

# Left Diencephalic Intracerebral Hematoma

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## Clinical Presentation

The patient is a 67-year-old male with a history of hypertension presenting with acute onset of right facial and extremity weakness, and difficulty speaking.

Neurologic exam demonstrated an alert male with capacity to state his name, but inability to name objects, repeat phrases or construct sentences. He could follow one-step, but not two-step commands. He had conjugate left gaze, right homonymous hemianopia, central VII palsy, no volitional movement of the right extremities and flexion withdrawal with noxious stimulation.

Pre-operative imaging (Figure 1) revealed a large left diencephalic hematoma centered in the external capsule and extending into the posterior mesial temporal lobe, 30x54x43 mm in orthogonal diameters, an approximate 35 ml clot. There was extension into the left lateral ventricle.

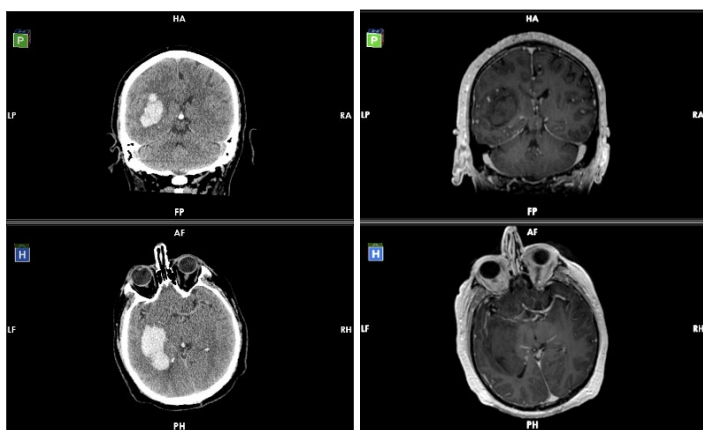


Figure 1: Left: Pre-op CT+C and Right Pre-op MRI T1+C

## Surgical Plan

Pre-operative planning software with whole brain tractography (BrightMatter™ Plan) was used to define a safe trajectory to the hematoma (Figure 2).

By generating the patient's whole brain tractography and further segmenting the tracts of interest it was evident that the hematoma was distorting the arcuate fasciculus (AF) laterally, corticospinal tract (CST) medially, and optic radiations (OR) inferiorly (Figures 2). The generated tractography revealed robust fiber tracts in the frontal portion of the AF, but a paucity of fibers in the temporal and parietal portion, correlating with the patient's conductive aphasia and receptive dysphasia.

