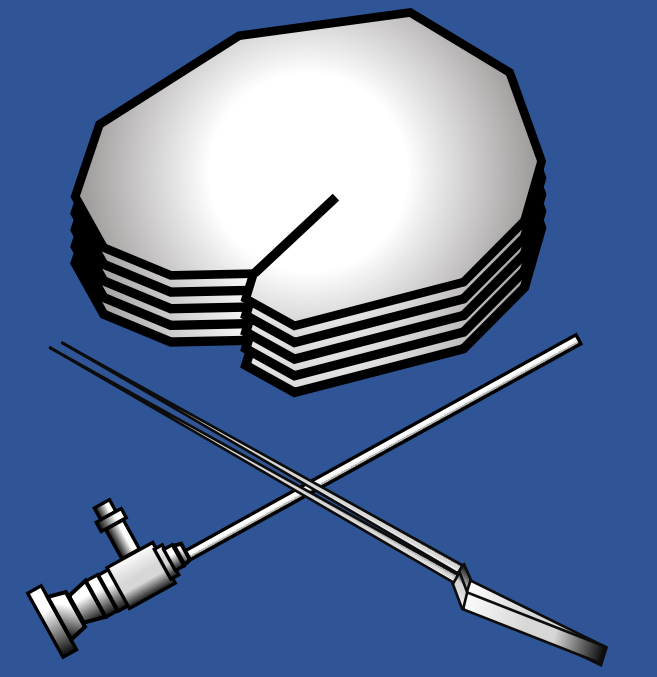


# Endoscopic Endonasal Skull Base Surgery using the Steerable Instruments



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## Introduction

The surgical field in endoscopic endonasal surgery for skull base lesions is both deep and narrow.<sup>1</sup> To perform adequate surgical techniques in such confined spaces, instruments with a high degree of tip maneuverability are required. We have actively used forceps with tip-steering capabilities<sup>2</sup> that allow rotation, bending, and grasping, in endoscopic endonasal surgery for skull base. This article presents our clinical experience and evaluates the usefulness of these forceps.



Flexible Curette Forceps® (Mizuho Co., Japan)

VIDEO 1



## Usefulness assessment

The usefulness of the steerable forceps was evaluated by retrospective analysis of operative videos. The surgeon judged the effectiveness of the instrument and classified as completely useful (Group C) for techniques that were effective throughout the procedure, partially useful (Group P) for techniques that were effective in specific parts of the procedure, and not useful (Group N) for techniques that showed no benefit.

### Cases

		Group C	Group P	Group N
• Pit-NET	211	160	30	21
• Craniopharyngioma	37	19	2	16
• Chordoma	29	9	9	11
• Meningioma	16	8	2	6
• Chondrosarcoma	7	4	0	3
• Others	56	15	8	33
• Total	356	215	51	90

A total of 356 cases with various skull base lesions were included.

## Results

Within the surgical field, which is also easily accessible with conventional rigid instruments, the steerable instruments provided improved visibility by eliminating the instrument shaft obstruction through distal instrument triangulation. In addition, the range of maneuverability has been expanded to allow lesion retraction in any direction in the vertical plane of the approach. In the periphery, the steerable instrument demonstrated high tracking performance and allowed manipulation of the lesion compartment, which was difficult to access with the conventional rigid instrument.<sup>3-5</sup>

Reasons for categorizing cases into Group P or N included procedures with minimal need for steerable forceps, such as cyst fenestration, biopsy, or CSF leak repair; hard lesions that made the use of forceps impractical; narrow surgical fields that made the use of forceps difficult; limited use due to inexperience in early cases; and soft lesions that were difficult to grasp with forceps.

## Limitation

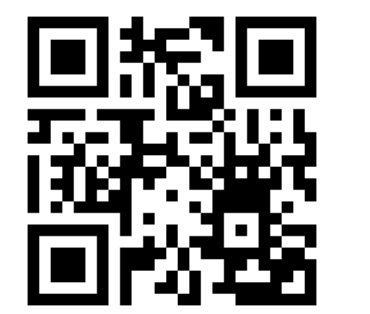
The evaluation of the procedure's usefulness was based on the subjective judgment of the surgeon. A validation study with a larger number of cases is therefore necessary to enable a more accurate evaluation.

