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Role of High Definition Fiber Tracking in Surgery of Cingulate Gyrus Tumors.

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Introduction

Tumors involving the cingulum are surgically challenging. They may originate within the cingulum gyrus or adjacent to it. Current imaging such as MRI or CT scans are unable to assess the integrity of the cingulum. Diffusion MRI (dMRI) fiber tracking is an in-vivo method for pre-operative assessment of brain lesions.

Methods

We retrospectively evaluated the dMRI fiber tracking database at our academic institution. We identified 11 patients with tumors affecting the cingulum. The lesions were first classified using regular MRI into 3 segments: anterior cingulum segment (ACS), anterior to a line drawn from the coronal suture to the foramen of Monro; middle cingulum segment (MCS) between the previous line and a posterior line drawn from the paracentral lobule to the mammillary body, and posterior cingulum segment (PCS) between the former line and the isthmus of the cingulum. Subsequently, pre-operative dMRI was performed to study cingulum involvement. Lesions infiltrating and/or disrupting the cingulum were sub-classified as cingulum resecting technique (CgRT), and those lesions purely displacing it as cingulum sparing technique (CgST).

Results

Eleven (7 male, 4 female) patients had tumors involving the cingulum. Tumor location was ACS in 8 (72.7%) patients, PCS in 2 (18.2%), and MCS in 1 (9.1%) patient. Seven (63.6%) patients were subclassified as CgRT and 4 (36,4%) as CgST. Six (85.7%) patients from the CgRT group underwent to open surgical removal with cingulum resection, and 1 underwent to CT-stereotactic biopsy. All of the patients on the CgST had open approach and the cingulum was preserved using the cingulum sulcus as a limit. Surgical removal was gross total in 8 (80%) and subtotal in 2 (20%) patients. Nine (90%) patients improved after surgery.

Conclusions

Advanced dMRI fiber tracking differentiate cingulate versus paracingulate tumors. Patients sub-classified as CgST might benefit from cingulum gyrus preservation; however, prospective studies incorporating neuropsychological tests are warranted.

Learning Objectives

-Classified tumors affecting the cingulum gyrus according to their anatomical location.

-Sub-classified tumors affecting the cingulum gyrus using an advanced diffusion MRI method.

-Identify those tumors where the cingulum gyrus could be resected.

-Identify tumors where cingulum gyrus should be preserved.

-Cingulum sulcus as a landmark for surgical resection.

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