CASE REPORT

Intracranial infection caused by minor skin contusion associated with previous craniotomy

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SUMMARY

Minor damage to the scalp may lead to intracranial infection. Moreover, the postoperative state of the scalp, skull and meninges is especially noteworthy with respect to invasion of pathogens into the skull. Therefore, a detailed medical history should be obtained from patients with even minor scalp injuries to avoid intracranial infection. We herein report a case of intracranial infection caused by a minor scalp injury associated with previous craniotomy, which was missed at first.

BACKGROUND

Major penetration wounds are well-recognised causes of intracranial injury and infection.¹ However, even minor trauma of the scalp with an intact skull can result in intracranial infection, especially in patients with a history of craniotomy.² We herein present a case of intracranial infection caused by a minor skin contusion associated with a previous craniotomy.

CASE PRESENTATION

A man aged 72 years sustained a minor contusion on his right forehead by a branch during pruning. He was treated with a topical antibiotic by a local dermatologist for 2 months; however, the wound did not improve and showed persistent purulent discharge (figure 1). He was thereafter admitted to the dermatology department in our hospital. A detailed interview regarding his medical history revealed that he had undergone a frontobasal craniotomy to treat a ruptured aneurysm 48 years previously.

Figure 1 Photograph of the forehead showing a fistula with persistent purulent discharge following a minor contusion.

INVESTIGATIONS

CT on admission showed frontal paranasal sinusitis and a partial bone defect around the craniotomy site (figure 2).

DIFFERENTIAL DIAGNOSIS

Simple cellulitis followed by fistula formation.

TREATMENT

Endoscopic sinus surgery was performed as the initial therapy. The surgical findings indicated communication between the frontal sinus and intracranial cavity through fragile tissue, which was considered to be the artificial material used in the previous surgery.

Despite opening of the drainage route in the frontal sinus, discharge of pus from the fistula on the patient's forehead continued. MRI showed no evidence of intracranial infection at that time. The bone flap was then considered to be infected and the source of the persistent infection, and surgical removal of the bone flap was scheduled.

Shortly after the MRI, the patient developed a seizure and CT revealed rapid abscess formation in the right frontal lobe (figure 3). Surgical removal of the bone flap and cerebral abscess was immediately performed. A small amount of pus and infected soft tissue was found in the epidural space. The removed bone flap showed no prominent deformations. The abscess was evacuated and irrigated with saline, and the procedure was completed without cranioplasty. Bacterial culture of the obtained pus and bone flap revealed infection by *Streptococcus*

Figure 2 Sagittal CT section on admission showing frontal sinusitis and a partial bone defect around the craniotomy site.

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Figure 3 Contrast-enhanced CT on second admission showing abscess formation in the right frontal lobe.

Figure 4 MRI 6 months after surgery showing no sign of recurrence of infection.

salivarius, *Streptococcus intermedius*, *Streptococcus anginosus* and *Pseudomonas aeruginosa*.

After intravenous administration of meropenem and metronidazole for 6 weeks postoperatively, the drainage of pus and other inflammatory reactions disappeared completely.

OUTCOME AND FOLLOW-UP

At the time of this writing, the patient was doing well without any sequelae except a depression in the forehead. MRI showed no signs of recurrence of infection 6 months after surgery (figure 4).

DISCUSSION

In the present case, the pathogens that caused the intracranial infection were considered to have entered the paranasal sinuses from cellulitis of the scalp via the bone defect following the

performance of the frontal craniotomy. To the best of our knowledge, no other cases of intracranial infection caused by a minor skin contusion in a patient with a history of frontal craniotomy have been previously reported.

Even minor scalp injuries can cause intracranial infection. Minor damage to the epidermis allows pathogens to penetrate the scalp² and can lead to cellulitis. Cellulitis, especially in galea aponeurotica of the scalp, is considered a main cause of intracranial infection through emissary veins³ because a variety of emissary veins travel through the galea aponeurotica.⁴ For example, one case report described an infant who developed an intracranial abscess secondary to an infected scalp vein catheter.⁵

Neurosurgeons recognise that the postoperative state of the scalp, skull and meninges is especially noteworthy with respect to invasion of pathogens into the skull.² In the present case, a minor contusion caused cellulitis in the forehead, and the pathogens penetrated the paranasal sinuses and intracranial tissues. However, a history of a craniotomy may be missed by family physicians because even the patients themselves often forget to include everything in their medical history, as in the present case.

With respect to the management of frontal sinus infection after frontal craniotomy, surgical techniques appear to be improving with advancements in endonasal endoscopic surgery. In one report, 10 of 19 patients with intracranial infections complicated by paranasal sinus infections were successfully treated by direct sinus surgery and drainage with concomitant antibiotics; the remaining 10 patients required concomitant or subsequent craniectomy.³ In a similar setting, successful results were obtained by endoscopic sinus surgery.⁶ In terms of the need for craniectomy, if the bone flap is determined to be infected, it will generally be removed.⁷ In the present case, initially, there was no sign of an intracranial or bone flap infection. Therefore, endonasal endoscopic sinus drainage was performed as the first-line treatment.

In conclusion, minor damage to the scalp may lead to intracranial infection, especially in patients with an iatrogenic route of infection after craniotomy. Therefore, we should obtain a detailed medical history even in patients with minor trauma to avoid delaying essential medical treatment.

Learning points

- ▶ Minor damage to the scalp may lead to intracranial infection.
- ▶ The postoperative state of the scalp, skull and meninges is especially noteworthy with respect to invasion of pathogens into the skull.
- ▶ A detailed medical history should be obtained even from patients with minor scalp injuries.

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