

Minimally Invasive Colloid Cyst Resection with Expandable Tubular Retractor for Small Ventricular Systems: Morphometric Analysis in 4 Cadaveric Specimens

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Background

- Colloid cysts are benign lesions that can obstruct CSF flow and in rare cases predispose to sudden death.^{1,2}
- The interhemispheric transcallosal corridor historically favored, though endoscopic transcortical/transventricular access is also used.^{2,3,4}
- Recent introduction of expandable minimally-invasive tubular retractors has facilitated microscopic minimally-invasive resection of symptomatic colloid cysts, even with non-dilated ventricular systems.
- Optimal positioning of this type of retractor and maximizing visualization of the roof of the third ventricle likely critical. However, there is a paucity of information available in the literature.

Methods

- Using morphometric analysis, the authors assessed visualization provided by (1) Kocher's point of entry (3 cm lateral to midline and 1 cm anterior to coronal suture) and (2) anterolateral site of entry (4 cm lateral to midline and 4.5 cm anterior to coronal suture) in four cadaveric specimens.
- Neuronavigation-protocol CT imaging was obtained for each specimen.
- Ventricular access was obtained using entry sites (1 + 2). Photographs were obtained through a surgical microscope, through an expandable tubular retractor, to qualitatively assess (A) visualization of roof of third ventricle and (B) assess for impediments to visualization (**Figure 1**).
- 3-D modeling software subsequently was used, with CT scan data, to identify an "ideal" point of entry which would avoid visual obstruction and maximize visualization of the roof of the third ventricle (**Figure 2**).

Results

- In the coronal plane, trajectories from Kocher's and anterolateral points to the foramen of Monro formed angles measuring an average of 24 and 46 degrees, respectively, relative to midline.
- In the sagittal plane, trajectories from Kocher's and anterolateral points to the foramen of Monro had an average of 25 and 60 degrees, respectively, relative to the coronal plane.
- View of the foramen of Monro was partially obstructed by the caudate head in 5 out of the 8 (63%) anterolateral entry points, and in none (0%) of the Kocher's point entry points.
- Based on 3-D modeling, ideal point of entry ranged from 12-35 mm lateral to midline, and 13-56 mm anterior to coronal suture (**Table 1**).

References

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Table 1: Pre-defined entry points with view of foramen of Monro obstructed by caudate head and ideal points of entry for each side

Specimen (#)	Side	Entry points with partially obstructed view of foramen of Monro	Ideal entry lateral to midline (mm)	Ideal entry anterior to coronal suture (mm)
1	Left	None	35	56
	Right	Anterolateral	26	33
2	Left	Anterolateral	29	13
	Right	Anterolateral	18	47
3	Left	Anterolateral	35	28
	Right	Anterolateral	12	33
4	Left	None	30	42
	Right	None	23	35

Figure 1: Visualization of foramen of Monro from Anterolateral and Kocher's point entry

