

CASE REPORT OPEN ACCESS

Other

Spontaneous Cloacal Prolapse in a Farm Ostrich (*Struthio camelus*): Case Management and Literature Review

Mohammad Raguib Munif^{1,2} 

¹Department of Surgery and Obstetrics, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh, Bangladesh | ²Biomedical Science, School of Science and Technology, University of New England, Armidale, New South Wales, Australia

Correspondence: Mohammad Raguib Munif (md.raguibmunif@gmail.com)

Received: 16 September 2024 | **Revised:** 2 December 2024 | **Accepted:** 30 December 2024

Funding: No funding was obtained for this study.

Keywords: balanced minerals | cloacal prolapse | hypocalcaemia | ostrich | purse-string suture

ABSTRACT

Captive ratites, including the ostrich (*Struthio camelus*), are susceptible to various gastrointestinal conditions. However, spontaneous cloacal prolapse is a relatively less frequent diagnosis. This report details the clinical management of cloacal prolapse in an ostrich, including a brief literature review. A 10-week-old female ostrich reared in a semi-intensive farming system was presented with a reddish protruded mass through the vent opening, along with a history of lethargy, poor appetite, and lack of droppings. Clinical examinations demonstrated a complete cloacal prolapse without any devitalization or necrosis of the involved tissues. Laboratory examinations revealed no parasitic or bacterial enteritis. Hematobiochemical analysis indicated low serum calcium. The case was surgically treated, which involved repositioning the prolapsed cloaca to its anatomical location and subsequent vent narrowing with a purse-string suture while ensuring adequate space for the passage of droppings. Postoperatively, supportive medications and formulated feed with vitamin–mineral supplements, including calcium, were provided. The ostrich experienced an uneventful recovery. The purse-string suture encompassing the vent was removed on the eighth postoperative day. No complications were reported 9 weeks after surgery. In brief, mineral deficiencies, particularly reduced serum calcium levels, may be associated with cloacal prolapse in young ostriches. Prompt surgical intervention and a balanced nutritional regimen with calcium supplements can effectively facilitate recovery.

1 | Introduction

The avian cloaca serves as the common terminal chamber of three anatomical systems: the digestive (gastrointestinal), renal (urinary), and genital (reproductive) systems (Greenacre 2011). Additionally, it plays a crucial role in the absorption of fluids and electrolytes (Macwhirter 2009). The cloaca comprises three distinct sections (Figure 1A), partially separated by transverse mucosal folds (Warui, Erlwanger, and Skadhauge 2009). The cranial section is known as the coprodeum, which receives faeces from the rectum; the middle section is called the urodeum,

into which the ureters and reproductive system discharge; and the caudal section is termed the proctodeum. The proctodeum features the bursa of Fabricius on its dorsal surface and the genital eminence on its floor and collects all waste products before excretion (Macwhirter 2009). The caudal cloacal orifice, which serves as the external opening for the expulsion of droppings/excrement, is referred to as the vent (Warui, Erlwanger, and Skadhauge 2009). Interestingly, the ostrich is the only bird capable of urinating independently of defecation because its urodeum and coprodeum are separated by a muscular sphincter (Stewart 1994).

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2025 The Author(s). *Veterinary Medicine and Science* published by John Wiley & Sons Ltd.

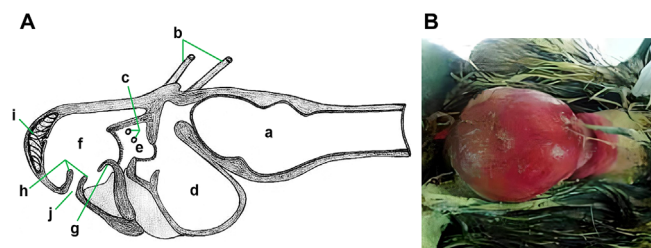


FIGURE 1 | Cloacal anatomy and cloacal prolapse in ostrich. (A) schematic presentation of the ostrich cloaca and its adjacent anatomical structures (image generated with Adobe Illustrator CC version 22.0): (a) rectum, (b) ureters, (c) ureteral orifices, (d) coprodeum, (e) urodeum, (f) proctodeum, (g) genital eminence, (h) cloacal sphincters, (i) cloacal bursa, and (j) external orifice of cloaca (vent). (B) Prolapsed cloaca in an ostrich.

A cloacal prolapse or eversion is a clinical condition characterized by the protrusion of the cloaca, intestine(s), or uterus/oviduct through the vent opening (Lightfoot 2020). In captive ratites, including ostriches (*Struthio camelus*) and emus (*Dromaius novaehollandiae*), various gastrointestinal conditions, such as impaction of the proventriculus, intussusception, foreign body ingestion, enteritis, and endoparasitism, are common; however, cases of prolapsed cloaca are occasionally observed (Bello et al. 2017; Bezuidenhout, Penrith, and Burger 1993; Lemarchand et al. 1997; Tully 2021a). Apart from ratites, this condition has been reported in different poultry species (chickens, ducks, and quails), as well as in psittacine birds (cockatoos, grey parrots, lovebirds, budgerigars, etc.) and raptors (Qasim et al. 2012; Ray et al. 2013; Dutton, Forbes, and Carrasco 2016; Singh et al. 2017; Lightfoot 2020; Cassanego et al. 2021).

