A fifty year-old male involved in a high-speed motorcycle accident suffered a severe traumatic brain injury. On initial evaluation, the patient had a GCS=3, pupils unequal, 3mm on the right and 2mm on the left, and fixed. There was blood in both nares and the left ear.

Initial CT study showed acute right hemisphere subarachnoid hemorrhage involving the frontal and temporal lobes and sylvian fissure with subdural component along the right frontal, parietal, and temporal lobes measuring 8mm in thickness. There was a left midline shift by 1cm. In addition, it showed a left temporo-pontine subarachnoid hemorrhage, right nasal bone fracture, and a fluid level in the left maxillary sinus.

The patient was taken emergently to the operating room for a right-sided hemi-craniectomy with subdural evacuation. The patient’s neurologic exam improved to GCS=2,5,1T with a residual left hemiparesis. The facial and skull fractures were treated non-operatively.

The patient developed a persistent large right temporal loculated subdural hematoma 5x5.5cm in size causing midline shift of 12mm and right-sided uncal herniation during his hospital stay. This was treated with iv mannitol and a steroid taper.

On hospital day #35 the patient was transferred to acute inpatient rehabilitation on a brain injury unit.

In acute rehabilitation the patient’s mental status improved as did his left hemi-paresis, hemianesthesia, and hemispatial neglect. Two weeks after admission, (now 7 weeks after the initial accident) the patient was found to have significant left eye proptosis. It was not associated with mental status changes, headache, or clear vision changes. The patient was sent to ophthalmology clinic for evaluation and subsequently transferred to the emergency department.

Subsequent Magnetic Resonance Imaging (Figure 1) and Magnetic Resonance Angiogram (Figure 2) revealed an enlarged left cavernous sinus with multiple tubular areas as well as enlargement of the left supraorbital vein, consistent with post-traumatic left carotid cavernous fistula. Subsequent angiography (Figure 3A&B) showed a type A (direct) carotid cavernous fistula. Endovascular coiling of the fistula was performed. MRI and MRA following the procedure were consistent with successful coiling of the fistula (Figure 4). Following the procedure the left eye proptosis steadily improved and eventually resolved.

Carotid-cavernous fistulas are abnormal communications between the carotid artery and the cavernous sinus. In post-traumatic patients this fistula likely arises after a tear to the internal carotid artery within the cavernous sinus. The incidence after traumatic brain injury ranges from 0.17-1.01%.2 The majority (67%) are associated with a basilar skull fracture.3 They can lead to significant morbidity and mortality including vision loss, intracerebral hemorrhage, and death.

Barrow and colleagues1 developed a classification system which categorizes carotid cavernous fistulas based on arterial blood supply:

Type A: direct communication of the fistula with the internal carotid artery
Type B: Arterial supply provided by the meningeal branches of the internal carotid artery
Type C: Arterial supply provided by meningeal external carotid branches
Type D: Arterial supply provided by meningeal branches of both internal and external carotid arteries

Post-traumatic carotid-cavernous fistulas are rare but serious complications of traumatic brain injury. It is important for rehabilitation physicians to be aware of this condition in patients with traumatic brain injury to ensure timely proper treatment.

REFERENCES