CASE REPORT

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ICH and SDH post craniotomy evacuation and extraction of corpus alienum in traumatic brain injury

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ABSTRACT

Introduction: Traumatic brain injury (TBI) from trauma like gunshot wounds occurs when a sharp object penetrates the skull and brain tissue. Intracerebral Hemorrhage (ICH) and Subdural Hemorrhage (SDH) are common head trauma-related bleedings. ICH results from torn brain blood vessels, causing bleeding into brain tissue, while SDH occurs when bridging veins between the brain and dura mater rupture.

Case description: A 4-year-old child presenting with decreased consciousness. Eight hours before admission, the patient was playing with his friend. While playing, the patient was hit by a gunshot wound to the head. After the incident, the patient complained of head pain that continued to worsen. On physical examination, there was tenderness and a subgaleal hematoma in the left parietal region. MSCT examination of the head without contrast was then performed on the patient. The patient underwent craniotomy to evacuate ICH, SDH, and extraction of bullet corpus alienum in the temporal region with C Arm guiding, with a total duration of 3 hours. The patient received treatment for 5 days after surgery.

Conclusion: Intracranial pellet injuries from air gun shots can be fatal if they affect critical brain areas like the hypothalamus, thalamus, or brainstem. If accessible, prompt removal via craniotomy can improve outcomes by evacuating bleeding and relieving symptoms like headaches.

Keywords: *traumatic brain injury, intracerebral hemorrhage, subdural hemorrhage, corpus alienum, gunshot, craniotomy*.
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INTRODUCTION

Traumatic brain injury (TBI) from gunshot wounds occurs when a projectile penetrates the skull and brain tissue, causing severe damage.[1] Gunshot wounds can be tangential, perforating, or penetrating, with the latter including injuries from bullets, knives, and other sharp objects.[2] According to the CDC, about 1.7 million people in the U.S. experience TBI annually, making it the third leading cause of trauma-related deaths.[3] In Indonesia, severe head injuries occur in 6-12% of cases, with a mortality rate of 25-37%, primarily affecting individuals aged 15-44.[4,5] In the UK, head injuries led to over 77,000 hospital admissions in 2013-2014, highlighting the global impact of TBI on quality of life.

Gunshot head injuries are life-threatening, often requiring immediate surgical intervention.[6] They can be categorized into entry and exit wounds, with the former occurring when a bullet remains in the body and the latter when it fully penetrates. TBI is most commonly caused by falls, motor vehicle accidents, blunt force trauma, and assaults, with young males being the highest-risk group.[7] Severe head trauma can lead to complications such as Intracerebral Hemorrhage (ICH) and Subdural Hemorrhage (SDH), which result from torn blood vessels and bleeding in or around the brain.[8,9] Since TBI is a major cause of morbidity and mortality, epidemiological studies are crucial for raising awareness, improving diagnosis, and enhancing treatment strategies.[10]

CASE DESCRIPTION

In this case, we report a 4-year-old child presenting with decreased consciousness. 8 hours before admission, the patient was playing with his friend. While playing, the patient was hit by a gunshot wound to the head. After the incident, the patient complained of head pain that continued to worsen. The patient had no history of systemic disease, previous trauma, or previous surgery. On primary survey examination, airway clear, right chest wall development equal to left chest wall, respiration rate 20x/min, blood pressure 79/52 mmHg, pulse 72x/min, Glasgow coma scale E3V3M4, pupils are isocor 3mm/3mm, no lateralization, temperature 36.5°C. On examination of the status localis of the head region, there was a subgaleal hematoma of the left parietal region and tenderness (Figure 1). The patient then underwent laboratory examination, thorax X-ray, Head MSCT with Reformat and 3D No Contrast (Figure 2).

One day after the incident, the patient underwent craniotomy to evacuate the ICH, SDH, and extraction of the bullet corpus alienum in the temporal region

Figure 1. Clinical features of the patient.

