



# De novo subgaleal abscess complicated by spontaneous osteomyelitis and epidural abscess: a case report and review of literature

Binita Timilsina, MBBS<sup>a</sup>, Anil Suryabanshi, MBBS<sup>a,\*</sup>, Niranjan Adhikari, MBBS<sup>a</sup>, Prajwol Luitel, MBBS<sup>a</sup>, Sujan Paudel, MBBS<sup>a</sup>, Bikash Thapa, MS<sup>b</sup>, Mohan R. Sharma, MS<sup>b</sup>

**Introduction and importance:** A subgaleal abscess is a collection of pus in a potential space between the galea aponeurotica and pericranium. De novo subgaleal abscesses are a subset of subgaleal abscesses that develop in the absence of identifiable risk factors such as head trauma or procedures. However, these have rarely been reported in the literature.

**Case presentation:** We present the case of a 65-year-old woman who presented with a headache for two and a half months, followed by swelling of the right parieto-occipital scalp. She denied any history of trauma, procedures, or anticoagulant use. A diagnosis of subgaleal abscess complicated by osteomyelitis and epidural abscess was made after obtaining a computed tomography of the head. Surgical treatment consisting of drainage, debridement, and craniectomy was performed, and the disease was successfully treated with a 6-week course of antibiotics.

**Clinical discussion:** It is uncommon to have a de novo subgaleal abscess with spontaneous osteomyelitis and an epidural abscess as concurrent complications. The symptoms can be subtle, such as chronic headaches which can lead to delayed hospital visits. Computed tomography of the head is sufficient to make a definitive diagnosis. Appropriate antibiotic therapy and surgical intervention are necessary, which may encompass incision, drainage, debridement, and occasionally a craniectomy in order to achieve full resolution.

**Conclusions:** One should be vigilant when evaluating scalp swelling for possible underlying abscesses. Prompt diagnosis and appropriate surgical treatment with adequate antibiotics are preferred treatment options for de novo subgaleal abscesses.

**Keywords:** de novo, epidural abscess, spontaneous osteomyelitis, subgaleal abscess

## Introduction

The subgaleal layer is an important layer of the scalp because it has a potential space that has clinical and surgical significance<sup>1,2</sup>. De novo subgaleal abscesses are a subset of subgaleal abscesses that develop in the absence of identifiable risk factors such as head trauma or procedures. Although subgaleal abscesses secondary to trauma, iatrogenic factors, or significant comorbidities are relatively common, primary subgaleal abscesses are remarkably rare<sup>3</sup>. Moreover, diagnosing secondary abscesses is typically straightforward, whereas

## HIGHLIGHTS

- Surgical and clinical implications of the subgaleal space are important.
- Although rare, de novo subgaleal abscess usually presents with complications.
- To diagnose, a computed tomography scan of the head is sufficient.
- Surgery is required, involving incision, drainage, debridement, and occasionally a craniectomy.

<sup>a</sup>Maharajgunj Medical Campus, Institute of Medicine and <sup>b</sup>Department of Neurosurgery, Tribhuvan University Teaching Hospital, Institute of Medicine, Kathmandu, Nepal

Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

\*Corresponding author. Address: Maharajgunj Medical Campus, Institute of Medicine, Kathmandu 44600, Nepal. Tel.: +97 798 475 407 64. E-mail: anilsuryabanshi1462@gmail.com (A. Suryabanshi).

Copyright © 2023 The Author(s). Published by Wolters Kluwer Health, Inc. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

