Case Report

Case Report: Surgical Excision of a Caseous Cervical Abscess in an 8-Year-Old Stallion

Artina Prastiwi[1]*, Dhirgo Aji[1], Dinar Arifianto[2], Devita Anggraeni[1], Agus Purnomo[1], Mungky Ema Ramadhani[1], Indira Putri Negari[3], Najeebullah Mohammadi[4]

[1]Department of Veterinary and Radiology, Faculty of Veterinary Medicine, Universitas Gadjah Mada, Yogyakarta, 55281, Indonesia; [2]Department of Veterinary Clinical Pathology, Faculty of Veterinary Medicine, Universitas Gadjah Mada, Yogyakarta, 55281, Indonesia; [3]Research Center for Vaccine and Drugs, National Research and Innovation Agency (BRIN), Raya Jakarta-Bogor Street KM.46, Bogor, West Java, 16911, Indonesia; [4]Department of Veterinary Anatomy, Faculty of Veterinary Medicine, Ataturk University, Erzurum, 25000, Turki.

Abstract | An 8-year-old mixed-breed stallion presented with a 7–8 cm swelling in the right cervical region. Clinical examination was unremarkable except for the localized mass. Hematology values were within normal limits. Fine Needle Aspiration (FNA) yielded caseous material; cytology revealed necrotic cellular debris consistent with liquefaction necrosis typical of suppurative bacterial processes. No bacterial culture was performed, which is acknowledged as a limitation. The patient underwent standing surgical drainage under constant rate infusion (CRI) anesthesia with detomidine and butorphanol. Post-operative care included systemic long-acting amoxicillin, phenylbutazone, and topical therapy with chloramphenicol, sodium diclofenac, and sodium heparin. Healing progressed uneventfully, with sutures removed on day 14 and complete recovery by day 39. This case highlights the practical application of standing surgery with CRI anesthesia and multimodal therapy in equine abscess management, while underscoring the importance of diagnostic procedures such as bacterial culture and sensitivity testing.

Keywords | Cervical abscess, Constant rate infusion, Multimodal therapy, Stallion, Standing surgery

Received | February 16, 2026; **Accepted** | April 05, 2026; **Published** | July 19, 2026
***Correspondence** | Artina Prastiwi, Department of Veterinary and Radiology, Faculty of Veterinary Medicine, Universitas Gadjah Mada, Yogyakarta, 55281, Indonesia; **Email:** artina.prastiwi@ugm.ac.id
Citation | Prastiwi A, Aji D, Arifianto D, Anggraeni D, Purnomo A, Ramadhani ME, Negari IP, Mohammadi N (2026). Case report: Surgical excision of a caseous cervical abscess in an 8-year-old stallion. Adv. Anim. Vet. Sci., 14(7):1531-1537.
DOI | https://dx.doi.org/10.17582/journal.aavs/2026/14.7.1531.1537
ISSN (Online) | 2307-8316

INTRODUCTION

Abscesses are common in horses and typically require surgical drainage and antimicrobial therapy (Mair and Sherlock, 2011). Cervical abscesses pose particular challenges due to their proximity to vital structures. An abscess is a localized accumulation of purulent material that forms in the tissue or an organ due to infection. Abscesses are divided into open and closed types. A closed abscess is a collection of purulent fluid located in a particular body tissue and is sometimes encapsulated by connective tissue (Green, 2014). Bacteria that cause purulent infections include *Pseudomonas* sp. and *Streptococcus* and *Staphylococcus* spp., which are generally found in the stable environment. Open wounds on the body facilitate bacterial entry. When skin trauma occurs, the body responds with blood cells, namely neutrophils and macrophages, to kill bacteria. An abscess can cause tissue rupture, leading to prolonged inflammation and infection (Mair and Sherlock, 2011).