## Conclusions

The use of the steerable forceps provided high range of freedom in the grasping and dissection maneuver and improved access to the deep and peripheral surgical field. The endoscopic endonasal surgery using the steerable forceps has the aspect of robotic surgery and can be considered as the next generation.

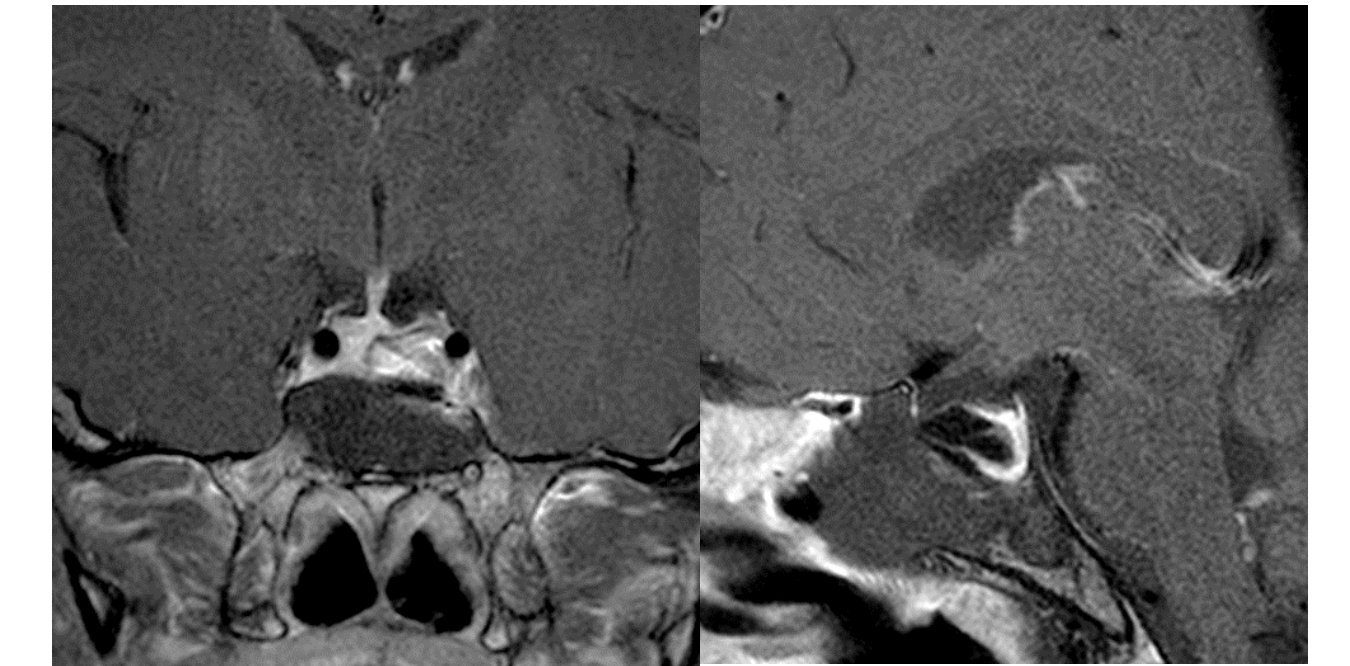
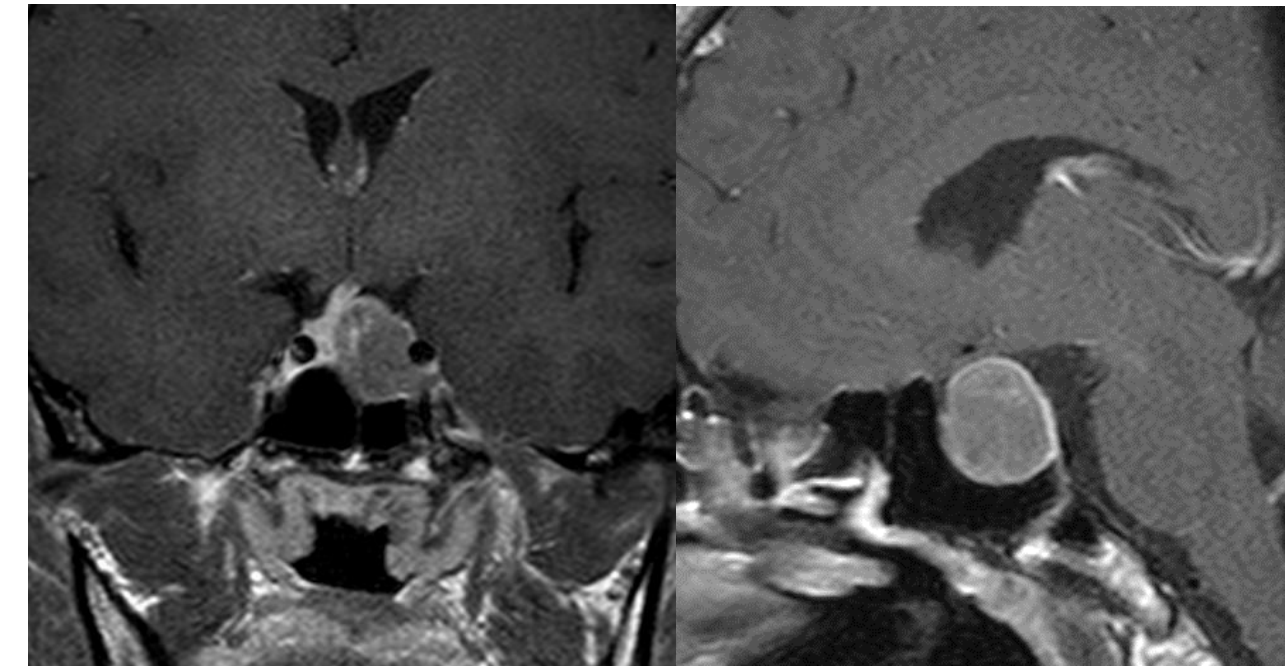
## Representative cases:

Case 1: Somatotroph PitNET 47 y/o F VIDEO 2



Preoperative MR images

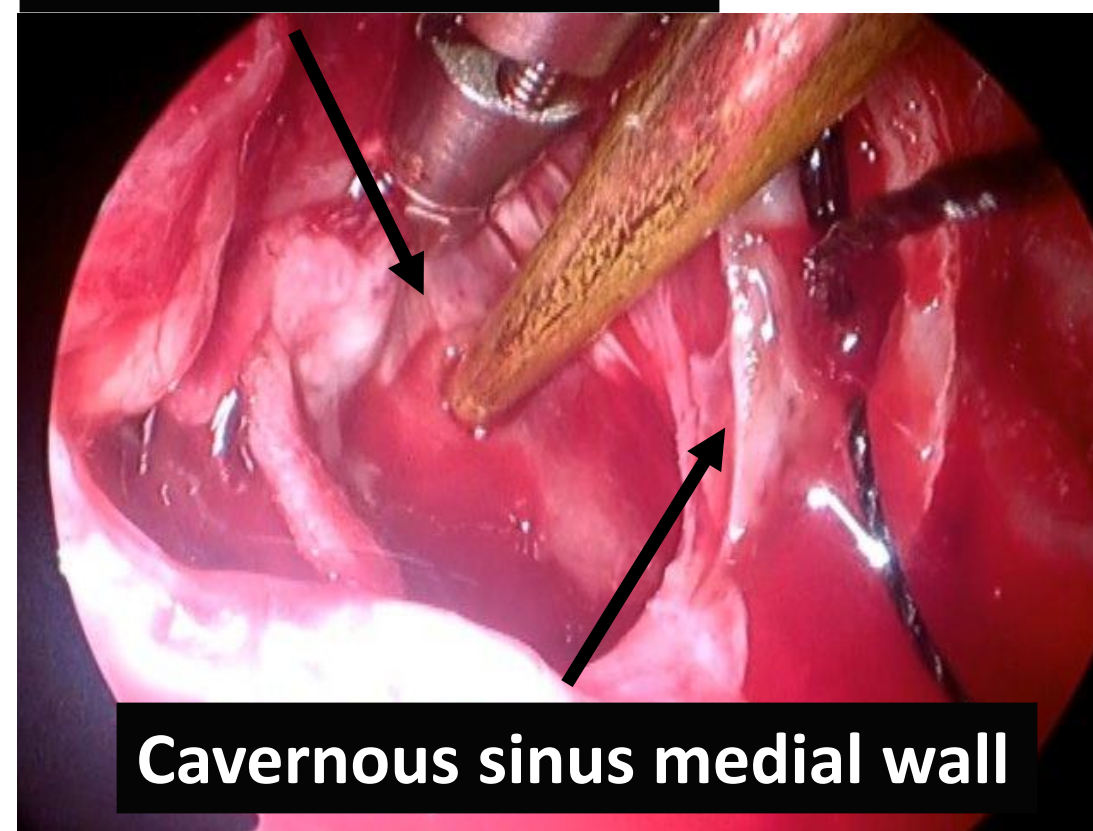
Postoperative MR images