Cloacal prolapse is considered multifactorial. The underlying factors include various cloacal conditions (i.e., cloacitis, cloacal polyps/granulomas/neoplasms, and cloacoliths); proventricular impaction; constipation or tenesmus; insufficient hydration; enteritis associated with *Cryptosporidium*, *Campylobacter*-like organisms, and *Candida*; histomoniasis; reproductive issues (e.g., oviduct impaction and egg bound syndrome); excess body weight; ascites or coelomic masses causing compression; genetic or idiopathic atony; age-related hormonal alterations; behavioural influences leading to excessive rubbing of cloaca or vent (masturbation/self-pleasuring); vices like vent pecking; poor nutrition resulting in immunosuppression; introduction of imbalanced fibrous diet; and external factors, such as excessive light stimulation (Bezuidenhout, Penrith, and Burger 1993; Lemarchand et al. 1997; Iordanidis et al. 2003; Rosen 2012; Dutton, Forbes, and Carrasco 2016; Lamglait 2018).

Clinical findings often reveal a swollen, haemorrhagic, semi-spherical, or cylindrical mass protruding through the vent (Akinrinmade and Eyarefe 2011; Qasim et al. 2012). Diagnostics are required to determine the cause of the prolapse. Radiography, computed tomography, and cloacoscopy can provide more detailed insights (Beaufrère, Nevarez, and Tully 2010; Jaber et al. 2023). Prognosis mainly relies on the timely and accurate diagnosis and management of the prolapsed tissues.

This report presents a comprehensive account of complete cloacal prolapse in a farm-raised ostrich, a comparatively less common

presentation in growing ostriches. It also outlines the diagnosis, management, and clinical outcome, while contextualizing these aspects within relevant literature. The findings provide evidence-based insights that inform practical guidelines for addressing similar conditions in ostrich husbandry.

2 | Case Presentation

2.1 | Case History

A 10-week-old female ostrich chick (*Struthio camelus*), weighing 15.5 kg, was referred to a local veterinary teaching hospital. The presenting complaint was the protrusion of a reddish mass through the vent opening, which had been noted over the past 17 h. Preliminarily, the mass was identified as a prolapsed cloaca. At the time of presentation, it was observed to be hanging ventrally and was matted with droppings on its caudoventral aspect. The case history included a week-long hyporexia, lethargy, straining during defecation, and periodic sternal recumbency prior to the observation of any prolapsed tissue. The ostrich was raised on a farm with a semi-intensive system akin to a paddock and was supplied with fresh vegetables and formulated poultry pellets (composition and manufacturer unknown). At the time of reporting, no other ostriches in the same flock had similar or different types of abnormalities.

2.2 | Investigations

Physical examinations indicated that the ostrich was alert, presenting a moderate body condition score (2.5 of 5) with good plumage. The prolapsed cloaca was slightly haemorrhagic and swollen, characterized by an oval shape without any signs of congestion, laceration, devitalization, or tissue necrosis (Figure 1B). The prolapsed segment measured 4.5 cm in diameter and 6.8 cm in length. No granulomas, space-occupying lesions, or foreign bodies were identified within the prolapsed segment, except for accumulated droppings including faeces, urates, and urine. In addition, moderate pain responses were noted, and self-excretion of droppings was absent.

The prolapsed cloaca itself did not display any overt signs of exudative enteritis. Moreover, laboratory examinations, including faecal wet mount smears and culture media-based observations, did not indicate any parasitic and bacterial enteritis. Diagnostic imaging, specifically abdominal (coelomic) radiography, and speculum examination revealed no additional abnormalities.

This case was clinically differentiated from intussusception by using a lubricated glass thermometer. The thermometer was used to determine whether it could pass through the space between the prolapsed segment and the vent wall. The inability to insert the thermometer deeply into the space confirmed the clinical diagnosis of cloacal prolapse. Given that the prolapse encompassed the entire cloaca, including all its constituent parts and layers, the case was designated as a complete cloacal prolapse.

The primary clinical parameters indicated no significant variations (Table 1). The hematobiochemical analyses revealed a decrease in the serum calcium level, with magnesium at the lower

TABLE 1 | Clinical and hematobiochemical parameters of the ostrich at the outset.

