

Case Report

Penetrating orbitocranial injury by shoji frame: A rare indoor accident in a Japanese style house

Hideaki Ueno, Satoshi Tsutsumi, Yasutoshi Akasaki, Kohei Yoshida, Natsuki Sugiyama, Hisato Ishii

Department of Neurological Surgery, Juntendo University Urayasu Hospital, Urayasu, Japan.

E-mail: Hideaki Ueno - hideakiueno1229@gmail.com; *Satoshi Tsutsumi - shotaro@juntendo-urayasu.jp; Yasutoshi Akasaki - y.akasaki.pv@juntendo.ac.jp; Kohei Yoshida - k.yoshida.rv@juntendo.ac.jp; Natsuki Sugiyama - natsuking0602@yahoo.co.jp; Hisato Ishii - hisato-i@juntendo.ac.jp



*Corresponding author:

Satoshi Tsutsumi,
Department of Neurological
Surgery, Juntendo University
Urayasu Hospital, Urayasu,
Japan.

shotaro@juntendo-urayasu.jp

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ABSTRACT

Background: To the best of our knowledge, there are no reports of penetrating orbitocranial injury (POCI) caused by a shoji frame.

Case Description: A 68-year-old man fell in his living room and was stuck headfirst by a shoji frame. At presentation, marked swelling was noted in the right upper eyelid, with the edge of the broken shoji frame exposed superficially. Computed tomography (CT) revealed a hypodense linear structure located in the upper lateral sector of the orbit, partially protruding into the middle cranial fossa. Contrast-enhanced CT revealed intact ophthalmic artery and superior ophthalmic vein. The patient was managed with frontotemporal craniotomy. The shoji frame was extracted by pushing out the extradurally located proximal edge from the cranial cavity and simultaneously pulling the distal edge from the stab wound in the upper eyelid. Postoperatively, the patient received intravenous antibiotic therapy for 18 days.

Conclusion: POCI can be caused by shoji frames as a result of an indoor accident. The broken shoji frame is evidently delineated on CT, which can result in prompt extraction.

Keywords: Indoor accident, Penetrating orbitocranial injury, Shoji frame, Treatment

INTRODUCTION

Penetrating non-missile injuries to the head are an infrequent entity that commonly occurs as an accident.^[3] Penetrating orbital injuries (POCIs) caused by wooden foreign bodies are rare, but distinct accidents that have been sporadically documented so far.^[1-5,7,8,10-15] These injuries are commonly diagnosed using computed tomography (CT). However, wooden foreign bodies that migrate into the orbital and cranial cavities can be missed or misinterpreted on CT.^[6,7,11-13,15]

Shoji is a traditional Japanese style architecture that typically divides the indoor rooms and the hall that faces outdoors. Shoji is commonly wooden, takes the structure of lattice frames over which Japanese papers are stuck, and slides laterally to come and out of the room. Only one penetrating head injury caused by a shoji frame has been reported in literature.^[9] However, to the best of our knowledge, POCI caused by a shoji frame has not yet been reported.

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Herein, we present such a case wherein a shoji frame was successfully extracted through frontotemporal craniotomy.

