## **Missile migration**

Complications of penetrating craniocerebral injuries can be early (during the first week after wounding) or late (after that period). Postoperative hematomas, infections, seizures, and cerebrospinal fluid fistulas (CSFFs) are counted among the early complications, whereas foreign bodies migrating intracranially, seizures, infections, and posttraumatic hydrocephalus represent late complications <sup>1</sup>.

Spontaneous migration of retained intracranial missiles is uncommon but a potentially serious phenomenon.

Missile embolism is the process of slow velocity projectiles penetrating into vascular spaces followed by arterial, venous, or paradoxical embolism of the fragments. This is a rare complication in craniocerebral gunshot injuries (CGI), with only six cases published demonstrating pulmonary or arterial emboli from these injuries <sup>2</sup>

Neurosurgeons performing delayed surgery on patients with retained intracranial missiles should be aware of the risk of spontaneous migration and verify the location of the missile after positioning the patient for surgery <sup>3)</sup>.

## **Case series**

The objective of Darwazeh et al. was to increase awareness of the risk of spontaneous migration of retained intracranial missiles by reporting the case series of 16 patients. They performed a retrospective single-center study on patients treated for intracranial missile injuries between 2000 and 2010 in Palestine with a particular focus on the migration of retained intracranial missiles. Detailed analyses were made of patients' age, sex, type of injurious agents (metallic bullets/rubber bullets/metallic shrapnel from bomb explosion), initial missile position, site to where the missile migrated, radiological and neurological manifestations, complications, treatment modalities (surgery vs. conservative) and functional outcome by Glasgow outcome scale-extended (GOSE) classification at last follow-up. In a cohort of 190 patients with retained intracranial missiles, we identified 16 (8.4%) patients with spontaneous migration. Patients' age ranged from 10 to 30 years (mean:  $18.9 \pm 6.4$ years). There were only 2 female patients. The missiles that migrated intracranially were metallic bullets (n = 10), rubber bullets (n = 3), and metallic shrapnel from a bomb explosion (n = 3). Among the 16 patients, 10 patients experienced symptoms due to missile migration and were treated surgically, while six patients did not develop new symptoms after missile migration and were managed conservatively. In these case series, 16/190 (8.4%) patients with retained intracranial missiles developed spontaneous migration. Neurosurgeons performing delayed surgery on patients with retained intracranial missiles should be aware of the risk of spontaneous migration and verify the location of the missile after positioning the patient for surgery <sup>4</sup>.

## **Case reports**

Duda et al. reported radiographic imaging of a metallic intravascular fragment from craniocerebral

gunshot injury through presumed transvenous mechanisms. The imaging provides a consistent timeline demonstrating migration can occur in the acute phase. This study additionally supports the presumed mechanism for pulmonary of migration through the right heart. Fragment embolization should be considered in cases of acute deterioration in this patient population <sup>5</sup>

A 21-year-old man was observing a gunfight in the street from his balcony. Suddenly something struck his forehead and there was a small amount of bleeding toward the medial end of his left eyebrow. He had moderate headache and dizziness. Because of nonresolution of headache over seven days he was hospitalized and underwent X ray of the skull and CT of the head, which showed a retained metallic bullet in left inferior parieto-occipital region without any significant hemorrhage. As there was no neurological deficit or meningeal signs, he was managed conservatively. His symptoms improved gradually within next week and he was discharged home. His most recent follow-up was 28 months since injury and imaging showed migration of the bullet to the right inferior temporal region. As he was completely asymptomatic throughout, no intervention was offered. However, long-term follow-up for potential complications of migration, hydrocephalus, and abscess formation is advisable <sup>6</sup>.