Annals of Medicine & Surgery (2023) 85:5690–5694

Received 10 August 2023; Accepted 29 August 2023

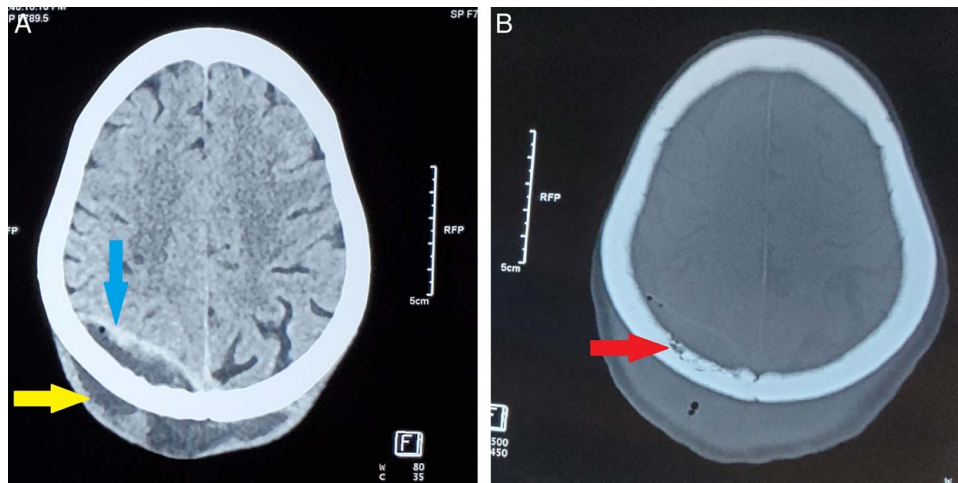
Published online 5 September 2023

<http://dx.doi.org/10.1097/MS9.0000000000001285>

identifying primary abscesses poses a challenge as they have a vague presentation, increasing the likelihood of complications<sup>4–6</sup>. Complications range from intracranial spread of infection to extracranial spread to adjacent orbit, causing cranial nerve III palsy<sup>6</sup>. We report a case of a primary subgaleal abscess complicated by spontaneous osteomyelitis of the skull bone with epidural extension. A written informed consent was obtained from the patient for the publication of this case report. This case report is in line with the SCARE (Surgical CAse REport) guidelines<sup>7</sup>.

## Presentation of case

This 65-year-old woman presented to the emergency department on June 2023 with a complaint of headache for the past two and half months, with an increase in severity over the past week. She



**Figure 1.** (A) Computed tomography of the head: (A) (brain window) showing subgaleal (yellow arrow) and epidural (blue); (B) (bone window) of the same scan revealed lytic areas (red arrow) in the right parietal and occipital bones, which is indicative of osteomyelitis.

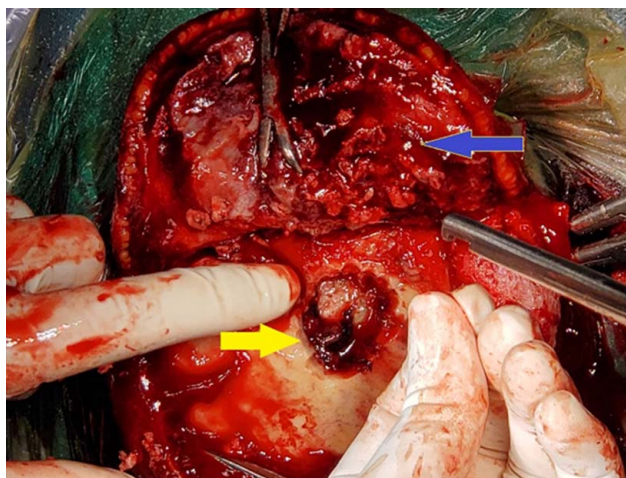
denied any neurological symptoms. This was followed by the gradual development of swelling on her right scalp. She had no history of head trauma, procedures, or anticoagulant use. Upon examination, she was alert. The scalp was swollen in the right parieto-occipital region, with a maximum dimension of 15 × 12 cm. The swelling fluctuated with slight tenderness. Neurological and systematic examinations were unremarkable.

A complete blood count revealed a white blood cell count of  $13 \times 10^4/\text{mm}^3$  and an erythrocyte sedimentation rate of 70 mm/h. Her random blood sugar was normal and serology was non-reactive. A non-contrasted computed tomography (CT) of the head revealed subgaleal (7 × 6.5 × 2.5 cm) and epidural (5.3 × 5.3 × 1.2 cm) collections with lytic areas in the right parietal and occipital bones, suggestive of osteomyelitis (Fig. 1).

