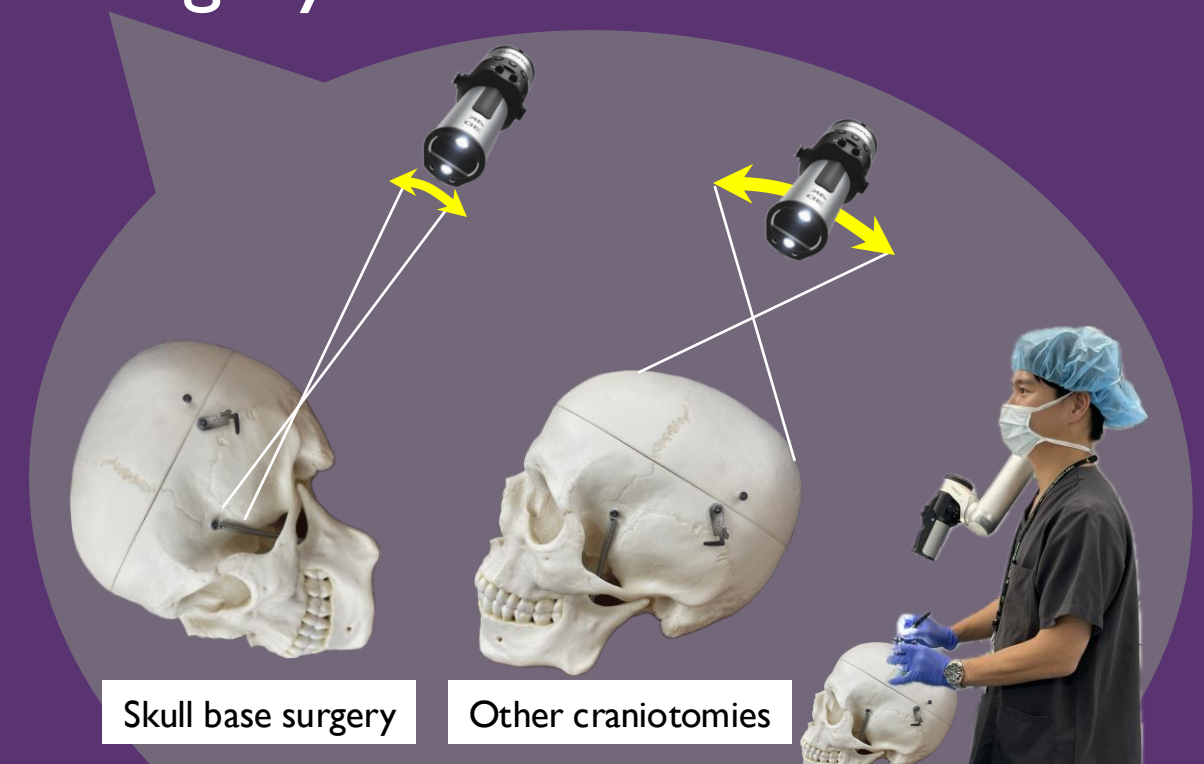


### 3.2. Discussion

#### Advantages of ORBEYE in Skull Base Surgery

##### 1. Compact Design and Wide Working Space

- Enables multiple viewing angles without changing body position.
- Quick autofocusing is achieved due to reduced movement distance and angle adjustment of the camera unit, which is particularly beneficial in narrow and deep fields like skull base surgery.
- Ideal for shallow and wide fields, like in the far-lateral approach, with an easy upward view(3.1.3.).



##### 2. Enhanced Collaboration in Combined Approaches

- Compact size allows for combined endonasal transcranial approaches without obstructing views(3.1.1.).
- Surgeons can share the monitors during surgery.

##### 3. Superior Visualization

- High-resolution, stereoscopic imaging aids in creating precise dissection planes for various skull base tumors.
- Maintains consistent brightness across the entire field, especially in deep surgical areas. This provides not only a better view, similar to traditional microscopes, but also a clearer and more delicate impression of the surgical anatomy, crucial for performing precision surgery(3.1.2.).

##### 4. LED Light Source

- Enables long surgeries without risking thermal damage to tissues.

## 4. Conclusion

Neurosurgery using the exoscope can be performed as safely as surgery using the microscope, and its advantages are particularly evident in skull base surgery.

## 5. References

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