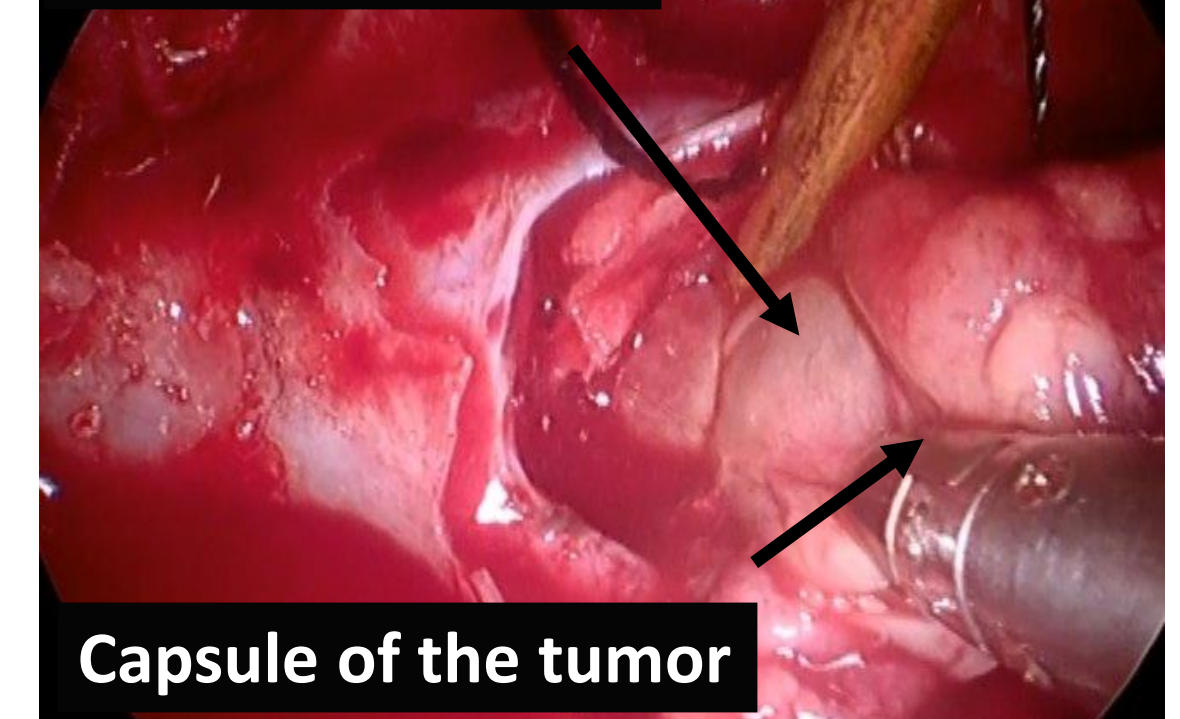
GH: 86.4ng/ml, nadir: 60.5ng/ml,  
IGF-1: 947ng/ml (+10.2 SD)

GH: 0.22ng/ml, nadir: 0.17ng/ml,  
IGF-1: 202ng/ml (+1.6 SD)