CASE PRESENTATION

A 68-year-old Japanese man fell in his living room and was stuck headfirst by a shoji frame. The patient visited a local ophthalmologist the day after the injury in the right upper eyelid, where he was suspected of penetrating orbital injury by a broken shoji frame. At presentation, the patient was well oriented. However, marked swelling and redness were noted on the right upper eyelid. In addition, the edge of the broken shoji frame was superficially exposed in the lateral part of the eyelid [Figure 1]. Watery discharge from the wound was noted. His visual acuity appeared intact on confrontation test. Considerable restriction of ocular movement was found on the lateralward gaze, while other extraocular movements were intact. The blood examination revealed normal findings. Cranial CT revealed a linear structure in the upper lateral sector of the orbit. It appeared homogeneously hypodense, well demarcated, and partially protruded into the middle cranial fossa. Contrast CT showed that the ophthalmic artery and superior ophthalmic vein were intact [Figure 2]. Under general anesthesia, the patient was positioned supine and underwent a right frontotemporal craniotomy. Initially, the site of the localized inner protrusion of the middle fossa (MF) dura, caused by the proximal edge of the broken shoji frame, was identified from the intradural side [Figure 3a]. The site was accompanied by a tiny laceration of the dura, while cerebral contusion or subdural hemorrhage was not observed. Next, the proximal edge of the broken shoji frame was secured from the extradural side [Figure 3b]. The edge was then pushed out from the cranial cavity using a Penfield dissector, while simultaneously pulling the distal edge through the stab wound in the upper eyelid [Figure 3c]. Using these methods, the shoji frame was successfully extracted in two pieces without hemorrhagic complications. The frame was flat, measured 1 cm in width and 5 cm in length, and had smooth surfaces [Figure 4]. Wound debridement was made around penetrating site in the upper eyelid. Postoperatively, the patient received intravenous antibiotic therapy with ceftriaxone sodium hydrate (4 g/day) for 18 days, which was sensitive for possible contamination of staphylococcus epidermidis. Marked swelling and redness initially found in the upper eyelid resolved 2 weeks after surgery without infectious complications. Visual deterioration was not identified. However, restriction of ocular movement on the lateralward gaze persisted, accompanied by horizontal skin depression in the affected upper eyelid [Figure 5]. The patient followed an uneventful post-treatment course for a year without



Figure 1: Photograph of the patient at the presentation, right oblique view, shows marked swelling and redness centered in the right upper eyelid, with the edge of broken shoji frame exposed superficially in the lateral part of the eyelid, as indicated with asterisk.

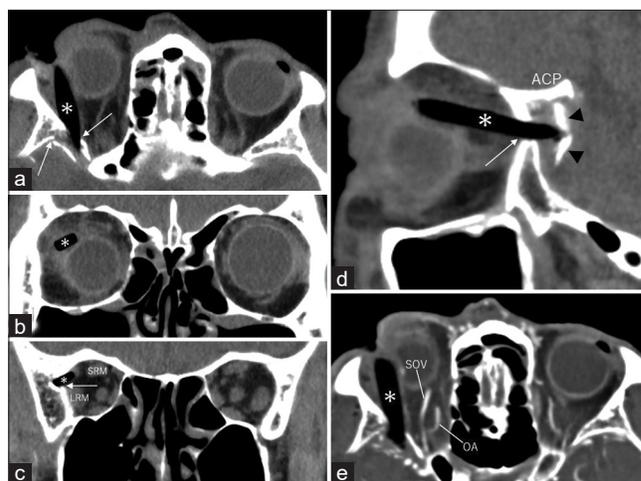


Figure 2: Non-contrast axial (a), coronal at the equator level of the bulb (b) and orbital apex (c), and sagittal (d) computed tomography, 3 mm in slice thickness, show a homogeneously hypodense, linear structure located in the upper lateral sector of the orbit, partially protruding into the middle fossa. Contrast-enhanced axial computed tomography revealed the ophthalmic artery (OA) and superior ophthalmic vein (SOV) to be intact (e). ACP: Anterior clinoid process, LRM: Lateral rectus muscle, SRM: Superior rectus muscle, Arrow: Fracture in the sphenoid bone, Arrowheads: Displaced inner table of the sphenoid bone, Asterisk: Broken shoji frame.

administration of antibiotic agents, with stable findings on periodic magnetic resonance imaging (MRI).

DISCUSSION

POCIs caused by wooden foreign bodies are rare. To the best of our knowledge, only ten cases including the present patient have been reported to date.^[1-3,5,8,11,14,15] The mean age of these patients was 40.4 years with a male predominance.