Parameters	Tested values	Reference intervals ^a
Clinical		
Temperature (°C)	38.8	37.5–42
HR (beat/min)	121	43–180
RR (breath/min)	42	6–12 ^b , 40–65 ^c
SpO ₂ (%)	100	98–100
Hematobiochemical		
TEC (× 10 ¹² /L)	1.8	1.7–2.2
TLC (× 10 ⁹ /L)	15.2	10–24
Hb (g/dL)	12.6	11–15.6
PCV (%)	44	40–55
ALT (U/L)	11.2	7.5–16.3
AST (U/L)	337	252–430
Na (mmol/L)	148.4	143–164
K (mmol/L)	5.1	4.50–5.90
Cl (mmol/L)	98.5	87–107
Ca (mmol/L)	1.9	2.5–4.6
Mg (mmol/L)	0.7	0.7–0.9
P (mmol/L)	1.5	1.3–2.2
CK (U/L)	3490	1655–4246
UN (mmol/L)	0.6	0.5–0.8
TP (g/dL)	4.8	4–5.4
Glc (mg/dL)	199.3	187–247

Abbreviation: ALT, alanine aminotransferase; AST, aspartate aminotransferase; Ca, calcium; CK, creatine kinase; Cl, chloride; Glc, glucose; Hb, haemoglobin concentration; HR, heart rate; K, potassium; Mg, magnesium; Na, sodium; P, phosphorous; PCV, packed cell volume; RR, respiratory rate; SpO₂, saturation of peripheral oxygen; TEC, total erythrocyte count; TLC, total leukocyte count; TP, total protein; UN, urea nitrogen.

^aReference intervals adapted from relevant sources (Bonadiman et al. 2009; Fielder 2022; Schrader, Fuhrer, and Petow 2009).

^bResting.

^cHyperpnea.

limit; however, all other assessed hematobiochemical parameters remained within normal ranges (Table 1). No hormonal assays were done.

2.3 | Surgical Treatment

With the owner's informed consent, a decision was made to proceed with surgical correction. At first, the ostrich was withheld from feed and water for 2 h and then stabilized by administering 70 mL of lactated Ringer's solution over 30 min via the left ulnar vein. Next, the ostrich was physically restrained by covering its eyes with a cloth hood over its head. Following the application of the hood, the ostrich's head was positioned slightly below the level of its body to avoid the risk of kicking. For chemical restraint and sedation, xylazine hydrochloride (HCl) at 2.5 mg/kg

body weight (BW) (Xylaxin, Indian Immunologicals Ltd.) was administered intramuscularly (IM) into the pectoral muscle. Approximately 15 min after the xylazine injection, ketamine HCl at 6 mg/kg BW (Ketalar, Popular Pharmaceuticals Ltd.) was administered IM for the induction of anaesthesia. The anaesthetic induction phase was marked as the interval between the administration of the drugs and the onset of loss of postural control. The surgical plane of anaesthesia was considered the period when the bird remained fully immobilized and desensitized, exhibiting no reflex responses. Under this condition, the prolapsed cloaca was irrigated carefully with normal saline (0.9% NaCl) solution. This removed the dried droppings and other debris that had superficially adhered to the prolapsed tissue and surrounding downy feathers near the vent. The droppings deposited into the cloaca were meticulously evacuated, and the passage between the vent and terminal intestine was also flushed with normal saline solution, ensuring no impaction. Then, the feathers surrounding the vent opening were gently plucked, and the area was aseptically prepared.

Prior to repositioning the prolapsed cloaca to its anatomical location, it was treated topically with a sterile hypertonic sugar solution (50% dextrose). This treatment was provided to reduce the swelling (oedema) of the cloacal tissue and restore the cloaca to its normal size. Immediately after the swelling had subsided and the cloacal size had returned to normal, careful irrigation was performed using normal saline and 0.3% (v/v) chlorhexidine gluconate solution to remove any residual sugar from the tissues and to prevent contamination. Then, the prolapsed cloaca was returned to its normal location, and the caudal end of the cloacal mucosa was just aligned to the level of the vent-lip epithelial margins. Subsequently, a temporary purse-string suture using 2-0 polypropylene (PROLENE*, Ethicon, Johnson & Johnson MedTech) was applied percutaneously through the circumferential margin of the dorsal and ventral vent lips, extending internally to include the subcutis and a portion of the caudal cloacal mucosa to ensure better stability. This suture aided in reducing the diameter of the vent orifice, facilitating the retention of the cloaca in its proper position and preventing recurrent prolapse. During suture placement, a 20-mL plastic injection syringe was maintained into the vent orifice to avoid excessive narrowing of the orifice, thereby ensuring an adequate passage for dropping discharge, and to guide the cloacal direction from inward to outward orientation (Figure 2A–C). After suture placement, the syringe was carefully withdrawn, which allowed the vent lips to align in close proximity, resulting in a near-normal appearance (Figure 2D). Again, normal saline flushing was performed through the vent opening. Until complete recovery from anaesthesia, the ostrich was kept hooded in a safe enclosure. As soon as the ostrich had restored sensitivity and regained locomotory stability, the protective eye-covering hood was removed. The ostrich excreted droppings ~12 h after complete recovery from anaesthesia and subsequently resumed feeding.