Although surgical draining of abscesses in horses is a common and well-documented treatment (Auer *et al.*,

2019), not all cervical swellings exhibit classical diagnostic characteristics. This case is clinically significant because the cytological findings were atypical, revealing epithelial debris but no visible inflammatory or neoplastic cells, which presented a diagnostic challenge. Furthermore, the hematological profile remained normal despite the presence of a persistent caseous abscess. These conflicting findings necessitated thorough clinical reasoning prior to decisive surgical intervention. As a result, this report emphasizes the need of combining cytology, clinical examination, and surgical judgment when standard diagnostic data do not accurately reflect the underlying pathology.

Clinical symptoms of abscesses seen in the field generally include swelling. Lumps typically have a soft consistency and may be fluctuant upon palpation (Mair and Sherlock, 2011). Treatment for abscesses in most cases is surgical, where an incision is made to drain the abscess. Treatment to drain the contents of the abscess is essential before it bursts. Before surgery, the primary steps are anesthesia for pain management and administration of antibiotics (Recchi *et al*, 2024). Abscesses rarely heal independently, so prompt medical intervention is necessary to prevent the abscess from spreading to other parts of the body. Surgical procedures can treat abscesses (Mair and Sherlock, 2011). This report aims to describe the diagnostic approach, surgical procedure, and therapy for abscess disease in an 8-Years old Stallion at the Faculty of Veterinary Medicine, Universitas Gadjah Mada, Indonesia.

Case presentation

An 8-year-old stallion was presented with a swelling in the right cervical region that had developed over several days. No prior treatment had been administered. The patient was otherwise healthy, with normal appetite and behavior.

- Clinical examination: HR 46 bpm, RR 20/min, rectal temperature 38.1 °C, mucous membranes pink, no lymphadenopathy.
- Hematology: All parameters were within normal ranges (Table 1).
- Cytology: FNA yielded caseous material. Giemsa staining revealed necrotic debris consistent with liquefaction necrosis (Figure 1). No bacteria were observed. The absence of inflammatory cells raised differential diagnoses including cyst, granuloma, or neoplasm; however, clinical presentation favored an abscess; however, clinical presentation favored abscess.
- Limitations: No ultrasonography or bacterial culture/susceptibility testing was performed.

Table 1: Hematology results.

Parameters	Result	Normal value*
RBC (x10^6 cells/µL)	7.26	6.2-10.2
Hemoglobin (g/dL)	13.7	11.4-17.3
Hematocrit (%)	33.34	31-50
Platelets (x10^3 cells/µL)	114	72-183
WBC (x10^3 cells/µL)	9.01	4.9-10.3
Lymphocytes (x10^3 cells/µL)	4.57	1.7-5.8
Lymphocytes %	50.7	18.8-58.9
Monocytes (x10^3 cells/µL)	0.4	0-1.0
Monocytes %	4.4	1.4-10.5
Neutrophils (x10^3 cells/µL)	3.92	2.2-8.1
Neutrophils %	43.6	28.0-82.8
Eosinophils (x10^3 cells/µL)	0.11	0-0.8
Eosinophils %	1.2	0-8.7
Basophils (x10^3 cells/µL)	0.01	0-0.3
Basophils %	0.1	0-2

*Southwood 2013.

