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INTRACRANIAL EPIDURAL ABSCESS IN A 48-YEARS-OLD PATIENT WITH HYSTORICAL UNCONTROLLED DIABETES MELITUS AND POST PROCEDURAL CRANIOTOMY FOR INTRACEREBRAL HEMORRHAGE : A CASE REPORT

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ABSTRACT

Intracranial epidural abscess (IEA) is a severe complication that can arise following skull surgery or as a result of trauma. It may also develop from infections related to otorhinolaryngological procedures or from issues involving the neck and thorax. The primary culprits behind these infections are often staphylococci, particularly Staphylococcus aureus, as well as various gram-negative bacteria. Patients typically present with a range of clinical symptoms, including fever, pain, headache, lethargy, nausea, vomiting, and photophobia. These symptoms may be accompanied by signs such as papilledema, sinus drainage, cranial nerve paralysis, and focal neurological deficits. In this case, we discuss a 48-year-old patient with poorly controlled diabetes mellitus who developed swelling following a cranioplasty. The patient reported fluctuating swelling in the head, headache, and fever one week after the operation. The study utilized a combination of observational methods, clinical evaluations, and analytical laboratory techniques, including the use of an aspiration needle to investigate the nature of the swelling. Aspiration revealed the presence of pus and blood, and further histopathological examination and culture confirmed an infection caused by Methicillin-Resistant Staphylococcus Aureus (MRSA). The patient subsequently underwent a repeat craniotomy to evacuate the abscess, followed by targeted antibiotic therapy. Over two weeks post-operatively, the patient experienced ongoing fluctuations in swelling and associated complaints, ultimately leading to a loss of smell. This case underscores the critical need for urgent attention to IEA, especially in patients with uncontrolled comorbidities like diabetes mellitus. Effective and timely management, which includes surgical intervention and culture-specific antibiotic therapy.

Keywords: intracranial epidural abscess; antibiotics; opening return craniotomy

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INTRODUCTION

Intracranial epidural abscesses (IEA) are a serious complication that can occur after craniotomy or due to trauma. (Neurology, 2018)This case, serving as a reminder, will highlight disease-causing microbes that can develop as a consequence of medical intervention. According to data from the World Health Organization (WHO), nosocomial infection, including IEA, is one of the most significant problems in global health. (Yaqin, 2024). The incidence rate of nosocomial infections shows a trend of increasing, making it a significant concern worldwide, including in developing countries (Si, 2020).

IEA increasingly urges, along with the increasing prevalence of conditions predisposing, such as diabetes mellitus, which can affect the body's immune system and increase the risk of infection. Diabetes mellitus is one of the chronic diseases with an ongoing increase in prevalence worldwide. According to the International Diabetes Federation (IDF), the number of people with diabetes is estimated to have reached 463 million in 2019 and is expected to

continue increasing annually (Jais et al., 2021). This matter highlights that increased awareness of the importance of hygiene will reduce the risk of infections occurring in group patients, who often undergo surgical procedures.

On the other hand, there are several specific contributing factors to IEA events, including invasive procedures, chronic disease history, immunosuppressive drug use, and medical device installation hygiene. One of the most important reasons is to be aware of infection by Staphylococcus aureus bacteria, especially those resistant to methicillin (MRSA) (N Syamsi, 2019). MRSA is a primary cause of infection in hospitals and can cause serious complications to patients with medical conditions (Hayati & Widyastuti, 2022).

According to Satyanegara et al. (2023)The IEA case can cause permanent neurological damage and requires additional intervention, including surgery, which contributes to improved health and maintenance costs. Therefore, handling symptoms quickly and effectively and treating them with the correct antibiotic is crucial to reducing complications.

Various studies emphasize the importance of early detection and proper management to enhance the patient's prognosis. However, although there has been an improvement in understanding of this condition, there is still much more to be done in terms of knowledge, prevention, and care to reduce the incidence of infections post-surgery. The update in the study regarding the IEA not only focuses on therapy antibiotics but also on the multidisciplinary approach to patient management.

The latest study gives a new outlook on factor risks, prevention, and treatment that can be applied to improve clinical outcomes for patients. Focus study moment: This switch to using technology diagnostics, such as MRI and CT scan imaging, facilitates the diagnosis and treatment of infections in a more effective way. The purpose of this study is to gain a deep understanding of the IEA incident following a cranioplasty procedure, exploring the connection between the medical condition and the development of infection, and evaluating the effectiveness of the therapeutic interventions performed.