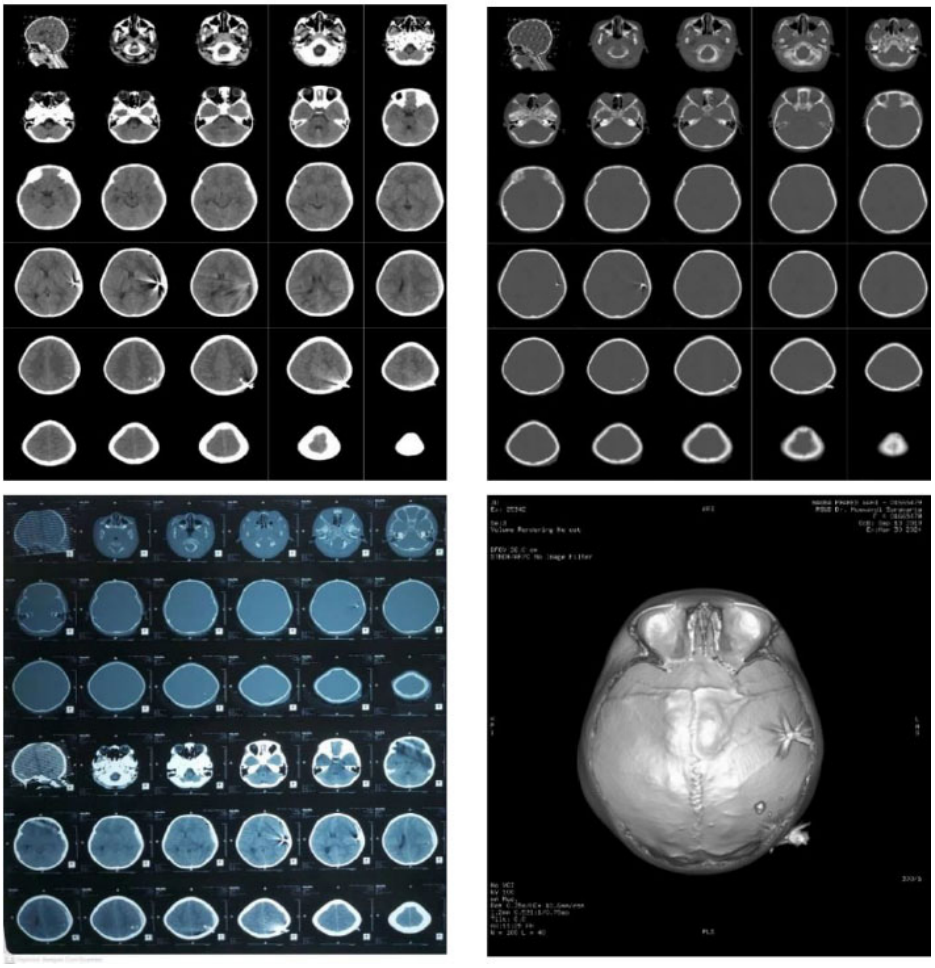

Figure 2. Head MSCT with Reformat and 3D No Contrast.

with C Arm guiding with a total duration of 3 hours (Figure 3). The patient received treatment for 5 days after surgery. There was no shock during the surgery. During the operation, vital signs were stable. After surgery, the patient was admitted to the PICU. Upon arrival at the PICU, the patient was not fully conscious due to sedation, no chest wall pull, and no desaturation. There was a postoperative wound on the head, covered with bandage, no seepage, drain attached, blood products along the drain hose.

After surgery, the patient received therapy from a neurosurgeon, including tranexamic acid injection 250 mg every 8 hours, metamizole injection 500 mg every 8 hours, ranitidine injection 25 mg every 12 hours, mannitol injection 50 cc every 6 hours (tapering off daily), and phenytoin injection 50 mg in 100 cc of NaCl every 8 hours. While pediatricians provide oxygenation therapy, nasal cannula 2 lpm, D5 1/4 NS infusion 60 ml/hour, ampicillin sulbactam injection (25 mg/kg / 6 hours), methylprednisolone injection (1 mg/kg / 8 hours), epinephrine nebulization 1 ampoule / 8 hours.