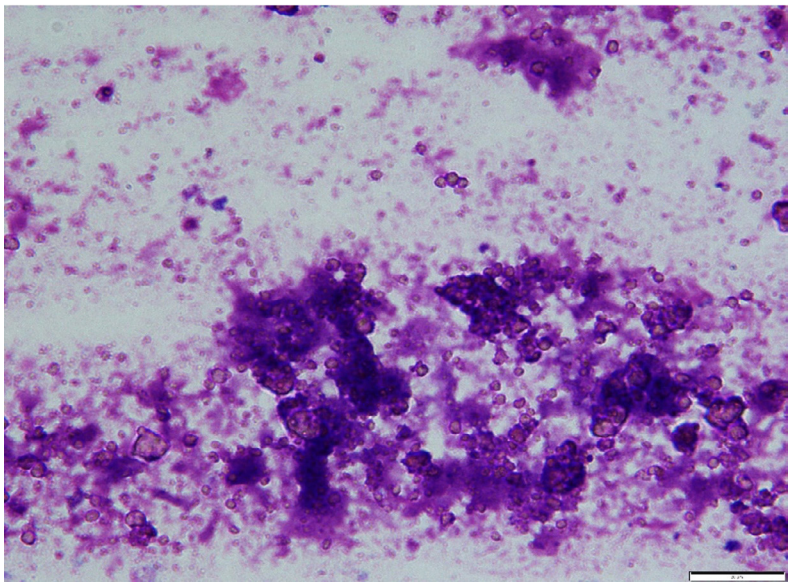

Figure 1: Cytology of the fine-needle aspirate showing necrotic cellular debris consistent with liquefaction necrosis. No inflammatory or neoplastic cells were observed. (Giemsa stain, 1000x magnification).

Differential diagnosis

Considered possibilities included:

- Abscess (primary bacterial infection, trauma, injection site reaction)
- Cyst or hematoma (based on cytology lacking inflammatory cells)
- Granuloma or neoplasm (squamous cell carcinoma, lymphosarcoma)
- *Corynebacterium pseudotuberculosis* (pigeon fever)

Cervical abscesses in horses may develop from several causes, including puncture wounds, insect bites, or underlying bacterial infections. Typical clinical signs include a distinct swelling at the affected site, which is often painful to palpation and occasionally associated with fever. Although the external manifestations of an abscess are generally easy to recognize, interpreting supplementary diagnostic findings can be difficult (Orsini *et al*., 2016). Normal hematology findings generally suggest that the infection is localized rather than systemic, with no elevation in leukocyte counts or other indicators of systemic inflammation (Walton *et al*., 2021).

Normal hematology findings do not rule out the presence of an abscess, as systemic inflammatory responses may not yet be evident. Targeted diagnostic techniques, including ultrasonography or bacterial culture of aspirated material, are therefore essential to improve diagnostic certainty. The absence of hematological abnormalities may also indicate that the patient's immune system is successfully localizing the infection, preventing systemic spread. These considerations emphasize the importance of vigilant clinical monitoring and the use of focused diagnostic methods in the evaluation of cervical abscesses in horses (Walton *et al*., 2021).

Differential diagnosis

Cervical abscesses in horses may arise from several conditions. Strangles, caused by *Streptococcus equi* subsp. *equi*, is the most frequent etiology, usually affecting submandibular or retropharyngeal lymph nodes but sometimes extending to the cervical region. Clinical signs include fever, nasal discharge, lymphadenopathy, and lethargy (Timoney, 2015; Boyle *et al*., 2018).

Corynebacterium pseudotuberculosis infection (pigeon fever) produces external abscesses, typically in the chest or ventral abdomen, but cervical involvement has been reported. Transmission occurs via insect vectors or direct contact (Spier *et al*., 2017).

Injection-site reactions may result from contaminated needles or improper technique, while trauma or foreign bodies such as splinters or wire can lead to secondary bacterial abscesses (Orsini and Divers, 2014).

Other infectious causes include Actinomycosis/Actinobacillosis, producing soft tissue or lymph node abscesses often linked to trauma (Walton *et al*., 2021), and Nocardiosis, which presents as chronic draining lesions requiring culture and sensitivity testing.

Less common etiologies include fungal infections such as *Histoplasma* or *Blastomyces*, typically associated with immunosuppression or environmental exposure (Latimer, 2011). Neoplasia (e.g., squamous cell carcinoma, lymphosarcoma) may mimic abscesses when necrosis and secondary infection occur (Valentine, 1995).

Additional bacterial pathogens such as *Staphylococcus aureus* and *Streptococcus* spp. are frequent in primary bacterial abscesses (Mair and Sherlock, 2011), while Rhodococcus equi is more typical in foals but should be considered (Giguère and Prescott, 1997). Rarely, atypical mycobacteriosis presents as chronic, treatment-resistant abscesses.

Recommended diagnostics include physical examination, cytology via Fine Needle Aspiration (FNA), bacterial culture and sensitivity testing, ultrasonography to assess structure and depth, and biopsy if neoplasia or granulomatous disease is suspected (Aiello *et al*., 2020).