RESEARCH METHOD

This study was designed as a clinical case report utilizing a qualitative-descriptive approach to thoroughly examine the clinical progression, risk factors, treatment process, and outcomes of a patient diagnosed with an Intracranial Epidural Abscess (IEA) after undergoing a cranioplasty procedure. Conducted at Dr. Mohammad Zyn General Hospital in Sampang, Indonesia—a referral hospital in the Madura region with specialized neurosurgical services—the research took place over two months. This timeline encompassed the patient's initial postoperative follow-up visit until clinical and laboratory assessments verified their recovery.

This study primarily centered on a 48-year-old female patient who exhibited typical symptoms following cranioplasty, such as head swelling, headaches, and fever. Due to her complicated medical history and the presence of comorbidities—specifically uncontrolled diabetes mellitus and hypertension—the research aimed to investigate the relationship between these underlying health issues and the development of postoperative infections, which ultimately led to the formation of an intracranial epidural abscess.

In this study, data collection extended beyond direct clinical observation. It was further enhanced by reviewing patients' medical records, laboratory results, radiological images (particularly non-contrast head MSCT), and intraoperative notes. All gathered information was systematically compiled and documented to facilitate comprehensive analysis and interpretation. To ensure clinical validation of the findings, a multidisciplinary team discussion was held, involving neurosurgeons, internal medicine specialists, and laboratory analysts.

The investigation covers a range of aspects, including the identification of post-operative signs and symptoms, an assessment of the patient's medical history to pinpoint contributory risk factors, and a visual and clinical examination of the surgical wound. It also involves preliminary interventions, such as needle aspiration, followed by a re-craniotomy procedure. Notably, special emphasis was placed on the findings from the histopathological examination and pus culture, which revealed Methicillin-Resistant Staphylococcus aureus (MRSA) as the causative agent.

This research focused on a single individual who was central to the case study. The qualitative-descriptive approach facilitated a deep dive into the clinical experience, offering valuable insights into the management of post-cranioplasty complications, especially in patients with high-risk comorbidities.

To ensure the validity of the data, we utilized triangulation by incorporating multiple sources. We visually confirmed intracranial complications through head MSCT scans. Laboratory tests, including pus cultures and antibiotic sensitivity testing, were performed to isolate the infectious organism and inform suitable treatment options. Furthermore, histopathological analysis of the tissue obtained during surgery reinforced the diagnosis of an intracranial epidural abscess.

The main tools utilized in this study consisted of medical records and visual documentation of the patient's clinical condition, both prior to and following treatment. Additionally, laboratory results and radiological findings provided crucial data for the narrative analysis. This information was examined narratively, focusing on the causal connections between the patient's medical history, clinical manifestations, medical interventions, and their responses to treatment.

In crafting the narrative report, the researcher sought to do more than merely outline the clinical timeline; the objective was also to illuminate the intricate decision-making processes faced by the medical team. For instance, the choice to proceed with a re-craniotomy was shaped not only by objective clinical indicators but also by the patient’s overall health, the associated risks of the procedure, and the pressing need to avert further complications, like the potential spread of infection to deeper brain tissues.

The strategic research approach in this case study aimed to generate practical and applicable solutions for routine clinical practice. One key strategy included comprehensive documentation of the case management process, which serves as a valuable reference for similar cases in the future. Additionally, the study highlighted the vital importance of screening and managing comorbidities, such as uncontrolled diabetes and hypertension, both before and after neurosurgical procedures, due to their significant impact on post-operative outcomes.

Furthermore, a thorough analysis of the pus culture and antibiotic resistance profiles significantly enhanced the evidence-based selection of antibiotics in this study. The identification of an MRSA infection in this instance underscores the critical importance of evidence-based clinical management and strict adherence to hospital infection prevention protocols.

While this study focuses on just one patient, its analytical strength is bolstered by thorough data collection that captures all pertinent clinical aspects. The narrative-descriptive format offers readers a clear understanding of the complete clinical journey and the reasoning behind each medical decision. Consequently, this research did not simply aim to passively describe a clinical phenomenon; rather, it endeavored to unveil actionable insights and practical lessons that can be applied to wider healthcare settings.

The researcher took great care to ensure that every piece of information presented in the report was both scientifically sound and ethically responsible. Ultimately, this research strategy aims to connect theory with practice in the field of neurosurgery. By contextualizing the available data and interpreting the relevant clinical dynamics, this study aspires to significantly enhance medical knowledge, particularly regarding the management of infectious complications after cranioplasty procedures.

