



# Non-Missile Penetrating Skull Base Injury Caused By A Fishing Harpoon: Endoscopic Transnasal Removal



Weerawong Sangphosuk, MD<sup>1</sup>; Thanit Chalermwattanachai, MD, PhD<sup>2</sup>

<sup>1</sup>Division of Neurosurgery, Department of Surgery <sup>2</sup>Department of Otolaryngology  
Phramongkutklo Hospital, Bangkok, Thailand

## Introduction

### Penetrating Brain Injury (PBI)

- Rare, but life-threatening type of TBI
- Classification
  - High velocity (Missile) PBI: greater than or equal to 100m/sec
  - Low velocity (Non-missile) PBI: less than 100m/sec

### Non-missile skull base injury

- Usually caused by sharp or pointed objects such as arrows, knives, iron rods
- Clinical outcome is better than missile injury, but still be lethal due to several complications (vascular injury, CSF leak, epilepsy, infection)
- Routes of injury
  - Transorbital
  - Transmental
  - Transnasal

## Surgical Planning

### Endoscopic transnasal approach

#### Principles of surgery

- Safe removal under direct visualization
- Dural defect closure
- Debridement
- Hemorrhage control

#### Surgical steps

Nasal Stage	Sphenoid Stage	FB Removal	Reconstruction
<ul style="list-style-type: none"> <li>- Uncinectomy</li> <li>- Ethmoid bullectomy (anterior ethmoidectomy)</li> <li>- Posterior ethmoidectomy</li> <li>- Harvesting posterior septal mucosal graft</li> </ul>	<ul style="list-style-type: none"> <li>- Sphenoidotomy following the tract</li> <li>- Upper clivus drilling around the arrow tip</li> </ul>	<ul style="list-style-type: none"> <li>- Gentle pulling upward when the arrow tip was free</li> <li>- High flow CSF leak</li> <li>- Minimal venous oozing</li> </ul>	<ul style="list-style-type: none"> <li>- Multi-layer closure (free mucosal graft, fascia lata, fat graft, fibrin glue)</li> <li>- External wound closure</li> <li>- Nasal packing</li> </ul>

## Clinical Case Presentation

A 23-year-old right-handed Thai male was accidentally hit by the distal end of a fishing arrow while he was setting up the harpoon gun

- Past history: No underlying condition
- Neurologically intact including both extraocular movement, VA
- Entry point of the arrow located medially to left globe
- The shaft was shortened before referral to our institute



Figure 1. Before operation

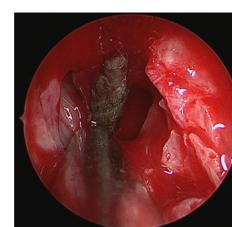


Figure 2. Metallic shaft in left posterior ethmoid sinus



Figure 3. Drilling of clival bone



Figure 4. Circumferential exposure of dura around the tip

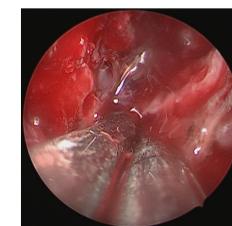


Figure 5. Dural defect after FB removal

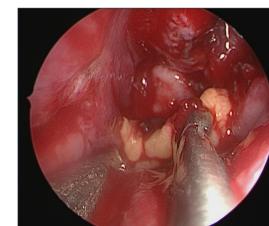


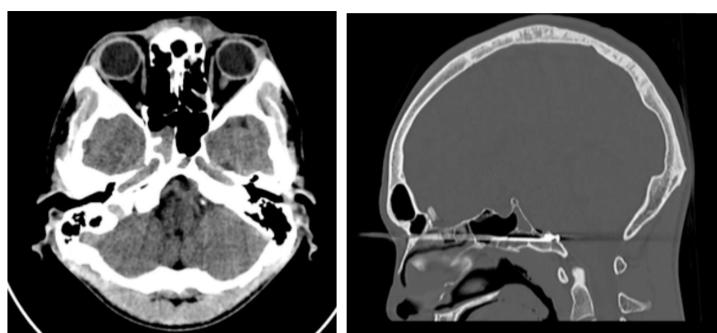
Figure 6. Multi-layer reconstruction



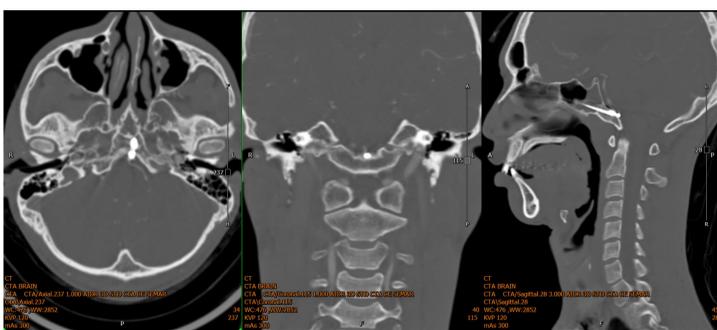
Figure 7. The fishing harpoon after removal

## Preoperative Investigations

### CT Brain (non contrast)



### CTA Brain



- A harpoon at left side of nasal region penetrates through left ethmoid sinus, bilateral sphenoid sinuses, and clivus into premedullary cistern with its tip located just anterior to left V4 VA (0.8mm)
- Small pneumocephalus at premedullary cistern
- Non-displaced comminuted fracture at medial wall of left orbit
- No evidence of globe injury
- No acute intracranial hemorrhage
- No occlusion, dissection, pseudoaneurysm, high grade stenosis or aneurysm was found

## Postoperative Course

- No neurological deficit
- Intravenous antibiotics (Ceftriazone, Metronidazole)
- Postoperative lumbar drain (5 days)
- No CSF leak was found during admission
- Nasal packing removal on POD7
- Postoperative CTA brain on POD10 showed no pseudoaneurysm
- Discharge home on POD14

## Conclusion

- Non-missile penetrating skull base injury is a rare but severe type of TBI involving a low velocity objects the brain through the skull base
- Critical neurovascular structures can be damaged or at risk of additional injury, resulting in a worse prognosis
- Management plan includes CT brain and vascular studies for surgical planning, antibiotic prophylaxis and long-term management for complications
- Surgical removal of the foreign body requires a multidisciplinary team approach
- Skull base approaches via either craniotomy or endoscopic procedure are often required to optimally visualize the involved neurovascular structures, provide access to proximal vascular control and offer a direct route to skull base reconstruction for prevention of CSF leakage

## Contact

Weerawong Sangphosuk, MD

Staff Neurosurgeon

Division of Neurosurgery, Department of Surgery

Phramongkutklo Hospital

315 Ratchawithi Road, Thung Phayathai, Ratchathewi, Bangkok

Thailand 10400

E-mail: weerawong.sangphosuk@pmk.ac.th

## References

1. Czyżewski W, Szymoniuk M, Litak J, Kura K, Kuś-Budzyńska K, Dryla A, Baj J, Torres K, Staśkiewicz G. Management and outcomes of non-missile penetrating brain injury involving the anterior skull base: a case report and systematic review. *J Clin Med*. 2025 Aug 13;14(16):5731.
2. Sweeney JM, Lebovitz JJ, Eller JL, Coppens JR, Bucholz RD, Abdulrauf SI. Management of nonmissile penetrating brain injuries: a description of three cases and review of the literature. *Skull Base Rep*. 2011 May;1(1):39-46.
3. Chibbaro S, Tacconi L. Orbito-cranial injuries caused by penetrating non-missile foreign bodies. Experience with eighteen patients. *Acta Neurochir (Wien)*. 2006 Sep;148(9):937-41; discussion 941-2.