A 32-year-old male presented with weakness and paraesthesia in his right leg following an accidental gunshot injury to his spine. Facet joint destruction and an intraspinal bullet were detected. Immediate surgical removal and transpedicular instrumentation was performed. The surgical procedure was complicated by lack of an identifying dural perforation at the bullet entry point and a gliding bullet inside the spinal canal during surgery. Gliding of the bullet was caused by the pushing effect of the bone rongeur and further gliding was avoided by performing the next laminectomy with an electric drill. Where other modalities indicated for a possible extradural location, intraoperative USG clearly showed the intradural position of the bullet and provided clear images without major artifacts. Surgical treatment of a mobile intradural bullet is challenging and open to surprises. Location of the bullet may shift as result of surgical procedure itself. Laminectomy should be performed with a power drill. Where fluoroscopy was inadequate and MRI not available, intraoperative USG proved useful in ascertaining the intradural versus extradural position of the bullet and allowed for a tailored dural opening <sup>71</sup>.

The case of a migratory intrathecal bullet in the lumbar spine of a patient who presented with cauda equina-type symptoms <sup>8)</sup>.

A case of a man shot by a shotgun, presenting with a posterior fossa stroke and occlusion of the superior cerebellar artery by a metallic pellet. To our knowledge, this is the third case of posterior fossa circulation pellet emboli<sup>9</sup>.

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 <sup>10</sup>.

A unique case of a self-inflicted brain injury using an ingenious home-made gun with spontaneous anterior migration of the intact bullet. On admission, the patient was fully conscious with no neurological deficits. Computed tomography (CT) confirmed a penetrating missile injury with transventricular across midline trajectory and multi-lobe injury with the bullet lodged in the occipital lobe. Serial CT revealed spontaneous version with anterior migration of the bullet from the occipital lobe to finally come to rest in the ipsilateral frontobasal region. The bullet was removed via a left supra-orbital craniotomy. The patient experienced good outcome. Home-made gun injuries, although uncommon today, represent a special form of missile injury with unique low velocity terminal ballistics. As these weapons are seen infrequently today, surgeons should be alerted to their existence as patients with this form of injury usually have a good prognosis if vital brain structures are spared <sup>11</sup>.

An unusual case of craniocerebral missile injury, with orbital roof perforation and spontaneous bullet migration into the maxillary sinus, is reported. Emergency treatment consisted in wide craniectomy around the bullet entry point, blood and foreign bodies debridement. Subsequent procedures were necessary for abscess evacuation, transmaxillary bullet removal and later cranial vault reconstruction. Challenging aspects were the treatment of the infectious complications, following cerebrospinal fluid fistula through the wound, and the onset of post-traumatic epilepsy, scarcely responsive to common antiepileptic drugs. The treatment of the abscess by combined systemic and intracavitary antibiotic therapy and of the chronic seizures by progressive adjustment with new protocols of antiepileptic drugs under EEG and brain mapping revealed successful <sup>12</sup>.

A case of missile injury to the brain with an unusual complication. The bullet migrated by its mere weight to a distant location through the brain parenchyma after initially lodged in a superficial site. Movement of the bullet was first detected on CT scan and the significance and treatment of this finding is emphasized <sup>13</sup>.

A penetrating gunshot injury to the cervical spine at the C6 level, with retention of the missile within the spinal canal at the T10 level. The treatment of this patient involved debridement of entrance wound on the day of admission and laminectomies in the cervical and thoracic levels 3 days after the incident. The migration of a foreign body along the intracranial part of the central nervous system has been reported in the literature, but we have found no report of an intercanal gunshot wound measuring 30 cm with complete liquefaction of the cord. On admission, a 21-year-old man had an entrance wound on the right side of neck. He had complete paraplegia and could not flex the wrist. The cervical spine radiograph revealed a fracture of the C5 arch and metallic fragments in the spinal canal. A radiograph of the thoracic and lumbar spine disclosed a bullet trapped at the T10 level. Laminectomies at C6-C7 and T9-T10 were performed and the bullet and its fragments were removed.

The ruptured dura was replaced by lyophilized dura. The wounds healed without infection. On discharges the patient's neurologic status was unchanged <sup>14)</sup>.