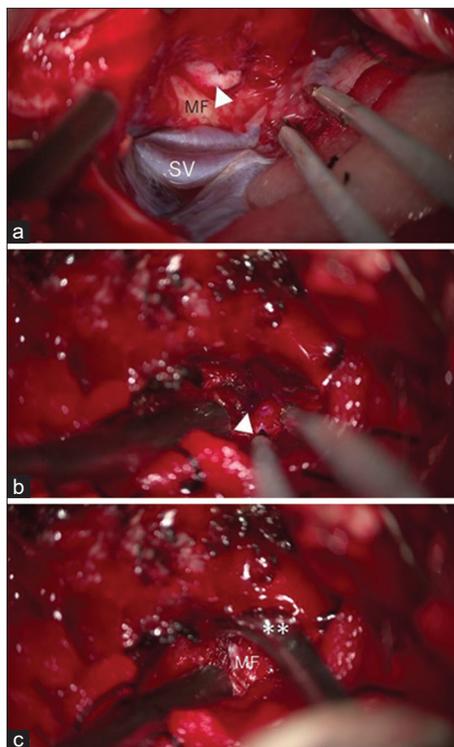


Figure 3: Intraoperative photos present step-by-step procedures of extraction. (a) Intradural view: site of the proximal edge of broken shoji frame is identified as a localized inner protrusion of the MF dura (*arrowhead*). (b) Extradural view: proximal edge of the shoji frame (*arrowhead*) is marked with pyoktanin blue. (c) Extradural view: proximal edge of the shoji frame (*arrowhead*) is being pushed out from the cranial cavity using a Penfield dissector (double asterisk). SV: Sylvian vein, MF: Middle fossa.

All patients underwent a frontotemporal craniotomy or its modifications, followed by empirical antibiotic therapy. Treatment outcomes were satisfactory in seven of ten patients, while ophthalmoplegia persisted in two patients. The condition of the remaining patient was complicated by severe bacterial ophthalmitis as a result of residual foreign bodies in the orbit [Table 1]. In the present case, an extradural maneuver aiming to push out the migrated shoji frame, through a frontotemporal craniotomy, was effective in exposing the proximal edge and extracting it from the distal side. In addition, the homogeneously flat shape and smooth surfaces of the shoji frame could be attributed to successful extraction. Considering the CT findings at the initial presentation, injury to the lateral rectus muscle, presumably occurring in the orbital apex, was thought to result in persistent ophthalmoplegia.

In the present case, a wooden foreign body was removed through a frontotemporal craniotomy. It was located in the



Figure 4: Photograph of shoji frame extracted in two pieces. The flat frame measures 1 cm in width and 5 cm in length. The surfaces of the frame are smooth. *Arrowhead*: Proximal edge of the shoji frame; *Asterisk*: superficially exposed, distal part of the shoji frame.



Figure 5: Photographs of frontal (a) and right lateral (b) views of patients, captured 2 weeks after surgery, show resolution of marked swelling and redness found in the right upper eyelid, accompanied by horizontal skin depression (*arrow*).

upper lateral sector of the orbit, while partially protruded into the middle cranial fossa accompanied by fractures and possible dura tears. Therefore, we adopted craniotomy, instead of lateral orbitotomy, feasible for both intra-, and extradural procedures.

Wooden foreign bodies migrated in the orbital and cranial cavities have been documented to be missed on CT, indicating the diagnostic value of MRI in POCI cases.^[6,7,11-13,15] In the present case, the broken shoji frame located in the upper lateral sector of the orbit and anterior MF was satisfactorily discriminated from the surrounding bony, muscular, and vascular structures on CT. Therefore,

Table 1: Summary of reported penetrating orbitocranial injuries.

Ref. No.	Age (y.o.)	Sex	Treatment	Outcome
[1]	71	Man	Cra+AT	Good
[2]	10	Woman	Cra+AT	Good
[3]	11	Man	Cra+AT	Good
[3]	45	Man	Cra+AT	Good
[5]	53	Woman	Cra+AT	Good
[8]	58	Man	Cra+AT	Good
[11]	9	Man	Cra+AT	Bacterial Panophthalmitis
[14]	27	Man	Cra+AT	Ophthalmoplegia
[15]	52	Man	Cra+AT	Good
Present case	68	Man	Cra+AT	Ophthalmoplegia
	Mean: 40.4 (range: 9–71)	Man: 8 Woman: 2		Good: 7/10

AT: Antibiotic therapy, Cra: Craniotomy, No.: Number, Ref.: Reference; y.o.: Years old

the patient underwent surgery without MRI evaluation. CT may provide valuable information on shoji frames penetrating into the orbital and cranial cavities, in addition to lessening the need for MRI, especially in an emergent setting. In contrast, if located adjacent to the nasal and paranasal cavities, it is less discernible from these cavities, because the shoji frame, a piece of dry wood, appears similar hypodensity on CT.