MATERIALS AND METHODS

Treatment

a) Sedation/Anesthesia: Detomidine (0.5 ml IV) and Butorphanol (1 ml IV) were administered to induce sedation and analgesia. Detomidine, an α-2 adrenergic agonist, provides sedation, muscle relaxation, and analgesia (Hubbell *et al*, 2025). Butorphanol, a mixed opioid agonist–antagonist, exerts analgesic effects primarily through kappa receptor activity (Commiskey *et al*., 2005). The effects of the detomidine-butorphanol combination injection include penile relaxation, muscle weakness, body relaxation, and the patient lowering its head. Subsequently, fluid therapy was administered using the constant rate infusion (CRI) method with the same agents i.e. detomidine and butorphanol at the exact dosage, diluted in 500 ml of Ringer's lactate solution. Anesthesia was maintained using a constant rate infusion (CRI) of the same agents diluted in 500 ml of Ringer's lactate solution. CRI is beneficial for providing sustained anesthesia and pain management or administering drugs with a short half-life (Creedon *et al*., 2012; Silverstein and Hopper, 2009).

b) Surgical preparation: The horse was fasted for 8-12 hours before anesthesia to reduce intra-abdominal pressure

and prevent hypoventilation (Coumbe, 2012). Following anesthesia induction, the surgical site was clipped and sterilized with povidone-iodine to minimize contamination (Auer *et al*., 2019). Jugular IV catheter placement for fluid therapy and drug administration. Surgical team wore caps, masks, gowns, and sterile gloves to maintain asepsis.

c) Surgical approach: The procedure was performed with the horse in a standing position to reduce the risk of hypoxia associated with recumbent anesthesia (Bonomelli and Bonilla, 2023). Ventral incision made into the mass; caseous material drained. Drainage was achieved through a ventral incision in the softer portion of the abscess, followed by manual evacuation of purulent material. The cavity was subsequently irrigated with physiological saline until clean (Aiello *et al*., 2020). The wound was closed with simple interrupted sutures.

d) Post-operative care: Following surgical drainage and closure, the patient was treated with long-acting amoxicillin administered intramuscularly for seven days to provide broad-spectrum antimicrobial coverage. Analgesia and anti-inflammatory support were achieved with phenylbutazone injections for three days, ensuring adequate pain control and reduction of post-surgical inflammation (Wilson *et al*., 2006; Hendrickson and Baird, 2013; Auer *et al*., 2019). Topical therapy was applied directly around the sutures, consisting of chloramphenicol ointment for local antimicrobial effect, sodium diclofenac to reduce swelling and subcutaneous thickening, and sodium heparin to mitigate local thrombosis (Auer *et al*., 2019). Because chloramphenicol poses potential human health risks, appropriate personal protective equipment (PPE) was used during its application.

Outcome and follow-up

The treatment of a neck abscess in an 8-year-old stallion by the Veterinary Surgery and Radiology UGM team was successful. The right cervical region showed a well-defined, fluctuating swelling prior to surgery (Figure 2A) and the post-drainage evaluation confirmed complete evacuation of caseous material and collapse of the abscess cavity without excessive hemorrhage (Figure 2B). Parenteral antibiotic and phenylbutazone injections were repeated on day 3 post-surgery (D+3) after surgery (Figure 2C). On day 5 post-surgery (D+5), the skin sutures were checked and the site was re-dressed to ensure optimal closure. Treatment included the application of antibiotic ointment to the suture lines and the administration of an ointment containing diclofenac sodium, heparin sodium, and chloramphenicol around the surgical site to aid healing and reduce inflammation (Figure 2D). By day 7 (Figure 2E) and day 9 after surgery (Figure 2F), the healing process was progressing well. By day 14 post-surgery, the sutures were removed, as the wound had healed well (Figure 2G). The patient ultimately made a full recovery, with complete healing observed by day 39 post-surgery (Figure 2H). However, regular monitoring is essential to prevent recurrence of the abscess.

DISCUSSION

This case reinforces established principles of abscess management while highlighting practical considerations.