A bullet migrated by its mere weight to a distant location through the brain parenchyma after it initially lodged in a superficial site. Instances of similar phenomena reported in the literature are reviewed <sup>15)</sup>.

1)

Tudor M, Tudor L, Tudor KI. Complications of missile craniocerebral injuries during the Croatian Homeland War. Mil Med. 2005 May;170(5):422-6. doi: 10.7205/milmed.170.5.422. PMID: 15974211.

Duda T, Zhang E, Reddy K. Craniocerebral gunshot injury bullet migration to the cardiac right ventricle. Surg Neurol Int. 2021 Sep 30;12:491. doi: 10.25259/SNI\_221\_2021. PMID: 34754541; PMCID: PMC8571419.

3) 4)

Darwazeh R, Darwazeh M, Sun X. Spontaneous migration of retained intracranial missiles: experience with 16 cases. Neurosurg Rev. 2022 Mar 6. doi: 10.1007/s10143-022-01763-x. Epub ahead of print. PMID: 35249151.

6)

Swain SK, Arora RK, Mittal RS. Migrating Souvenir Bullet: The Management Dilemma. Ann Neurosci. 2021 Jan;28(1-2):79-81. doi: 10.1177/0972753120966495. Epub 2021 Apr 9. PMID: 34733058; PMCID: PMC8558984.

Genç A, Usseli MI, Necmettin Pamir M. When the bullet moves! Surgical caveats from a migrant intraspinal bullet. Neurol Neurochir Pol. 2016;50(5):387-91. doi: 10.1016/j.pjnns.2016.06.006. Epub 2016 Jul 2. PMID: 27591067.

8)

Moon E, Kondrashov D, Hannibal M, Hsu K, Zucherman J. Gunshot wounds to the spine: literature review and report on a migratory intrathecal bullet. Am J Orthop (Belle Mead NJ). 2008 Mar;37(3):E47-51. PMID: 18438477.

da Costa LB, Wallace MC, Montanera W. Shotgun pellet embolization to the posterior cerebral circulation. AJNR Am J Neuroradiol. 2006 Feb;27(2):261-3. PMID: 16484388; PMCID: PMC8148771.

Duman H, Ziyal IM, Canpolat A. Spontaneous subfalcial transcallosal migration of a missile to the contralateral hemisphere causing deterioration in neurological status-case report. Neurol Med Chir (Tokyo). 2002 Aug;42(8):332-3. doi: 10.2176/nmc.42.332. PMID: 12206485.

Alessi G, Aiyer S, Nathoo N. Home-made gun injury: spontaneous version and anterior migration of bullet. Br J Neurosurg. 2002 Aug;16(4):381-4. doi: 10.1080/0268869021000007623. PMID: 12389893.

Rinaldi A, Gazzeri R, Conti L, Schiavone M, Cava M, Tirelli GC. Cranio-orbital missile wound and bullet migration. Case report. J Neurosurg Sci. 2000 Jun;44(2):107-12. PMID: 11105841.

Salvati M, Cervoni L, Rocchi G, Rastelli E, Delfini R. Spontaneous movement of metallic foreign bodies. Case report. J Neurosurg Sci. 1997 Dec;41(4):423-5. PMID: 9555653.

Tekavcic I, Smrkolj VA. The path of a wounding missile along the spinal canal: a case report. Spine (Phila Pa 1976). 1996 Mar 1;21(5):639-41. doi: 10.1097/00007632-199603010-00020. PMID: 8852322.

Rengachary SS, Carey M, Templer J. The sinking bullet. Neurosurgery. 1992 Feb;30(2):291-4;

From:

https://neurosurgerywiki.com/wiki/ - Neurosurgery Wiki

Permanent link: https://neurosurgerywiki.com/wiki/doku.php?id=missile\_migration

Last update: 2024/06/07 02:50