2.4 | Postoperative Care and Follow-Up

Following surgery, the ostrich was housed in a padded stall for 2 weeks to monitor and care closely. The routine postoperative medications included ciprofloxacin at 30 mg/kg BW (Ciprocine-Vet, Square Pharmaceuticals Ltd.) orally twice a day for 7 days,

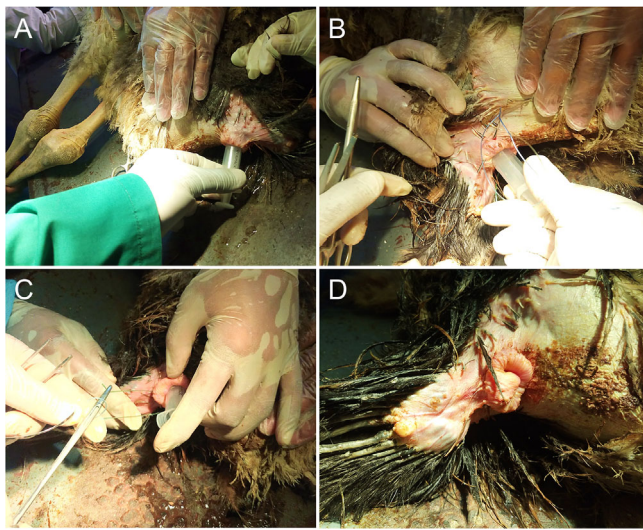


FIGURE 2 | Process of vent narrowing with purse-string suture after repositioning the cloaca: (A) placement of a plastic syringe to the vent orifice, (B) percutaneous insertion of suture needle for the application of purse-string suture, (C) the suture encompassing the circumferential margin of vent-lips, and (D) complete vent narrowing after ensuring a passage for excretion of droppings.

meloxicam orally at 1 mg/kg BW (Melcam, Square Pharmaceuticals Ltd.) once a day for 5 days, 10% calcium gluconate slow IV at 50 mg/kg BW (Calcium-Jayson, Jayson Pharmaceuticals Ltd.) once a day for 2 days, and oral electrolyte and mineral supplement (mixture of NaHCO_3 , NaCl , KCl , dextrose, vitamin A, ZnSO_4 , CaCl_2 , and MgSO_4) at 1 g/L of drinking water (Electromin powder, Square Pharmaceuticals Ltd.) daily for 5 days. Fly repellent was used regularly in the stall. An analgesic containing 2% lidocaine HCl (Jasocaine jelly, Jayson Pharmaceuticals Ltd.) was applied topically to the vent-cloacal region twice a day for 3 days. After the third postoperative day, an oral vitamin B complex and C supplement at 2 g/L of drinking water (Becevit-Vet powder, Square Pharmaceuticals Ltd.) was provided daily for the next 5 days. Additionally, a nutritionally balanced diet, that is, ostrich grower/maintenance pellet, was recommended, which comprises crude protein 17%, crude fat 3%, crude fibre 10%, crude ash 9%, moisture 11%, sodium 0.35%, lysine 0.76%, methionine 0.34%, calcium 1.35%, and phosphorous 0.9%. Furthermore, it was advised that the ostrich be routinely exposed to balanced sunlight to support the natural synthesis of vitamin D_3 . On the eighth postoperative day, the purse-string suture encircling the vent was removed, indicating satisfactory healing of the surgical site (Figure 3A). Follow-up consultations were carried out weekly via mobile phone until 9 weeks post-surgery. Throughout these sessions, the owner reported no complications, and the ostrich appeared to be normal (Figure 3B). A repeat serum calcium analysis indicated a value (3.38 mmol/L) within the normal range (2.5–4.6 mmol/L). No further hematobiochemical tests were conducted due to the owner's constraints.

3 | Discussion

Like other poultry species, the ostrich has emerged as a promising candidate for breeding and farming globally, with significant



FIGURE 3 | Surgical site healing and postoperative status of the ostrich: (A) healing observed at the surgical site 8 days post-surgery, following removal of suture material and (B) the ostrich appeared in good condition 9 weeks post-surgery.

adoption in many Asian countries (Abbas et al. 2018; Okasha, Attia, and Mahrose 2019). Cloacal prolapse is a clinical condition observed in a limited number of captive ostriches. According to a study cited by Adhikari, Pratima, and Kedar (2022), cloacal prolapse was noted in ~2.7% of ostrich chicks within the first 3 months of age. Furthermore, Iordanidis et al. (2003) documented a few instances of cloacal prolapse in ostrich chicks within the same flock and farm, occurring at 20 days and 2 months of age, respectively. Previous literature also demonstrates that cloacal prolapse is more prevalent among male juvenile ostriches up to 6 months of age (Bezuidenhout, Penrith, and Burger 1993). The present study reports a case of cloacal prolapse in a 10-week-old female ostrich, highlighting the occurrence of this condition in a less commonly affected sex at a comparable age. In addition, a similar case has been documented previously in a young female emu (Akinrinmade and Eyarefe 2011). In terms of other types of prolapses, there have been reports of recurrent prolapse of the phallus in an adult male ostrich and in a mature male greater rhea (Kimura et al. 2022; Lima et al. 2023).