- Standing surgery with CRI anesthesia minimized the risks of hypoxia compared to recumbent anesthesia (Bonomelli and Bonilla, 2023).
- Multimodal therapy (systemic + topical) supported healing, though antimicrobial use without culture and sensitivity testing is a significant limitation (Wilson *et al*., 2006; Auer *et al*., 2019).
- Detailed recovery timeline provides guidance for clinicians on expected healing progression (Aiello *et al*., 2020).
- Diagnostic limitations are openly acknowledged, underscoring the need for culture and susceptibility testing in future cases.

Although single-case reports cannot establish new standards, they can provide valuable clinical insights. This case demonstrates that even routine abscess management requires careful diagnostic reasoning, ethical antimicrobial use, and structured follow-up. Cervical abscesses in an 8-year-old stallion can be managed successfully with standing surgery under CRI anesthesia and multimodal therapy. Complete recovery was achieved within 39 days. The case underscores both the practical value of this approach and the limitations of incomplete diagnostics, emphasizing the need for culture and susceptibility testing in future cases.

The therapy administered on the day of surgery involved an injection of long-acting amoxicillin. In surgical cases, antibiotics are provided to reduce the risk of infection. Animals undergoing surgical procedures have incision sites are considered open wounds (unless the surgery is laparoscopic). Open wounds serve as a breeding ground for bacteria, and infections can be hazardous while the body is recovering from surgery (Caneschi *et al*., 2023). Therefore, antibiotics are often prescribed. A repeat injection of long-acting amoxicillin was given on the third day. Based on its antimicrobial activity profile, antibiotics used for postoperative care can be formulated to have a long-acting effect (Hardefeldt *et al*., 2019). Long-acting antibiotics are both bactericidal and bacteriostatic, with a longer plasma retention time, typically around 48 hours (Hardefeldt *et al*., 2019).

