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Posttraumatic Cholesteatoma Causing a Brain Abscess Presenting 29 Years After Head Injury

Running head: Gunshot to Cholesteatoma to Brain Abscess

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Dear Editor-in-chief and the readers,

Although sensorineural and conductive hearing loss, cerebrospinal fluid leakage, and facial paralysis are common acute effects associated with trauma to the temporal bone, late sequelae should also merit attention, such as the development of middle ear cholesteatoma. It may then lead to intracranial complications such as brain abscess, sinus-thrombosis, and meningitis. [1-5] We would like to report on a case of brain abscess secondary to middle ear cholesteatoma, presenting 29 years after gunshot-related head injury.

A 53-year-old male patient presented to our ENT department with left-sided otalgia, otorrhea, oedema of the external ear canal skin and fever up to 39 degrees Celsius. In 1992, he had been shot from behind in the left side of the head and the bullet passed through the left mastoid, inner ear, and finally came out through his mouth. Urgent reconstructive surgery was performed, with persistent left-sided deafness and complete facial nerve paralysis. Almost three decades later, he presented with left sided otorrhoea and otalgia. Audiologic testing confirmed complete sensorineural hearing loss following the injury. Multi-slice computed tomography (MSCT) revealed mastoid inflammation and a focal brain lesion containing few air bubbles, surrounded with vasogenic cerebral edema (Fig. 1A and 1B). The T2-weighted magnetic resonance image (MRI) confirmed a brain abscess in the left temporal lobe (Fig. 2A and 2B). *Streptococcus, Staphylococcus,* and *Pseudomonas* were isolated from the external ear and broad-spectrum intravenous antibiotic therapy was initiated (meropenem and vancomycin). Repeated MSCT and DWI MRI sequences showed restricted diffusion in the mastoid, supporting cholesteatoma presence (Fig. 3A and 3B). Implosive skin intrusion was most probable at the entry point of the bullet, located in the posterior mastoid. The bulled caused multifragmentary fracture lines, passing directly through the cochlea, labyrinth and the mastoid and tympanic facial nerve segments (Fig. 4A and 4B). Osseous fragments of temporal bone and retained metallic shrapnel fragments are localized near the inner table of the skull, indicating multiple

injury points, with the main direction of the outward bullet though the maxillary sinus floor and exit through the oral cavity.

A subtotal petrosectomy was then performed. Intraoperatively, a large cholesteatoma in mastoid extending infra-cochlear towards the cranial base was identified. The eardrum and ossicles were normal. Part of the cholesteatoma had invaded the middle cranial fossa, and the cholesteatoma was completely removed. The cavity was obliterated with abdominal fat. Histopathological findings were consistent with the diagnosis of cholesteatoma. Follow-up MRI 20 days after surgery showed regression of the abscess cavity and significant regression of inflammatory changes of the temporal bone. After 3 months follow up MRI showed complete regression of the brain abscess.

Our patient developed symptoms 29 years after the temporal bone trauma and this is now one of the longest time intervals ever recorded. This time interval is usually 2 to 12 years, with the longest one recorded to date was 24 years. [1] Since severe temporal trauma is relatively rarely associated with chronic otitis media and cholesteatoma, an important learning point from this case is that post-traumatic cholesteatoma may represent an uncommon and late complication of temporal bone trauma. Even if it occurs many years after the initial injury, the mechanism of implosive skin intrusion may cause typical cholesteatoma-related complications, such as a brain abscess and need for extensive otologic surgery to address the underlying issue. [6] Due to this possible link, the importance of a timely diagnostic workup, including radiologic imaging in patients with significant temporal bone trauma is paramount. Development of posttraumatic cholesteatoma may occur as a complication of extralabyrinthine injuries as seen in longitudinal or mixed fractures. [2] Also, the mechanism of injury is specific – a gunshot injury with a bullet passing through the temporal bone and exiting through the mouth. Furthermore, the first presentation of cholesteatoma was a brain abscess. In our patient, an encapsulated brain abscess was indicative of post-traumatic cholesteatoma, leading to a confident diagnosis and surgical

plan resulting in a subtotal petrosectomy and fat obliteration because of previous deafness and bone destruction towards the middle cranial fossa.

1. References

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Figures and Legends

Fig 1. Axial CT scans show increased attenuation of the left middle ear and mastoid air cells with abnormal fluid levels (thin arrows) and mastoid postoperative findings (A). Non-contrast

CT scan shows isodense focal brain lesion (thin arrows) containing few air bubbles (wide arrows), surrounded with low density vasogenic cerebral edema (B).

Fig 2. MR imaging shows isointense rounded brain lesion in the left temporal lobe on T2WI (A), with thin peripherally enhancing rim on contrast enhanced T1WI sequence (B)

Fig. 3. Axial CT scan shows sharply marginated soft tissue lesion located in the mastoid that doesn't show contrast enhancement on MRI T1WI sequence (A). DWI and ADC sequences show restricted diffusion (B), supporting cholesteatoma presence.

Fig. 4. Coronal and axial CT images show the most probable pathway of penetrating gunshot injury to the head. Osseous fragments of temporal bone (long arrow) (A) and retained metallic shrapnels are localized near the inner table of the skull (wide arrow) (B).