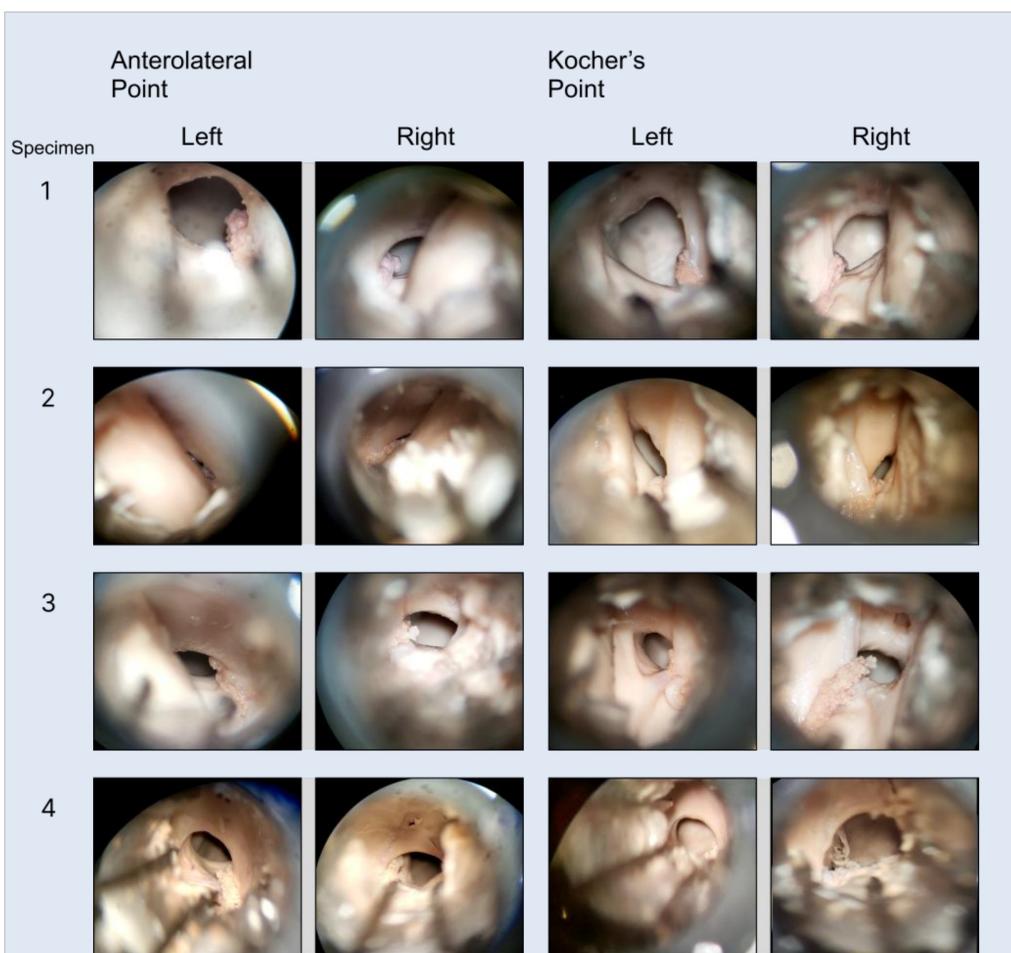
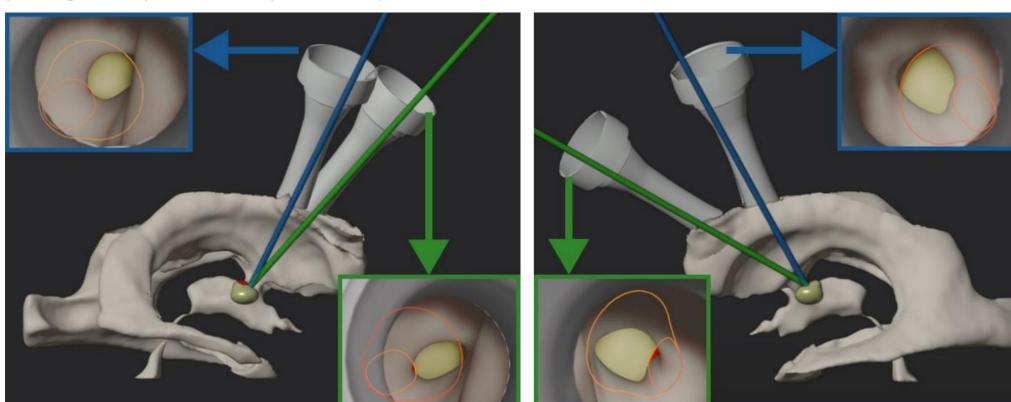


Figure 2: Simulated visualization of third ventricle using 3-D software. Blue represents entry at Kocher's point, green represents entry at "ideal" point.



Discussion

- Anterolateral entry points (4 cm lateral to midline and 4.5 cm anterior to coronal suture) provide greater visualization of the roof of the third ventricle at the expense of partial obstruction of view in non-dilated ventricular systems secondary to the caudate head.
- In this population we recommend an entry as anterior as possible, coplanar with the mid-pupillary line.**