RESULTS AND DISCUSSION

A 48-year-old woman presented to the clinic with concerns regarding swelling in her head following a cranioplasty procedure. She reported experiencing noticeable swelling one week post-surgery, accompanied by feelings of illness over the past three days. The pain in her head intensified, particularly when she coughed or exerted herself. Additionally, she experienced a fever that lasted for two days.Upon examination, swelling and softening were noted in the left frontotemporal area of her scalp, while no neck stiffness was observed. The overall physical examination remained routine. The soft swelling in her head was found to be fluctuating upon palpation, and her medical history revealed poorly managed diabetes mellitus, with a recent random blood glucose level of 208 mg/dL, as well as uncontrolled hypertension. Notably, she had previously undergone a craniotomy for the evacuation of an intracerebral hemorrhage (ICH) and had experienced a non-traumatic subarachnoid hemorrhage (SAH) one month prior to her cranioplasty. A non-contrast CT scan of her head indicated the presence of maxillary sinusitis.

Given her condition, timely intervention at the clinic was critical. It was vital to address any damaged nerves resulting from the surgery. An aspiration procedure was conducted on the soft, fluctuating swelling on her head, using a 10 mL syringe to extract about 30 mL of fluid that contained both blood and pus. Despite this intervention, the area continued to show signs of swelling and fluctuation upon examination. The patient was scheduled for a subsequent open procedure, specifically a cranioplasty. During the operation, upon opening the craniotomy, we discovered roughly 30 mL of pus, blood, and cerebrospinal fluid (CSF) in the epidural intracranial space. Following the procedure, the patient was started on antibiotic therapy tailored to the results of culture and sensitivity tests. The Staphylococcus aureus (MRSA)

isolated from the samples was found to be resistant to methicillin, usually originating from abscesses. This organism is often assessed rapidly, especially in patients with neurological complications, and has demonstrated improvements in infection management.



Figure 1. After aspiration with a 10 mL injection, consisting of not more than 30 mL of fluid, including a stiff drink, blood, and pus, but still fluctuates when palpable on the left frontotemporal head, the swelling has decreased.

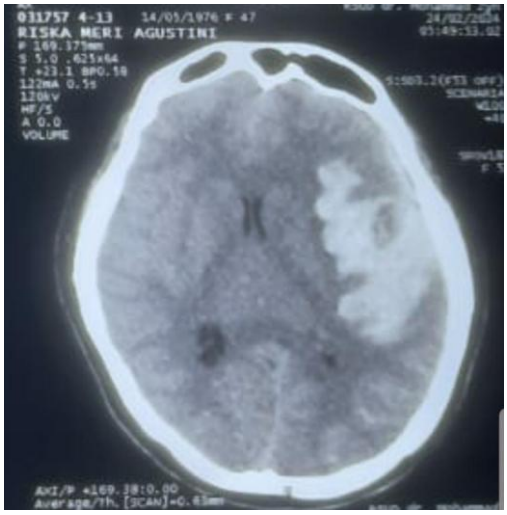


Figure 2. Axial MSCT without contrast patient shows SAH and ICH in the left frontoparietal region of the head when the patient came to the emergency unit with lost consciousness, hemiparesis, hypertension, uncontrolled diabetes mellitus, and uncontrolled diabetes mellitus controlled with hyperglycemia.

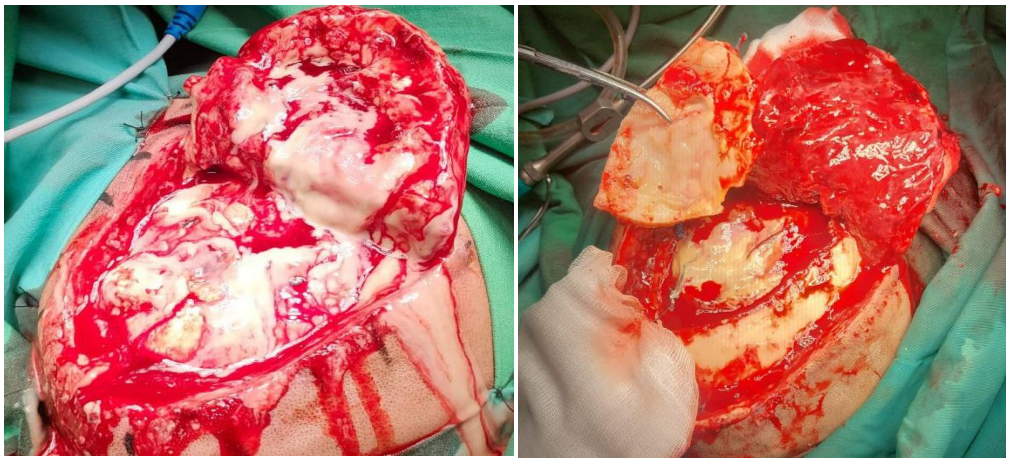


Figure 3. Intraoperative image. For an open return cranioplasty on the left frontotemporal region of the head, an intracranial epidural collection containing approximately 30 mL is present, consisting of pus, blood, and cerebrospinal fluid (CSF).