Capsule of the tumor



Diaphragma sellae

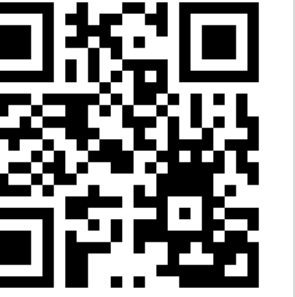


Cavernous sinus medial wall

Capsule of the tumor

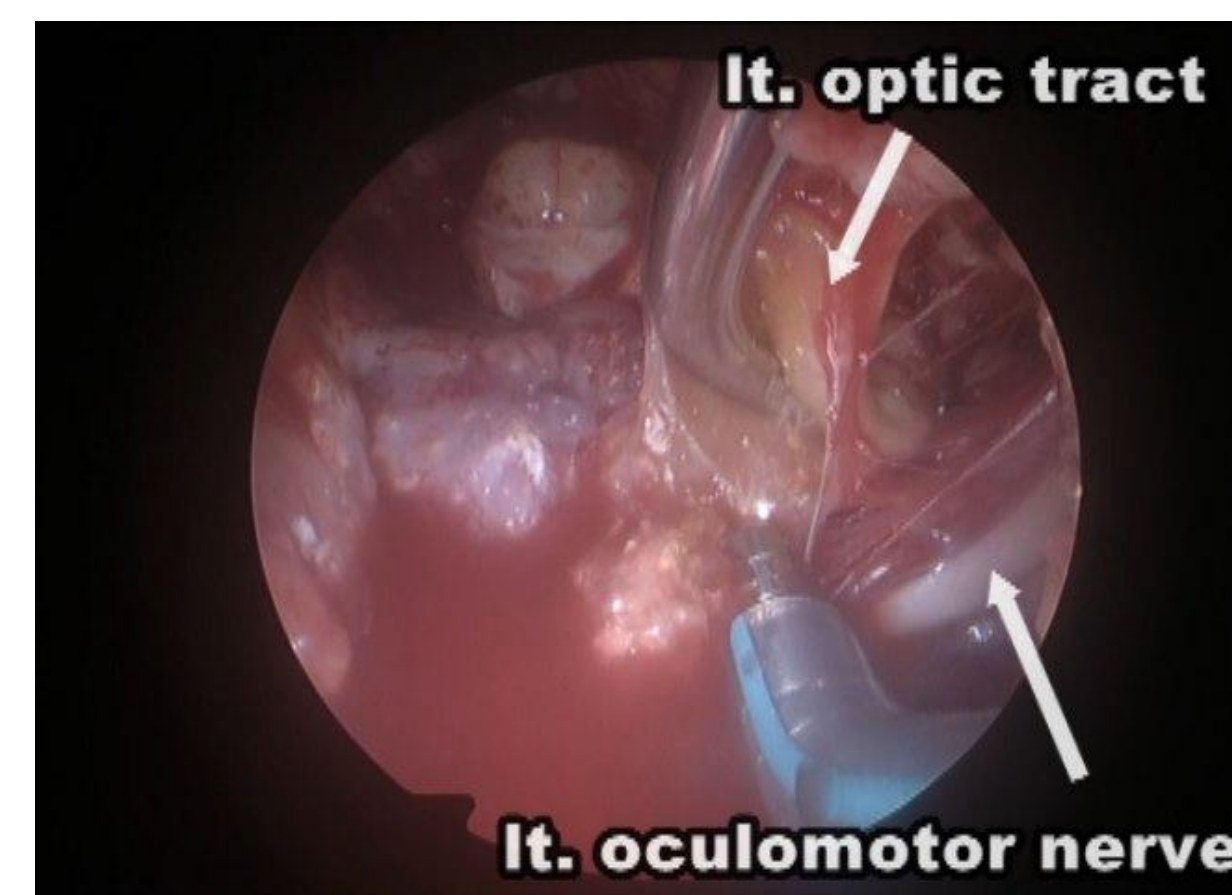
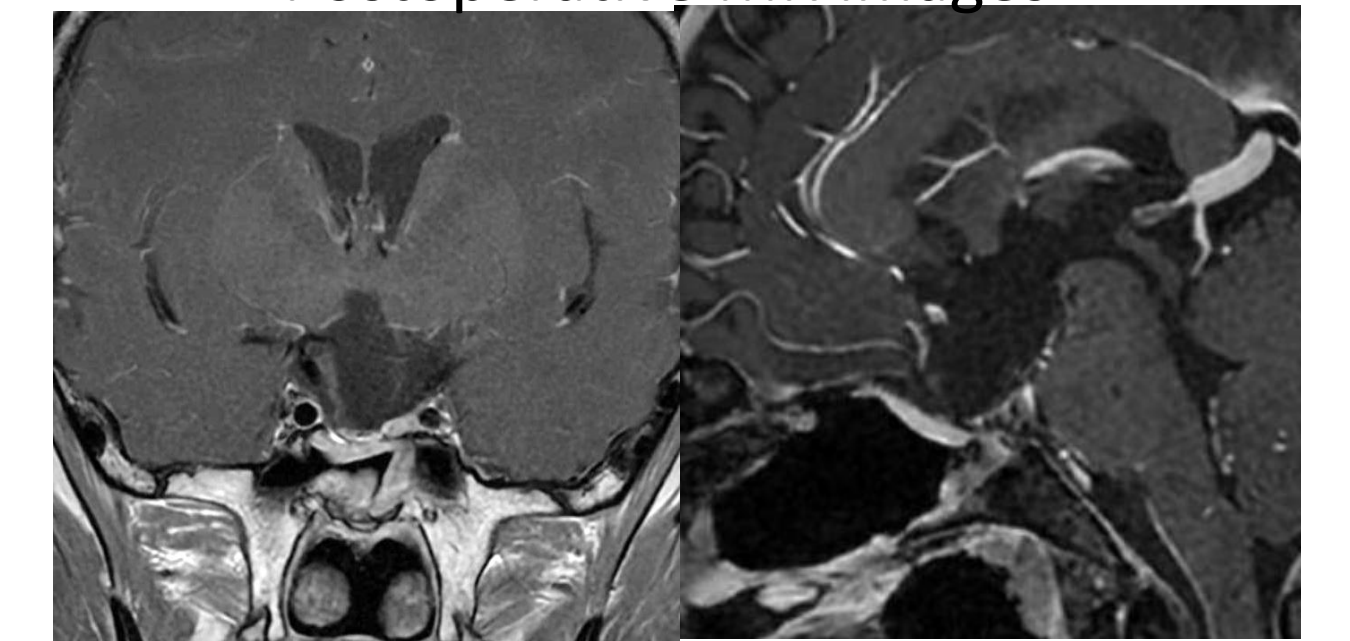
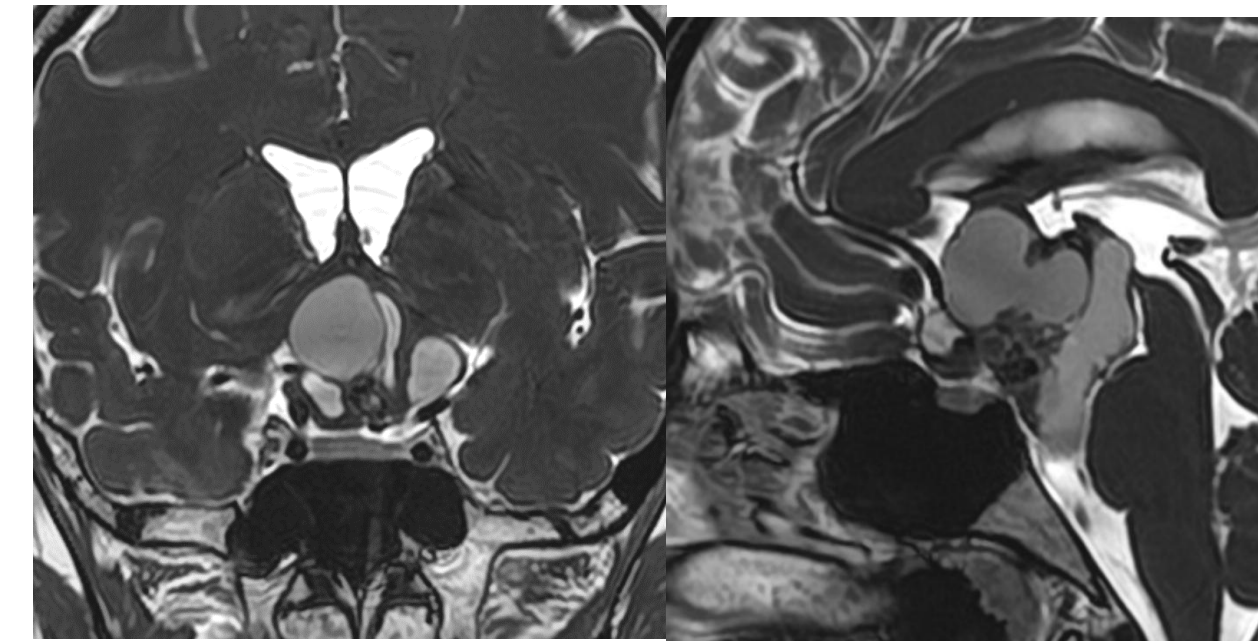
Case 2: Craniopharyngioma 16 y/o F VIDEO 3