The present case was uncomplicated, as the prolapsed cloaca did not reveal any notable lesions during the clinical and laboratory examinations, apart from a transient haemorrhagic appearance and tissue oedema. This might be attributed to the overall health of the ostrich chick and the prompt reporting of the case within 24 h of its onset. The clinical signs observed in this case align with those documented in relevant studies (Akinrinmade and Eyarefe 2011; Qasim et al. 2012; Adhikari, Pratima, and Kedar 2022; Lima et al. 2023). The clinical procedure that ruled out the possibility of intussusception and confirmed the diagnosis of cloacal prolapse is consistent with the findings reported in other investigations (Akinrinmade and Eyarefe 2011; Munif and Alam 2021).

Of the multiple aforementioned factors influencing prolapse in avian species, enteritis (i.e., infection of the cloacal and bursal tissues) with *Cryptosporidium* has been reported as a reasonable cause of prolapse of the phallus and cloaca in ostrich chicks (Penrith et al. 1994). The aetiology of the present case was considered to be of nutritional origin. Normally in a semi-intensive farming system, birds scavenge within their enclosure during the daytime, searching for various feed ingredients, as part of their behaviour. They hunt for insects as a protein source, pick up stones, grit, or pebbles for essential minerals (which also serve as gastroliths for grinding of feed materials in ventriculus), and consume leafy greens, vegetables, and seeds for vitamins, in addition to the daily feed provided by the farmers (Miao, Glatz, and Ru 2003). Due to the nature of bird-raring in a semi-intensive system, there is a potential risk of overcrowding and competition for feed, which may result in deficiencies of specific vitamins and minerals. This hypothesis is also applicable to the ostrich in the present case study, given the lack of a reliable record of stocking density. Stocking density is important and specific for ostriches according to age, flock size, housing system, and environment (Primary Industries Standing Committee: Model Code of Practice for the Welfare of Animals 2003; Dangerous Wild Animals Order 2004; Murrells 2017). High stocking densities result in overcrowding and feed competition, which can adversely impact the behaviour, growth, and performance of ostriches in a flock (Lambrechts et al. 2004).

The assessment of the formulated poultry pellet provided to the ostrich up to the development of the cloacal prolapse proved challenging due to its unknown nutritional composition. Nevertheless, the hematobiochemical analysis revealing a lower level of serum calcium suggested a possible correlation between this mineral deficiency and the onset of the cloacal prolapse in the ostrich. Calcium is vital for maintaining the tonicity and proper functioning of gastrointestinal smooth muscles (Hafen and Burns 2023), facilitating both contraction and relaxation which are essential for the peristaltic activity of the gastrointestinal tract and the propulsion of ingested feed materials. Moreover, calcium is integral to various functions of the nervous system, including neurotransmitter release and intracellular signal transduction (Burgoyne and Haynes 2012). In the present case report, it is posited that calcium deficiency may have contributed to the weakening of the intestinal muscles and cloacal sphincters in the ostrich, resulting in poor contraction and delayed retraction. The resultant muscular strain, in turn, likely forced the cloaca outward to remain protruded for an extended period, ultimately leading to a spontaneous and complete cloacal prolapse. However, this area warrants further investigation, especially

regarding the role of calcium in the digestive physiology of ostriches.

In addition to calcium deficiency as a potential cause of muscular weakness, there are additional conjectures regarding calcium imbalance that may contribute to cloacal prolapse in ostriches. Nutritional secondary hyperparathyroidism may develop in young birds due to an imbalanced calcium-to-phosphorus ratio in their feed (Hoppe 2021). Birds primarily subsisting on pelletized feed may experience this condition, which can further be aggravated by vitamin D₃ deficiency, leading to skeletal defects, impaired growth and productivity, and an increased risk of cloacal prolapse (Hoppe 2021). Considering the importance of feed nutrients in maintaining the muscular tonicity of the cloaca, the author highlights that an age-appropriate ratite-specific diet should be considered for ostriches and other ratites, rather than traditional poultry or avian feed. Ostriches provided with supplementary ratite feed demonstrate improved and faster growth compared to those relying solely on grazing (Strydom et al. 2009).

Furthermore, age-related alterations in reproductive hormones could be another plausible factor influencing oviductal or cloacal prolapse. Sex hormones, particularly oestradiol (oestrogen) and testosterone, are essential for the proper conditioning of the oviduct, its ligaments, pubic bones, and the cloaca (Burmester 1948). Low plasma oestradiol levels are considered to be associated with prolapse. Reduced plasma oestradiol leads to a decrease in prostaglandin synthetase activity, which in turn lowers the prostaglandin levels (Lera 2022). Prostaglandin plays a critical role in the smooth muscle activity of the oviduct and intestine, and its reduction may predispose birds to oviductal or cloacal prolapse. Given that sex hormonal regulation can be influenced by light stimulation, bird management programs should maintain proper lighting duration for photo stimulation to ensure effective hormonal regulation. However, the effects of sex hormones on the onset of cloacal prolapse in ostriches remain unclear to date, emphasizing the necessity of future research.

