

# **Spontaneous Subfalcial Transcallosal Migration of a Missile to the Contralateral Hemisphere Causing Deterioration in Neurological Status**

## **—Case Report—**

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### **Abstract**

**A 26-year-old man sustained a gunshot injury. Computed tomography (CT) demonstrated the missile in the right parietal region. Twenty-four hours later, the missile had moved towards the midline. Following slight deterioration in his neurological condition one week later, follow-up CT revealed that the missile had crossed the midline through the corpus callosum and was located in the left parietal region. CT during the second week demonstrated that the missile had stopped close to the left parietal bone. Spontaneous migration of a missile to the contralateral side via a subfalcial-transcallosal route with deterioration in neurological status is unusual. The missile may have moved under the influence of the intracranial pressure and pulsatile effect of the cerebrospinal fluid.**

Key words: gunshot wound, migration, missile injury, subfalcial-transcallosal migration

### **Introduction**

Migration of intracranial missile/bullet fragments after civilian gunshot injuries occurs in 4.2% of cases.<sup>5)</sup> Migration is usually into or out of the ventricles, in the cisterns, in the ipsilateral cerebral lobes, or in the cerebellum.<sup>1,3-6)</sup> Movement from the ipsilateral to contralateral hemispheres may occur due to the effect of the initial shot<sup>4)</sup> and spontaneous migration via the subdural space.<sup>1)</sup> We report a rare case of contralateral spontaneous migration of a missile under the falx through the corpus callosum via a subfalcial-transcallosal route, with deterioration in neurological status 2 weeks following gunshot injury.

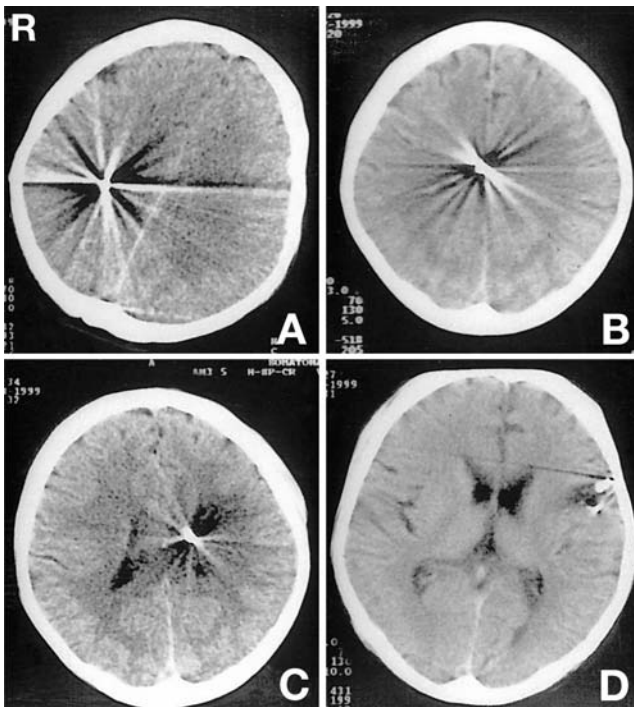
### **Case Report**

A 26-year-old man was shot in the right parietal region, the shoulder, and the chest. On admission, he was unconscious with flexor response to pain on the right side and both eyes deviated to the left. Thoracentesis and chest radiography demonstrated hemothorax. Emergent computed tomography (CT) of the head revealed a right parietal hemorrhagic

contusion surrounding a missile (Fig. 1A). He was treated with mechanical hyperventilation and anti-edema therapy, and closed thoracotomy. CT of the head 24 hours later demonstrated that the missile had moved towards the midline (Fig. 1B). Five days after admission, his orientation and cooperation were normal with left hemiparesis. One week after admission, neurological examination showed not only slight lateral deviation and nystagmus of the left eye and left hemiparesis, but also distal 3/5 paresis of the right arm with temporary fluctuation in orientation. Follow-up CT at that time revealed that the missile had crossed the midline through the corpus callosum and was located in the left parietal region (Fig. 1C). CT in the second week demonstrated that the missile had stopped close to the left parietal bone (Fig. 1D). No infection or abscess formation was observed during his hospital stay. The patient was treated conservatively and underwent prophylactic antiepileptic therapy with phenytoin for 6 months. He is doing well now after a rehabilitation program.

### **Discussion**

The movement or migration of an intracerebral missile or bullet can be attributed to gravitation,



**Fig. 1** Computed tomography scans, on admission immediately after gunshot injury in the right parietal region (A), 24 hours later (B), one week later (C), and 2 weeks later (D), demonstrating that the missile crossed the midline under the falx through the corpus callosum via a subfalcial-transcallosal route and stopped close to the left frontal bone.

cerebral softening, or local tissue damage.<sup>4,6)</sup> A missile or a bullet will always tend to migrate into or out of a ventricle depending on the ventricular sink action. Cerebrospinal fluid (CSF) flow and pulsation in the ventricular cavity will facilitate this movement.<sup>4)</sup> Fragments in the anterior fossa may migrate towards the sella turcica and fragments in the middle fossa and occipital lobes towards the torcula. The petrous ridge, tentorium, and falx are solid natural barriers which prevent such migration.<sup>6)</sup>

Initial penetration of the missile always creates a pathway in the parenchyma with destruction of the white matter. Early after the injury, brain edema does not permit the missile to migrate. In our case, the migration was in the horizontal plane and not in the vertical plane, and the patient was always supine in bed, so the migration cannot be due to gravity. After the resolution of the edema and presence of encephalomalacia, the missile should have moved forward due to the intracranial pressure and pulsatile effect of the CSF behind the missile. If the level of

the injury had been closer to the vertex, the falx would have prevented the migration of the missile. The patient's neurological status changed at the end of the first week, probably related to the injury of the corpus callosum by the missile and especially injury of the contralateral parietal lobe. A larger and heavier bullet might not have moved under the influence of the same mechanism.

Surgical removal of the missile/bullet should be performed if hematoma evacuation or debridement of necrotic/infected material to prevent abscess formation is required, or if worsening in neurological status occurs. Removal of accessible missile or bone fragments, and meticulous hemostasis and dural closure is essential. Damage is not as widespread in civilian wounds as in military injuries, so less or no debridement may be necessary. Although a more aggressive approach to debridement may be favored, only 28 of 143 patients in one series underwent major debridement.<sup>2)</sup> Good results were also obtained with more conservative treatment.<sup>7)</sup> In our case, the hemothorax was not an indication for surgical treatment. Furthermore, removal of this small missile might cause iatrogenic damage to the brain parenchyma. There was also no sign of infection or brain abscess formation during his hospital stay. Therefore, we decided to treat him conservatively despite the progression in neurological status.

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