The patient received the first dose of flucloxacillin and metronidazole in the emergency department and underwent surgical intervention. An incision of 14 cm was made, which

drained 100 ml of foul-smelling purulent fluid. Subsequently, a scalp flap was raised that revealed a necrotic area on the scalp (Fig. 2), which was removed meticulously. Additionally, we created a 3 × 3 cm burr hole in the right parieto-occipital region to remove the underlying non-viable bone, which exposed dural thickening and an epidural abscess that was drained (about 25 ml). Thorough washing with betadine, hydrogen peroxide, and normal saline was performed, and the scalp was closed in two layers using a subgaleal drain. Necrotic material, pus, and bone were sent for Gram staining and culture. Gram staining of pus revealed gram-positive cocci, and culture after 72 h of incubation showed methicillin-sensitive *Staphylococcus aureus*. However, the culture of the bone specimens was negative.

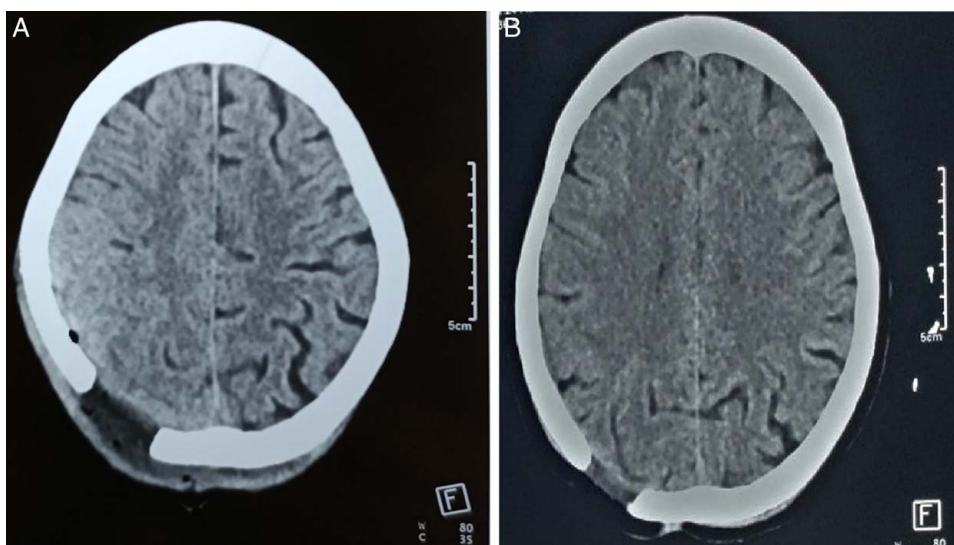
Intravenous antibiotics (flucloxacillin 500 mg 4 times a day and metronidazole 500 mg three times a day) were continued for 14 days. The drain was removed on postoperative day 5. Her postoperative head CT, repeated on the 6th day, revealed the resolution of the abscess (Fig. 3). She did well during her postoperative stay and was discharged on the 15th postoperative day. The intravenous antibiotics were changed to oral antibiotics (flucloxacillin 500 mg orally four times a day) for the next 4 weeks. At the 4-week follow-up, the examination was normal and her repeat CT head showed no further collection (Fig. 3).



**Figure 2.** Intraoperative view showing necrotic scalp (blue arrow) and burr hole (yellow arrow) created to drain the epidural abscess.

## Discussion

The subgaleal space is a potential space that extends from the supraorbital ridge to the zygomatic arches and auricular muscles laterally and posteriorly to the cervical muscles<sup>[2,5]</sup>. Potential space allows easy and large collection of blood and other fluids, which can result in complications, such as abscess formation<sup>[5]</sup>. Subgaleal abscesses usually form after trauma or iatrogenic procedures involving the head, ears, or sinuses<sup>[8,9]</sup>. It can also form due to spread from a nearby structure, such as the skin or sinus, or a hematogenous route<sup>[10]</sup>. In neonates, fetal scalp monitoring and forceps delivery have been reported as precipitating factors<sup>[11,12]</sup>. Immunocompromised conditions, such as malignancies, chronic renal failure, and diabetes mellitus, can increase the risk of abscess formation<sup>[3]</sup>. Primary/



**Figure 3.** Postoperative computed tomography head on the fifth (A) and thirty (B) day showing cranial defect and resolution of subgaleal and epidural collection.

de novo/spontaneous subgaleal abscesses are those abscesses that develop in the absence of the aforementioned condition. Our case also fits the definition of de novo subgaleal abscess because our patient had no risk or precipitating factors. Such cases are rare, with only five case reports (Table 1) published to date<sup>[3,4,6,13,14]</sup>. Additionally, it is unique because it involves concurrent complications of spontaneous skull osteomyelitis and epidural abscess, a combination that has been previously reported only once<sup>[6]</sup>.