An important aspect of ostrich breeding is the meticulous selection of pairs or groups based on physical attributes, temperament, and genetic diversity, as these factors are critical for producing healthy, viable offspring, thereby ensuring a resilient flock (Breeding Ostriches: Essential Tips for Success 2024). In the present case, the ancestral history and breeding records of the ostrich remained unclear. Inbreeding may result in an increased susceptibility to diseases and genetic anomalies, including prolapse; therefore, crossbreeding is generally recommended (Cloete 2014). Additionally, optimal breeding environments and nutritional management are essential for captive breeding programs (Shanawany et al. 1999).

In the present case, the pre-surgical fasting was conducted for a short period, as prolonged feed deprivation in young ostriches can significantly predispose them to hypoglycaemia, owing to their higher metabolic rates (Cornick-Seahorn 1996). Although not regarded as the gold standard, a combination of xylazine and ketamine was used in the present case due to the unavailability of a suitable inhalation anaesthetic setup. Previous literature indicates that injectable anaesthetics, including xylazine and ketamine, can be used in ostriches without complications (Ciboto et al. 2006; Al-Sobayil et al. 2009; Heard 2016; Tully 2021b). In

addition, combinations of midazolam, butorphanol, ketamine, and isoflurane have been reported for anaesthesia in ostriches (Bailey et al. 2001). Based on the type and severity of prolapse, bird size, and duration/convenience of the method, local analgesia with 2% lidocaine HCl or general anaesthesia, with or without anaesthetic maintenance (isoflurane), is considered (Adhikari, Pratima, and Kedar 2022; Lima et al. 2023). Inhalation anaesthesia is generally preferred in avian species due to their highly efficient respiratory systems; this minimizes the handling time and stress (Lawton 2016). Halogenated ethers, including isoflurane, sevoflurane, or desflurane, administered via an appropriate mask, can provide quick anaesthetic induction and smooth recovery from general anaesthesia (Granone et al. 2012) while reducing the risk of cardiopulmonary arrest.

The surgical restoration technique employed in the present case aligns with a procedure described elsewhere (Akinrinmade and Eyarefe 2011). Mild or incomplete cloacal prolapse can be managed simply by repositioning the cloaca through the vent (Stewart 1994). However, in cases of chronic recurrent prolapse, complex surgical procedures are required to treat the prolapse. These include cloacoplasty, percutaneous cloacopexy, coeliotomy with circumcostal cloacopexy, coprodeum cloacopexy, or a combination thereof (Zaheer et al. 2020). Since the present case was neither mild nor chronic, the traditional method described herein was effective in restoring the cloaca to its proper position. During case management, the removal of accumulated droppings from the prolapsed cloaca relieved internal pressure, leading to an auto-reduction in its overall size. Additionally, using a hypertonic sugar solution promoted osmosis, drawing excess water from the cloacal tissue, which reduced the tissue oedema. Surgical intervention is worth consideration for the management of cloacal prolapse. Untreated cases may result in further complications (e.g., dehydration, traumatization/devitalization of tissues, and ascending infections), which can potentially lead to impaired dropping discharge, impaction, intussusception, cloacal rent formation, haemorrhage, necrosis, and death.

In the postoperative phase, supportive medications and vitamin–mineral supplements were administered routinely to facilitate recovery. This regimen comprised the antibiotic (ciprofloxacin) and anti-inflammatory (meloxicam) agents, along with electrolytes and vitamin–mineral supplements including calcium, to mitigate the risk of secondary infections and inflammation, maintain muscular tonicity, and enhance immunity to promote healing. Fly repellent was used to prevent myiasis. The topical analgesic jelly was applied to the vent-cloacal area to alleviate pain and discomfort. In addition, a nutritionally balanced feed was prescribed to maintain the proper nutrition of the ostrich and to prevent the recurrence of prolapse. No overt complications were reported by the owner 9 weeks postoperatively, and the second serum calcium analysis showed a normal calcium level; this indicates the effectiveness of the procedures employed in the case management.

4 | Conclusions

This study describes a case of spontaneous cloacal prolapse (complete) in an ostrich chick, which was considered to be

associated with hypocalcaemia. The prompt case reporting, accurate diagnosis, and subsequent surgical management, combined with postoperative therapies, vitamin–mineral supplementation including calcium, and nutritional correction, resulted in a successful outcome. Future investigations should be prioritized to determine the effects of imbalances in dietary minerals and hormonal alterations on the incidence of cloacal prolapse in ostriches.

Author Contributions

Mohammad Raguib Munif: conceptualization, visualization, methodology, investigation, writing—original draft, review, and editing. The author has finalized the manuscript.

Acknowledgements

The author extends gratitude to the staff at the Veterinary Teaching Hospital of Bangladesh Agricultural University for their support during the case management.

Ethics Statement

This report describes a case managed as part of the regular clinical workload at the Veterinary Teaching Hospital of Bangladesh Agricultural University. Since it followed the hospital's standard protocols, no separate ethical approval for animal care and welfare was required. The hospital director approved the publication, and consent for participation was obtained.