DISCUSSION

A 4-year-old female patient presented with a chief complaint of decreased consciousness. 8 hours before admission, the patient was playing with her friend. The patient was accidentally hit by a gunshot wound to the head by her friend. Complaints such as fainting, vomiting, and seizures were denied. After the incident, the patient complained of head pain. After supporting examination, the patient was diagnosed with SDH and ICH. The patient underwent craniotomy to evacuate ICH, SDH, and extraction of bullet corpus alienum in the temporal region with C Arm guiding, with a total duration of 3 hours. The patient received treatment for 5 days after surgery.

Intracerebral Hemorrhage (ICH) and Subdural Hemorrhage (SDH) are two types of bleeding that often occur due to head trauma. In ICH, trauma can cause tears in the blood vessels within the brain, resulting in bleeding into the brain tissue.[11] In SDH, trauma causes tears in the bridging veins between the brain surface and the dura mater.[12]

Intracerebral hemorrhage refers to bleeding within the brain parenchyma resulting from the rupture of an intracerebral vessel. The extravasated blood accumulates and exerts mass effect on the surrounding neural tissue, leading to increased intracranial pressure, neuronal injury, and subsequent neurological deficits depending on the affected region.[8,12] The most common sites of ICH are the cerebral hemispheres, basal ganglia, thalamus, brainstem, and cerebellum.[13,14] The classic symptoms of ICH in a progressive onset are neurologic deficits that occur within minutes to hours, accompanied by symptoms such as headache, nausea, vomiting, decreased consciousness, and increased

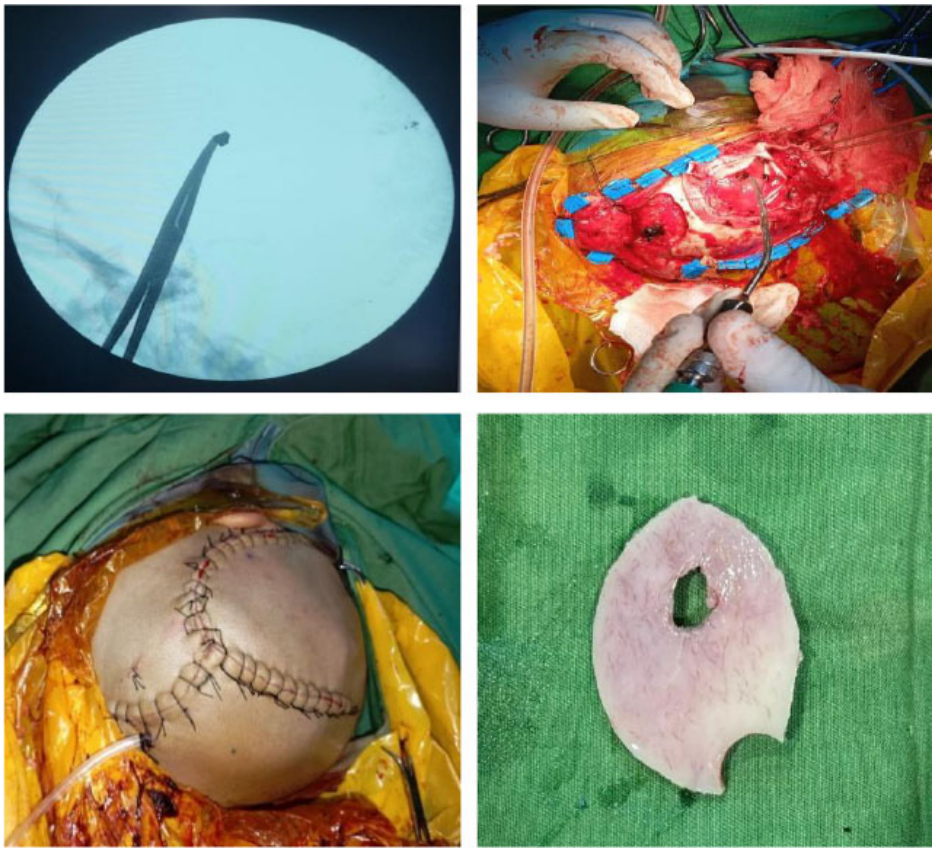

Figure 3. Craniotomy Evacuation and Extraction of Corpus Alienum in Traumatic Brain Injury.