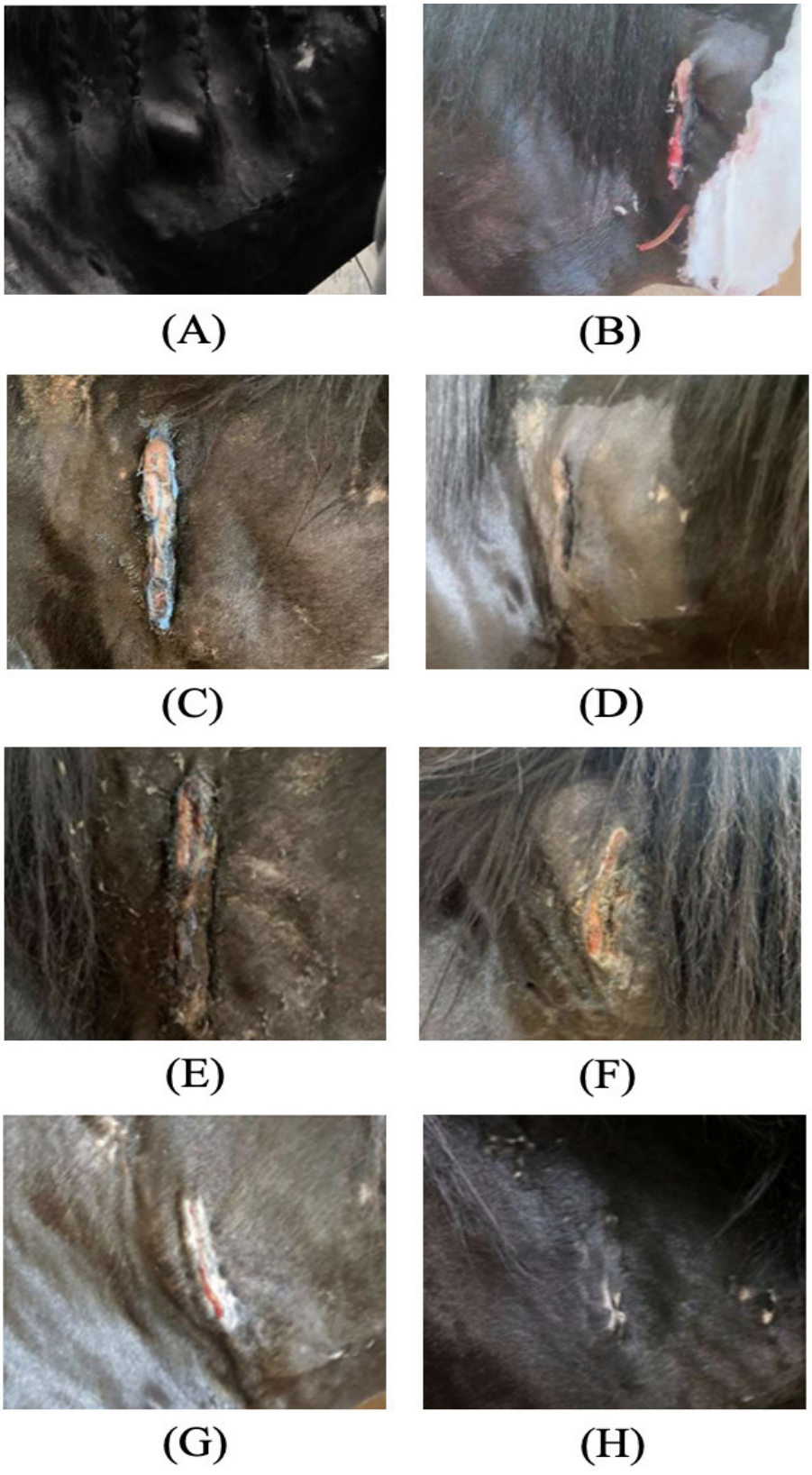

Figure 2: Clinical progression and healing of the surgical site. (A) Pre-operative view showing a well-defined, fluctuant swelling in the right cervical region. (B) Intra-operative view immediately after surgical drainage and before skin suturing, demonstrating complete evacuation of caseous material. (C) Day 3 post-surgery (D+3), showing the surgical site after repeated parenteral antibiotic and phenylbutazone injections. (D) Day 5 post-surgery (D+5), with sutures in place; topical therapy with antibiotic and compounded ointments was initiated. (E) Day 7 post-surgery (D+7), the healing process is progressing well. (F) Day 9 post-surgery (D+9), continued granulation and healing. (G) Day 14 post-surgery (D+14), sutures were removed as the wound had granulated well. (H) Day 39 post-surgery (D+39), complete recovery with full closure of the surgical site.

On the third day, phenylbutazone injections were also administered. Phenylbutazone belongs to the class of non-steroidal anti-inflammatory drugs (NSAIDs) widely used in equine medicine to treat conditions associated with pain and inflammation, such as musculoskeletal disorders and soft or hard tissue injuries (Meucci *et al*., 2015). This drug has analgesic, antipyretic, and anti-inflammatory properties and works by inhibiting the cyclooxygenase enzyme pathway, thereby preventing the release of inflammatory mediators, including prostaglandins, prostacyclins, and thromboxanes.

On the fourth day, topical medications, including a commercial chloramphenicol antibiotic ointment and a prescribed compounded ointment, were administered. Topical administration avoids first-pass hepatic metabolism, enhancing bioavailability (Levine *et al*., 2009).

The prescribed compounded ointment consisted of a mixture of sodium diclofenac, heparin sodium, and chloramphenicol ointments. Sodium diclofenac is a commonly prescribed NSAID for managing pain and inflammation (Levine *et al*., 2009). Heparin sodium possesses antithrombotic and anti-inflammatory properties, making it useful for preventing venous thromboembolism. Topically, heparin is used to treat local symptoms of peripheral vascular disorders (Cabre *et al*., 2023).

Chloramphenicol ointment is commonly used on sutured wounds as a prophylactic measure against infection. Chloramphenicol ointment, an antimicrobial agent, is used for wound treatment because it is a broad-spectrum antibiotic effective against aerobic, anaerobic, gram-positive, and gram-negative organisms. Research by Heal *et al*. indicates that topical chloramphenicol applied to sutured wounds after minor surgical procedures reduces the incidence of infection (Shen *et al*., 2018). In this case, antibiotic ointment was applied directly to the sutured wound, while the compounded ointment was applied around the sutures. Topical medication was administered once daily for up to 14 days.