Conflicts of Interest

The author declares no conflicts of interest.

Data Availability Statement

All the data and supporting files are presented in this report.

Peer Review

The peer review history for this article is available at <https://publons.com/publon/10.1002/vms3.70217>.

References

- Abbas, G., O. Zahid, M. S. A. Khan, M. Sajid, and H. Saeed. 2018. "Future of Ostrich Farming in Pakistan." *Advances in Zoology and Botany* 6, no. 2: 55–65. <https://dx.doi.org/10.13189/azb.2018.060202>.
- Adhikari, B. P., B. Pratima, and K. Kedar. 2022. "Surgical Management of Rectal Prolapse in Ostrich Chicks (*Struthio camelus*)." *International Journal of Veterinary Science and Research* 8, no. 3: 110–112. <https://dx.doi.org/10.17352/ijvsr.000122>.
- Akinrinmade, J. F., and O. D. Eyarefe. 2011. "Rectal Prolapse in an Emu (*Dromaius novaehollandiae*): A Case Report." *Nigerian Veterinary Journal* 32, no. 3: 249–251. <https://www.ajol.info/index.php/nvj/article/view/85227>.
- Al-Sobayil, F. A., A. F. Ahmed, N. A. Al-Wabel, et al. 2009. "The Use of Xylazine, Ketamine, and Isoflurane for Induction and Maintenance of Anesthesia in Ostriches (*Struthio camelus*)." *Journal of Avian Medicine and Surgery* 23, no. 2: 101–107. <https://dx.doi.org/10.1647/2008-034.1>.
- Bailey, J. E., D. Heard, J. Schumacher, A. Bennett, and L. S. Pablo. 2001. "Midazolam/Butorphanol/Ketamine and the Clinically Effective Dose of Isoflurane Anesthesia of Ostriches (*Struthio camelus*)." *Veterinary Anaesthesia and Analgesia* 28, no. 2: 109. <https://doi.org/10.1111/j.1467-2987.2001.40-28.x>.