blood pressure.[7,15] Factors that increase mortality are large hematoma volume > 30ml, posterior fossa location, advanced age, MAP > 130mmHg, and lower GCS. Conservative management of ICH itself is to improve hemostasis function, prevent and overcome cerebral vasospasm due to bleeding, and use neuroprotectants.[1,7,16] While indications for surgical therapy are bleeding volume of more than 30cc, bleeding diameter of more than 3 cm in the posterior fossa, location of ICH in lobar and cortical with signs of acute increase in intracranial pressure and threat of brain herniation, cerebellar hemorrhage, and GCS> 7.[1,8,15] The choice of surgical therapy is open craniotomy and evacuation of the hematoma.[17]

Subdural hematoma is the most frequent form of intracranial trauma. Subdural hematoma not only occurs in severe head trauma but can also occur in people with moderate or mild head trauma.[12,18] Hemorrhage occurs between the dura mater and the arachnoid. Bleeding may result from tearing of the bridging veins (connecting veins on the surface of the brain and the sinus venosus inside the dura mater) or from tearing of the arachnoid.[19] In general, subdural hematomas are classified into acute phase (occurring in less than 48 hours), subacute phase (occurring between 2 to 14 days), and chronic phase (developing over weeks and hypodense lesions).[9,18,20] The clinical picture is determined by two factors: the severity of the brain injury that occurred at the time of impact trauma and the speed of hematoma volume increase.[9] Symptoms that arise are not typical and are a manifestation of increased intracranial pressure, such as headache, nausea, vomiting, vertigo, papilledema, diplopia due to paralysis of nerve III, epilepsy, anisocoria, and other neurological deficits.[17,21] The diagnosis of SDH can be made through history taking, physical examination, and also from supporting examinations.[22] CT-scan (Computed Tomography scan) is the best imaging modality for the initial evaluation of SDH.[23,24] Treatment of SDH is divided into operative measures performed based on indications, as well as conservative therapy to improve the patient's hemostasis, administration of corticosteroids, and control of increased intracranial pressure.[4,15,18,25]

Without prompt medical treatment, ICH and SDH can lead to death. Other complications include recurrent bleeding or brain herniation.[15,25] Brain herniation occurs when pressure from subdural bleeding pushes on the brain, causing it to shift from its normal position. Brain herniation can lead to death.[4,6] In some other cases, immediate operative action for brain decompression is required. Surgery on chronic subdural hematoma provides a good prognosis, as around 90% of cases will generally recover completely.[20,25]

CONCLUSION

Intracerebral pellet injuries resulting from air gun incidents carry a significant risk of morbidity and mortality, particularly when the trajectory involves eloquent or deep-seated brain structures such as the hypothalamus, thalamus, or brainstem. Early identification and, when anatomically feasible, timely surgical extraction of the retained pellet are crucial to optimize neurological outcomes and reduce the likelihood of fatal complications. Craniotomy was then performed to evacuate ICH and SDH, and the extraction of the bullet corpus alienum. After the craniotomy, the patient reported fewer headaches. Intracerebral Hemorrhage (ICH) and Subdural Hemorrhage (SDH) are two types of bleeding that often occur due to head trauma. In ICH, trauma can cause tears in the blood vessels within the brain, resulting in bleeding into the brain tissue. In SDH, trauma causes tears in the bridging veins between the surface of the brain and the dura mater. Head injury is one of the leading causes of morbidity and mortality.

DISCLOSURES

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Conflict of Interest
None.

Author Contribution

Mohammad Ilham Akbar, Hanis Setyono, Geizar Arsika Ramadhana, and Muhammad Fauzan Jauhari did physical examination, surgery, and wrote the manuscript.

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