CONCLUSION

Management of the abscess in the 8-year-old stallion was successfully achieved with a surgical procedure to excise and drain the caseous mass. The surgical procedure began with pre-operative stages, including administration of detomidine-butorphanol for sedation, followed by the surgical drainage and closure of the incision with sutures. Post-operative management involved administering long-acting amoxicillin and monitoring the surgical site. By the 39th day post-operation, the abscess had fully healed, as shown by the complete closure of the surgical site.

ACKNOWLEDGEMENTS

The authors would like to thank the owner of the mixed breed stallion for allowing the publication of this case. Informed consent was received from the owner for use of clinical data and images for medical treatment and publication purposes.

NOVELTY STATEMENT

This study is the first reported case of successful standing surgical management of an equine cervical abscess under Constant Rate Infusion (CRI) anesthesia, reducing the risk of hypoxia compared with recumbent anesthesia and achieving complete recovery within 39 days despite cytology revealing necrotic cellular debris consistent with liquefaction necrosis typical of suppurative bacterial processes.

AUTHOR'S CONTRIBUTION

AP, DA, DAF, DAG, APR, and MER conceived and planned the medical treatment of an abscess on 8-year-old mixed breed stallion's neck. AP, DA, DAF, DAG, APR, and MER contributed to the design and implementation of the treatment, to the analysis of the results. AP, DA, DAF, DAG, APR, MER, and IPN contributed to the writing and editing, english proof-reading of the manuscript. AP, IPN, NM and DAF contributed to the final version of the manuscript. DA supervised the project.

Generative AI and AI assisted technology statement

The authors declare that no generative AI and AI assisted technology was used in the creation of this manuscript.

Conflict of interest

The authors have declared no conflict of interest.

REFERENCES

Aiello SE, Moses MA, Allen DG (2020). The Merck veterinary manual (11th ed.). Merck and Co, Inc.

Auer JA, Stick JA, Kümmerle JM, Prange T (2019). Equine surgery (5th ed.). Elsevier.

Bonomelli N, Bonilla AG (2023). Standing surgery among equine board certified surgeons: Survey regarding current use and trends. Equine Veterinary Journal.,55(6):1045-1057. https://doi.org/10.1111/evj.13920

Boyle AG, Timoney JF, Newton JR, Hines MT, Waller AS, Buchanan BR (2018). Streptococcus equi infections in horses: Guidelines for treatment, control, and prevention of strangles—Revised consensus statement. J. Vet. Intern. Med., 32(2):633-647. https://doi.org/10.1111/jvim.15043

Cabre F, Camacho JA, Rodríguez-Garcés CA, Breier DV, Ballarin M (2023). Review of Topical Sodium Heparin 1000 IU/g Gel in Symptomatic Uncomplicated Superficial

Thrombophlebitis.Cureus.,15(10):e47418.https://doi.org/10.7759/cureus.47418

Caneschi W, Câmara ACL, Moreira AS, Silva RCA, Soares JFM, Alvarenga IC (2023). Antimicrobial use and resistance in equine medicine: A global perspective. Animals, 13(3): 501.

Commiskey S, Fan LK, Ho I, Rockhold R (2005). Butorphanol: Effects of a prototypical agonist-antagonist analgesic on κ-opioid receptors. J. Pharmacol. Sci., 98: 109-116. https://doi.org/10.1254/jphs.CRJ05001X

Coumbe K (2012). Equine veterinary nursing manual (2nd ed.). Wiley-Blackwell.

Giguère S, Prescott JF (1997). Clinical manifestations, diagnosis, treatment, and prevention of Rhodococcus equi infections in foals. Vet Microbiol., 56:313-334. https://doi.org/10.1016/S0378-1135(97)00099-0

Creedon JM, Davis H, Davis J (2012). Advanced monitoring and procedures for small animal emergency and critical care. Wiley-Blackwell.

Green R (2014). Infectious diseases of livestock (3rd ed.). Oxford University Press.