Infection is usually polymicrobial<sup>[10]</sup>. The most frequently encountered bacteria in secondary subgaleal abscesses is *S. aureus*. Other bacteria such as *Streptococcus pyogenes*, *Eikenella corrodens*, *Clostridium perfringens*, *Salmonella enteritidis*, *Escherichia coli*, *Kocuria rosea*, *Pasturella multocida*, and *Burkholderia pseudomallei* have also been reported<sup>[10,12–15]</sup>. Although less common, monomicrobial infections are usually associated with primary abscesses, as in the present case<sup>[4,13,14]</sup>. *S. aureus* was the sole culprit for the abscess in our patient.

Presentation findings of primary subgaleal abscesses may be confusing compared to secondary subgaleal abscesses, potentially resulting in delayed hospital visits and accurate diagnoses. Such delays can contribute to the development of various complications, including osteomyelitis of the skull and intracranial extension, such as epidural, subdural, and brain abscesses<sup>[14]</sup>. Diagnosis of primary subgaleal abscesses typically requires CT of the head. Furthermore, aspiration of the abscess may be required for the confirmation of the diagnosis<sup>[4]</sup>.

Surgical incision and debridement of necrotic tissue with drain placement with concurrent intravenous antibiotics are the treatments of choice for subgaleal abscess; however, some cases have been managed with needle aspiration only<sup>[5]</sup>. Antibiotics should be guided by culture susceptibility reports. One to four weeks of antibiotic treatment for isolated subgaleal abscess has been described in the literature, although a longer course (Table 1) should be administered when complications such as osteomyelitis develop<sup>[13,14]</sup>. Our case also received a 6-week course (2 weeks intravenous and 4 weeks oral) of antibiotics based on the culture sensitivity report.

## Conclusion

A de novo subgaleal abscess is a rare entity that, if not diagnosed and treated promptly, can lead to the spread of infection and cause serious problems. CT head is enough to reach a diagnosis in most cases. Delays in treatment can result in serious complications. The preferred treatment is a surgical intervention combined with antibiotic coverage.

## Ethical approval

Since this is a case report, our Institutional Review Board waived the requirement for ethical approval.

## Consent

Written informed consent was obtained from the patient for the publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

## Sources of funding

No funding was received for the study.

## Author contribution

M.R.S. and B.Th.: managed the case; A.S. and B.T.: conceptualized, collected data, reviewed the literature, wrote the original manuscript, and reviewed it; P.L., N.A., S.P., B.Th., and M.R.S.: reviewed and edited the manuscript. All authors reviewed and finalized the final manuscript.

## Conflicts of interest disclosure

All the authors declare that they have no conflicts of interest.

**Table 1****Reported cases of de novo subgaleal abscess in literature.**

Study	Year	Country	Case	Age (year)	Comorbidities	Presenting feature	Imaging	Complications	Organism	Antibiotic	Antibiotic duration	Surgery
Schaefer <i>et al.</i> <sup>[4]</sup>	1992	Canada	F	62	Hypertension, appendectomy	Scalp pain and swelling	Skull X-ray, plain CT head, Technetium bone scan	Osteomyelitis	<i>Streptococcus pyogenes</i>	Intravenous penicillin G	6 weeks	Abscess drainage and debridement
Dalugama <i>et al.</i> <sup>[13]</sup>	2018	Sri Lanka	M	64	Diabetes mellitus	Fever and headache	USG scalp, plain CT head	None	<i>Burkholderia pseudomallei</i>	Intravenous ceftazidime followed by cotrimoxazole	3 months	Abscess drainage and debridement
Umana <i>et al.</i> <sup>[3]</sup>	2019	Italy	M	59	None	Fever and scalp pain	USG scalp, plain CT head	Probable metastasis abscessualization	Not reported	Daptomycin, ertapenem, rifampicin	Not mentioned	Abscess drainage, debridement, and craniectomy
Rangnekar <i>et al.</i> <sup>[14]</sup>	2019	India	M	35	None	Headache and scalp swelling	Plain CT head, MRI head	Osteomyelitis	<i>Kocuria rosea</i>	Intravenous cefotaxime followed by oral clindamycin	6 weeks	Abscess drainage, debridement and craniectomy
Tan and Tan <sup>[6]</sup>	2023	Philippines	M	55	Hypertension	Diplopia, Ptosis and scalp swelling	Contrast CT head and MRI head	Osteomyelitis, epidural abscess and orbital extension	Not clearly mentioned	Ceftriaxone and azithromycin followed by cotrimoxazole and piperacillin-tazobactam	Not clearly mentioned	Abscess drainage, debridement and craniectomy
Present case	2023	Nepal	F	65	None	Headache and scalp swelling	Plain CT head	Osteomyelitis and epidural abscess	<i>Staphylococcus aureus</i>	Intravenous flucloxacillin and metronidazole followed by oral flucloxacillin	6 weeks	Abscess drainage, debridement, and craniectomy