VIDEO 3



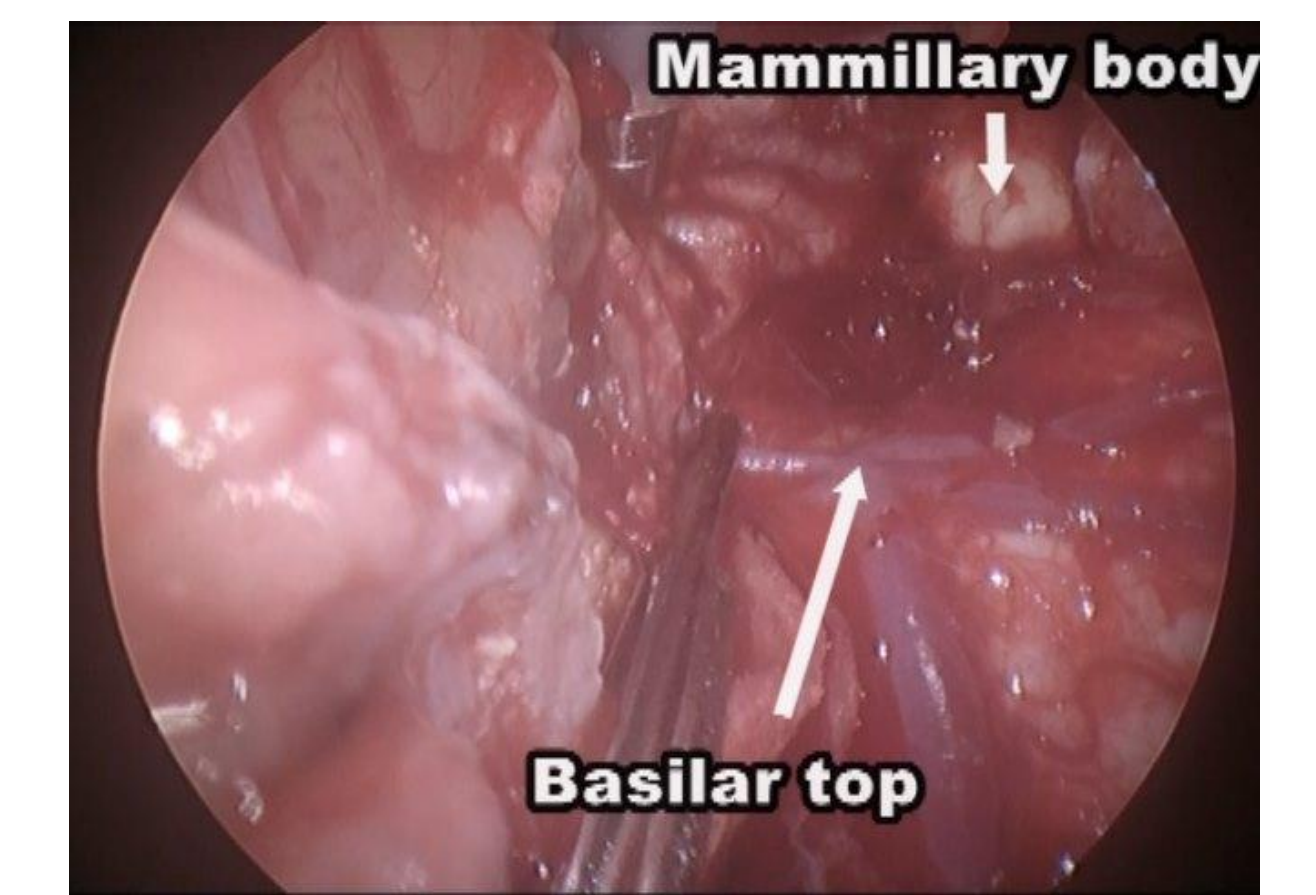
Preoperative MR images

Postoperative MR images



lt. optic tract

lt. oculomotor nerve



Mammillary body

Basilar top

## Discussion

The ability to grasp objects laterally and apply transverse traction enabled the tumor to be dissected from surrounding tissue in any direction, offering a significant advantage over traditional tools. The superior tracking ability of the steerable forceps enabled surgical maneuvers in lateral and upper peripheral fields, including areas where circumvention of critical structures, such as the internal carotid artery, was necessary to access the target regions. Although potential bleeding during manipulations in the lateral peripheral operative field was a concern, no complications related to such bleeding were observed. However, the development of steerable forceps with hemostatic capabilities is necessary. As more cases are gathered and analyzed, more precise criteria for identifying suitable cases for the effective use of this instrument are anticipated to emerge.

## Contact

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