Figure 4. Surgical wound after cranioplasty: The wound remains wet, dirty, and not fully united two weeks after the procedure.



Figure 5. Surgical wound after 2 weeks of control. For the procedure, the cranioplasty opening is returned. For the evacuation of an epidural abscess and leak, drink hard. Treatment

also includes antibiotics from the fluoroquinolone group, specifically a combination of levofloxacin and metronidazole. Surgical wounds are clean, dry, and unified with precision.

Discussion

Intracranial Epidural Abscess (IEA) can appear as a consequence of trauma, cranial surgery, and sinusitis (Vakili, 2017). Painful swelling around the eyes and headaches are common symptoms associated with an abscess following sinusitis. Individuals with diabetes, alcohol or drug users, and those with weakened immune systems are particularly susceptible, experiencing abscess formation more rapidly. The presence of microorganisms can spread in various ways, including through the bloodstream, direct extension from nearby areas, penetrating cranial trauma, or as a result of surgical interventions involving the nerves (Ziu, et al, 2014).

Following the operation, the patient continued to demonstrate normal functioning for 14 days. Upon performing the opening return cranioplasty, it was found that there was no swelling or pain, and the previously experienced head symptoms had completely resolved. The histopathological examination of the abscess, along with findings from the stiff drink, indicated chronic inflammation, which is consistent with an intracranial epidural abscess. The Gram stain of the intracranial epidural pus showed a network of necrotic debris, surrounded by inflammation and epithelial cells, along with a mixture of gram-positive cocci (GPC) and polymorphonuclear (PMN) leukocytes. Importantly, no malignant tumor cells were observed.

While it is difficult to make broad generalizations, it's important to note that intracerebral empyema (IEA) is the third most common type of pyogenic infection within the cranial cavity, following brain abscesses and subdural empyemas (Boody et al. , 2018). Historical data suggest that infections originating in the head and neck, including conditions like sinusitis, mastoiditis, and otitis, contribute significantly to this issue (Yao, et al, 2016). However, complications arise during the surgical procedure at this critical stage.

In our situation, the reasons mentioned above are closely tied to the backgrounds of our patients, particularly those receiving treatment at our clinic, who commonly present these symptoms. Through thorough anamnesis and careful evaluation of the diagnosis regarding intracranial epidural issues, we can better understand their conditions (Lakhundi, 2018) An abscess may be evaluated using head MSCT or a diagnostic MRI, with the latter offering more detailed imaging. Nowadays, CT-guided needle aspiration is increasingly utilized for both conditions globally. With prompt and precise diagnosis, along with effective management, the prognosis for Intracranial Epidural Abscess (IEA) and Spinal Epidural Abscess (SEA) is quite favorable.

MRSA infection is a major type of hospital-acquired infection that is often linked to increased morbidity, mortality, prolonged hospital stays, and substantial healthcare costs. (Mehmood et al., 2018). MRSA infections can be transmitted, leading to two primary types: hospital-associated MRSA (HA-MRSA) and community-associated MRSA (CA-MRSA). It is believed that infections often arise from practices such as scratching a patient’s wound during surgery, combined with a history of poorly managed diabetes mellitus. Common risk factors

for MRSA infection include prolonged hospitalization, stays in intensive care, antibiotic usage, MRSA colonization, invasive procedures, open wounds, and the presence of central venous access or long-term urinary catheters (Babu, et al 2019) .

CONCLUSION

This study highlights that an intracranial epidural abscess is a serious postoperative complication, particularly in patients with uncontrolled diabetes mellitus. Prompt and accurate management, including surgical intervention and targeted antibiotic therapy, is crucial for improving outcomes. By employing a multidisciplinary approach to patient care, the research underscores the importance of minimizing complications and enhancing prognosis. Moreover, it emphasizes the necessity of paying special attention to the management of comorbidities such as diabetes during nerve surgery procedures.

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