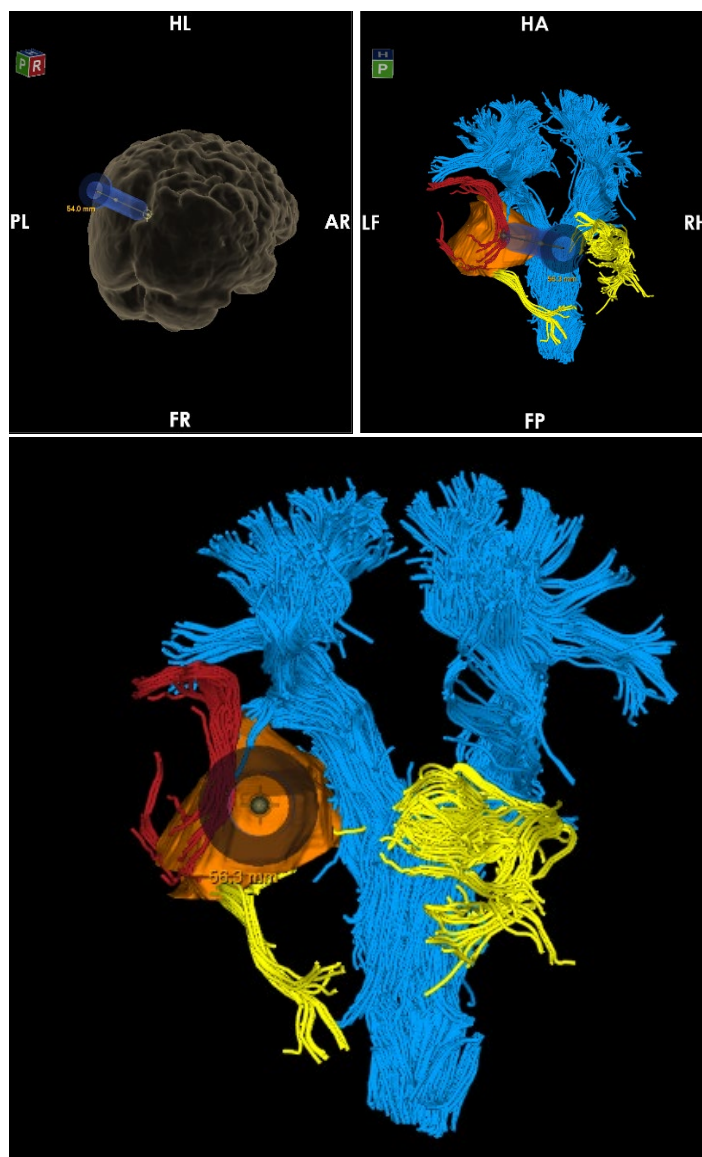


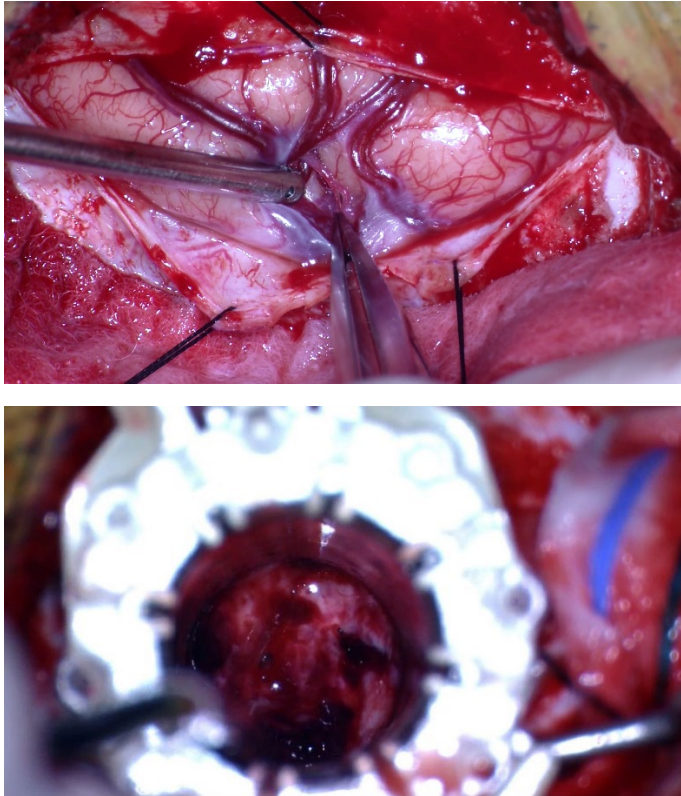
Figure 2: Segmented tracts showing lateral, medial and inferior distortion of AF (red), CST (blue) and OR (yellow) respectively

## Surgical Management

The surgical goal was to evacuate the hematoma to reduce mass effect on the AF, OR, and CST. A trans-sulcal trajectory was chosen that intersected the fewest, and least eloquent fiber tracts. This proved to be via the mesial (oblique) portion of the intra-parietal sulcus. The surgical plan was exported into BrightMatter Guide™ for intraoperative navigation. A 13 mm linear dural opening was made over the planned sulcal entry site.