Hardefeldt LY, Crabb HK, Bailey KE, Gilkerson JR, Billman-Jacobe, Browning GH (2019). Antimicrobial dosing for common equine drugs: a content review and practical advice for veterinarians in Australia. Austral. Vet. J., 97(9): 372-372 https://doi.org/10.1111/avj.12791.

Hendrickson DA, Baird AN (2013). Turner and mcilwraith's techniques in large animal surgery (4th ed.). Wiley-Blackwell.

Hubbell JAE, Brandly J, Muir III WW, Page J, Hopster K (2025). Review Article: Alpha-2-adrenoreceptor agonists as analgesic drugs in equinemedicine. Equine Vet Educ., 00: 1–9. https://doi.org/10.1111/eve.70028

Latimer KS. (2011). Duncan & Prasse's Veterinary Laboratory Medicine: Clinical Pathology (5th ed.). Wiley-Blackwell; . ISBN: 978-0-813-82014-9.

Levine DG, Epstein KL, Neelis DA, Ross MW (2009). Effect of topical application of 1% diclofenac sodium liposomal cream on inflammation in healthy horses undergoing intravenous regional limb perfusion with amikacin sulfate. AVJR., 70(10):1323-1325.

Mair TS, Sherlock CE (2011). Surgical drainage and post operative lavage of large abdominal abscesses in six mature horses. Equine Vet. J., 43 (Suppl. 39): 123-127. https://doi.org/10.1111/j.2042-3306.2011.00405.x

Meucci V, Luci G, Vanni M, Sgorbini M, Intorre L (2015). Withdrawal Time of Phenylbutazone Administered to Healthy Horses. Journal of Equine Veterinary Science., 35(11-12):901-906. https://doi.org/10.1016/j.jevs.2015.08.012

Orsini JA, Divers TJ (2014). Equine emergencies: Treatment and procedures. 4th ed. Saunders, Ithaca.

Orsini JA, Elce YA, Kraus B (2016). Management of Severely Infected Wounds. In: Equine Wound Management, 3rd ed. John Wiley & Sons, Inc., 449-475. https://doi.org/10.1002/9781118999219.ch19

Recchi L, Cribb N, Côté N, Dubois M, Koenig J, Valverde A, Monteith G (2024). Retrospective study of perioperative antimicrobial use in horses undergoing elective laparoscopy at a single institution. Can. J. Vet. Res., 88(1): 24-29.

Shen AY, Haddad EJ, Hunter-Smith DJ, Rozen WM (2018). Efficacy and adverse effects of topical chloramphenicol ointment use for surgical wounds: a systematic review: Topical chloramphenicol ointment use. ANZ Journal of Surgery., 88(12):1243-1246. https://doi.org/10.1111/ans.14465

Silverstein DC, Hopper K (2009). Small animal critical care medicine (1st ed.). Elsevier Saunders.

Southwood LL (2013). Practical guide to equine colic. 1st ed. John Wiley and Sons Inc, New York, pp. 339–342. https://doi.org/10.1002/9781118704783.ch1

Spier SJ, Azevedo V (2017). Corynebacterium pseudotuberculosis infection in horses: Increasing frequency and spread to new regions of North America. Equine Vet Educ.,29(8):436-439. https://doi.org/10.1111/eve.12589

Timoney JF. (2015) Strangles. In: Robinson's Current Therapy in Equine Medicine. 8th ed. Elsevier:173-177. https://doi.org/10.1016/C2011-0-05761-7

Valentine BA (1995). Equine Melanocytic Tumors: A Retrospective Study of 53 Horses (1988 to 1991). Journal of Veterinary Internal Medicine., 9(5):291-297. https://doi.org/10.1111/j.1939-1676.1995.tb01087.x

Walton RM, Cowell RL, Valenciano AC (2021). Equine hematology, cytology, and clinical chemistry. John Wiley and Sons, Hoboken. NJ. https://doi.org/10.1002/9781119500186

Wilson JH, Bayly WM, Sellon DC (2006). Equine internal medicine (3rd ed.). Saunders.