## Research registration unique identifying number (UIN)

Not applicable.

## Guarantor

Dr Mohan Raj Sharma.

## Data availability statement

All the required data are presented within the manuscript itself.

## Provenance and peer review

Not commissioned, externally peer-reviewed.

## Acknowledgements

Not applicable.

## References

- [1] Ellis H, Mahadevan V. The surgical anatomy of the scalp. *Surgery (Oxford)* 2014;32:e1–5.
- [2] Seery GE. Surgical anatomy of the scalp. *Dermatol Surg* 2002;28:581–7.
- [3] Umana GE, Scalia G, Fagone S, *et al.* Spontaneous subgaleal abscess associated with lung adenocarcinoma: first description of this unusual association. *World Neurosurg* 2019;131:133–6.
- [4] Schaefer J, Clein L, Conly J. De novo subgaleal abscess. *Can J Infect Dis* 1992;3:30–2.
- [5] Wiley JF II, Sugarman JM, Bell LM. Subgaleal abscess: an unusual presentation. *Ann Emerg Med* 1989;18:785–7.
- [6] Tan RJD, Tan MCM. Isolated pupillary-sparing cranial nerve III palsy from a subgaleal abscess. *Acta Med Philipp* 2023;57:59–62.
- [7] Agha RA, Franchi T, Sohrabi C, *et al.* The SCARE 2020 guideline: updating consensus Surgical CAse REport (SCARE) guidelines. *Int J Surg* 2020;84:226–30.
- [8] Barry J, Fridley J, Sayama C, *et al.* Infected subgaleal hematoma following blunt head trauma in a child: case report and review of the literature. *Pediatr Neurosurg* 2015;50:223–8.
- [9] Akhaddar A, Hall W, Boucetta M. Subgaleal and brain abscesses due to *Salmonella enteritidis* following craniotomy for giant cell glioblastoma multiforme: a case report and literature review. *Surg Neurol Int* 2019;10:37.
- [10] Goodman SJ, Cahan L, Chow AW. Subgaleal abscess: a preventable complication of scalp trauma. *West J Med* 1977;127:169–72.
- [11] Chen C-H, Hsieh W-S, Tsao P-N, *et al.* Neonatal subgaleal abscess. *Eur J Pediatr* 2004;163:565–6.
- [12] Onyeama CO, Srinivasan H, Lotke M, *et al.* Subgaleal abscess and *E. coli* septicemia following scalp electrode in a preterm newborn: a case report. *J Matern Fetal Neonatal Med* 2009;22:1201–3.
- [13] Dalugama C, Tennegedara A, Gawarammana IB. De novo subgaleal abscess – a rare presentation of melioidosis: a case report. *J Med Case Rep* 2018;12:115.
- [14] Rangnekar RD, Jamaluddin MA, Raja K, *et al.* Spontaneous skull osteomyelitis with subgaleal abscess due to *Kocuria rosea*. *Neurol India* 2019;67:915–8.
- [15] Per H, Kumandaş S, Gümüş H, *et al.* Meningitis and subgaleal, subdural, epidural empyema due to *Pasteurella multocida*. *J Emerg Med* 2010;39:35–8.