The robotic digital microscope, Modus V™, with its integrated camera, allowed for automated alignment and visualization of the surgical site, providing optimal views throughout the procedure (Figure 3). Sulcal dissection was performed carefully preserving the pia and vascular anatomy. A 75mm BrainPath™ operating channel with obturator was navigated from the depth of the sulcus into the clot cavity using BrightMatter Guide™ for minimally invasive evacuation of the hematoma.

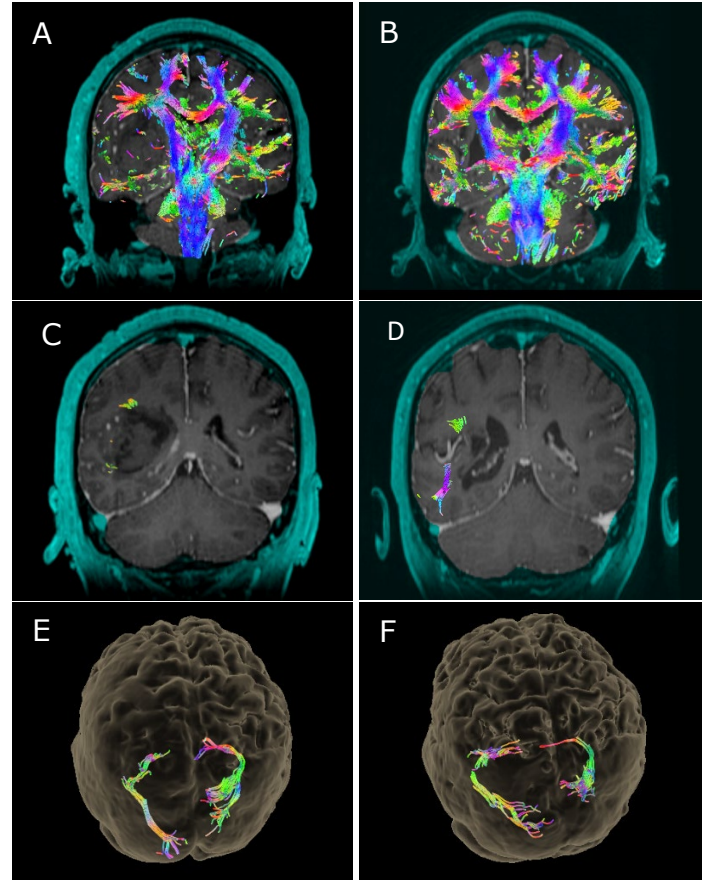


**Figure 3:** Image of initial dissection (top) and clot cavity (bottom) from Modus V™

## Clinical Outcomes

There was modest improvement in the patient's gaze preference, verbalization and orientation following surgery. There was slight improvement in facial weakness, but hemiplegia persisted. He required several days to wean from nicardipine and on to oral antihypertensive therapy to control his blood pressure. He was

discharged to a rehabilitation unit on his eighth postoperative day with significant conductive aphasia and only weak shoulder abduction, hip flexion and knee extension, but after five weeks he was discharged home independent in all activities of daily living. Neurologic exam at 3 months demonstrated normal verbal language with mild persistent reading comprehension difficulties, no facial or extremity weakness and a partial inferior quadrantanopia. Post-operative MRI performed at 6.5 months revealed recovery of AF, CST, and OR (Figure 4).



**Figure 4:** Pre-operative images (left) and post-operative images (right); CST is pushed medially pre-op (A), which is restored post op (B). Images also show paucity in AF (C), and post-op show robust AF (D). OR is deviated and disconnected pre-op (E) with OR restored but still disconnected post-op (F)

## Highlights

- Surgeon observed function correlated with tract recovery: CST was intact but deviated pre-op, and therefore recovered rapidly. AF was more impaired pre-op and recovered gradually. The superior component of the optic radiations appeared disconnected pre-op and therefore the inferior quadrantanopia persists.
- Complete recovery of motor and language deficits was observed. Inferior quadrantanopia was persistent as predicted by complete loss of the optic radiations connecting to the superior primary visual cortex.