Broken shoji frames could be a strong weapon that can penetrate into the skull.^[9] Therefore, the shoji frame may cause indoor POCI in Japanese style houses.

CONCLUSION

POCI can be caused by a shoji frame as a result of an indoor accident. The broken shoji frame is evidently delineated on CT, which can result in prompt extraction after injury.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Avraham E, Smolikov A, Smolyakov R, Azriel A, Sufaro Y, Kaisman-Elbaz T, *et al.* Minimally invasive subtemporal intradural approach for penetrating orbitocranial injury by wooden foreign body into the lateral wall of the cavernous sinus. *Front Surg* 2020;7:533567.
- Borkar SA, Garg K, Garg M, Sharma BS. Transorbital penetrating cerebral injury caused by a wooden stick: Surgical nuances for removal of a foreign body lodged in cavernous sinus. *Childs Nerv Syst* 2014;30:1441-4.
- Chowdhury FH, Haque MR, Hossain Z, Chowdhury NK, Alam SM, Sarker MH. Nonmissile penetrating injury to the head: Experience with 17 cases. *World Neurosurg* 2016;94:529-43.
- Damm A, Lauritsen AØ, Klemp K, Nielsen RV. Transorbital impalement by a wooden stick in a 3-year-old child. *BMJ Case Rep* 2015;2015:bcr2015211885.
- Dunn IF, Kim DH, Rubin PA, Blinder R, Gates J, Golby AJ. Orbitocranial wooden foreign body: A pre-, intra-, and postoperative chronicle: Case report. *Neurosurgery* 2009;65:E383-4.
- Jooma R, Bradshaw JR, Coakham HB. Computed tomography in penetrating cranial injury by a wooden foreign body. *Surg Neurol* 1984;21:236-8.
- Kapoor AG, Vijitha VS, Fernandes M. Retained intraorbital wooden foreign body presenting with combined anterior and posterior scleritis. *BMJ Case Rep* 2020;13:e232237.
- Lee JS, Lee JE, Oum BS, Cha SH. Orbitocranial injury caused by wood. *Korean J Ophthalmol* 1999;13:128-32.
- Okura H, Takaki Y, Makino K, Nonaka S, Tsutsumi S, Ishii H. An unprecedented case of penetrating head trauma caused by shoji (a Japanese-style paper sliding door). *Trauma Case Rep* 2021;36:100533.
- Shoji MK, Maeng MM, Tse DT. Penetrating orbital injury due to a wooden dowel in a birthday cake. *JAMA Ophthalmol* 2022;140:544-6.
- Specht CS, Varga JH, Jalali MM, Edelstein JP. Orbitocranial wooden foreign body diagnosed by magnetic resonance imaging. Dry wood can be isodense with air and orbital fat by computed tomography. *Surv Ophthalmol* 1992;36:341-4.
- Taş S, Top H. Intraorbital wooden foreign body: clinical analysis of 32 cases, a 10-year experience. *Ulus Travma Acil Cerrahi Derg* 2014;20:51-5.
- Tite DJ, Batstone MD, Lynham AJ, Monsour FN, Chapman PJ. Penetrating orbital injury with wooden foreign body initially diagnosed as an orbital floor blowout fracture. *ANZ J Surg*

- 2002;72:529-30.
14. Wahyudi, Zaky A, Islam AA, Prihantono, Rosyidi RM. An extremely rare case: Transorbital penetrating intracranial injury by wooden foreign body. Case report. *Ann Med Surg (Lond)* 2021;71:102937.
15. Wu Y, He W, Yang Y, Chen J. A rare case of orbitocranial

penetrating injury with intracranial wooden foreign body residue. *Medicine (Kaunas)* 2022;58:1832.

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