- Beaufrère, H., J. Nevarez, and T. N. Tully Jr. 2010. "Cloacolith in a Blue-Fronted Amazon Parrot (*Amazona aestiva*)."
Journal of Avian Medicine and Surgery 24, no. 2: 142–145. <https://dx.doi.org/10.1647/2009-013.1>.
- Bello, A., S. Frei, M. Peters, A. Balkema-Buschmann, W. Baumgärtner, and P. Wohlsein. 2017. "Spontaneous Diseases in Captive Ratites (*Struthioniformes*) in Northwestern Germany: A Retrospective Study." *PLoS One* 12, no. 4: e0173873. <https://dx.doi.org/10.1371/journal.pone.0173873>.
- Bezuidenhout, A. J., M. L. Penrith, and W. P. Burger. 1993. "Prolapse of the Phallus and Cloaca in the Ostrich (*Struthio camelus*)."
Journal of the South African Veterinary Association 64, no. 4: 156–158. <https://pubmed.ncbi.nlm.nih.gov/8176694>. Accessed 15 March 2024.
- Bonadiman, S. F., G. C. Stratievsky, J. A. Machado, A. P. Albernaz, G. R. Rabelo, and R. A. Damatta. 2009. "Leukocyte Ultrastructure, Hematological and Serum Biochemical Profiles of Ostriches (*Struthio camelus*)."
Poultry Science 88, no. 11: 2298–2306. <https://dx.doi.org/10.3382/ps.2009-00176>.
- Breeding Ostriches: Essential Tips for Success. 2024. "Superior Ostrich (Online)." <https://superiorostrich.com/blogs/ostrich-education/breeding-ostriches-essential-tips-for-success>.
- Burgoyne, R. D., and L. P. Haynes. 2012. "Understanding the Physiological Roles of the Neuronal Calcium Sensor Proteins." *Molecular Brain* 5, no. 1: 2. <https://doi.org/10.1186/1756-6606-5-2>.
- Burmester, B. R. 1948. "The Influence of Sex Hormones Upon the Occurrence of Prolapse in Chickens." *Poultry Science* 27, no. 6: 745–750. <https://doi.org/10.3382/ps.0270745>.
- Cassanogo, G. R., P. I. Ferreira, C. C. Rosa, F. S. Flores, and L. F. D. Corrêa. 2021. "Cloacoplasty in a 40-Day-Old Monk Parakeet With Cloacal Prolapse." *Acta Scientiae Veterinariae* 49, no. (Suppl)1: 729. <https://doi.org/10.22456/1679-9216.116658>.
- Ciboto, R., S. Cortopassi, M. Lopes, R. Carvalho, and C. Baitelo. 2006. "Comparison of Chemical Restraint Techniques in ostrich (*Struthio camelus*)."
Brazilian Journal of Poultry Science 8, no. 2: 119–123. <https://doi.org/10.1590/S1516-635X2006000200008>.
- Cloete, S. W. P. 2014. *Breeding of Ostriches. Ostrich Manual, Western Cape Department of Agriculture, Private Bag XI. Elsenburg*. https://www.elsenburg.com/wp-content/uploads/2022/02/Ostrich-Manual_English-ed_-2014_content.pdf.
- Cornick-Seahorn, J. L. 1996. "Anesthesiology of Ratites." In *Ratite Management, Medicine and Surgery*, 79–94. Florida: Krieger Publishing Co.
- Dangerous Wild Animals (Northern Ireland) Order. 2004. *Guidance on the Keeping of Ostrich and Emus*. United Kingdom: Environment and Heritage Service. https://www.doc-developpement-durable.org/file/Elevages/autruches&Emeus/ostrich_emu_leaflet.pdf.
- Dutton, T. A. G., N. A. Forbes, and D. C. Carrasco. 2016. "Cloacal Prolapse in Raptors: Review of 16 Cases." *Journal of Avian Medicine and Surgery* 30, no. 2: 133–140. <https://doi.org/10.1647/2015-091>.
- Fielder, S. E. 2022. *Serum Biochemical Analysis Reference Ranges*. MSD veterinary manual (online). <https://www.msddvetmanual.com/special-subjects/reference-guides/serum-biochemical-analysis-reference-ranges>.
- Granone, T. D., O. N. de Francisco, M. B. Killos, J. E. Quandt, R. E. Mandsager, and L. F. Graham. 2012. "Comparison of Three Different Inhalant Anesthetic Agents (Isoflurane, Sevoflurane, Desflurane) in Red-Tailed Hawks (*Buteo jamaicensis*)."
Veterinary Anaesthesia and Analgesia 39, no. 1: 29–37. <https://doi.org/10.1111/j.1467-2995.2011.00668.x>.
- Greenacre, C. 2011. "Avian and Exotic Animal Dermatology." In *Small Animal Dermatology*, edited by K. A. Hnilica, 3rd ed., 490–549. Philadelphia: WB Saunders, Elsevier. <https://doi.org/10.1016/B978-1-4160-5663-8.00015-X>.
- Hafen, B. B., and B. Burns. 2023. "Physiology, Smooth muscle." In *StatPearls [Internet]*. Treasure Island (FL): StatPearls Publishing. <https://www.ncbi.nlm.nih.gov/books/NBK526125>.
- Heard, D. 2016. "Anesthesia." In *Current Therapy in Avian Medicine and Surgery*, edited by B. L. Speer, 1st ed., 601–615. St Louis: WB Saunders. <https://doi.org/10.1016/B978-1-4557-4671-2.00028-8>.
- Hoppes, S. M. 2021. "Nutritional Diseases of Pet Birds." MSD veterinary manual (online). <https://www.msddvetmanual.com/exotic-and-laboratory-animals/pet-birds/nutritional-diseases-of-pet-birds>.
- Iordanidis, P. I., M. G. Papazahariadou, G. K. Georgiades, N. G. Papaioannou, and S. E. Frydas. 2003. "Cloacal Prolapse in Ostrich Chicks With Histomoniosis." *The Veterinary Record* 153, no. 14: 434–435. <https://doi.org/10.1136/vr.153.14.434>.
- Jaber, J. R., M. Fumero-Hernández, J. A. Corbera, et al. 2023. "Cross-Sectional Anatomy and Computed Tomography of the Coelomic Cavity in Juvenile Atlantic Puffins (Aves, *Alcidae*, *Fratercula arctica*)."
Animals 13, no. 18: 2933. <https://doi.org/10.3390/ani13182933>.
- Kimura, T. H., G. A. Rocha, H. J. da Rocha Neto, M. F. Cavalcante Filho, M. C. Rodrigues, and L. S. Catenacci. 2022. "Prolapse and Amputation of Phallus in a Greater Rhea (*Rhea americana*) Kept in Captivity: Case Report." *Research Society and Development* 11, no. 3: e41411326015. <https://rsdjournal.org/index.php/rsd/article/view/26015>.
- Lambrechts, H., D. Swart, S. W. P. Cloete, J. P. C. Greyling, and S. J. van Schalkwyk. 2004. "The Influence of Stocking Rate and Male:Female Ratio on the Production of Breeding Ostriches (*Struthio camelus* spp.) Under Commercial Farming Conditions." *South African Journal of Animal Science* 34, no. 2: 87–96. <https://www.sasas.co.za/journals/the-influence-of-stocking-rate-and-malefemale-ratio-on-the-production-of-breeding-ostriches-struthio-camelus-spp-under-comme>.
- Lamglait, B. 2018. "Retrospective Study of Mortality in Captive Struthioniformes in a French Zoo (1974–2015)." *Journal of Zoo and Wildlife Medicine* 49, no. 4: 967–976. <https://doi.org/10.1638/2015-0210.1>.
- Lawton, M. P. C. 2016. "Anesthesia and Analgesia: General anesthesia." In *Avian Medicine*, edited by J. Samour, 3rd ed., pp 179–191. St Louis: Mosby, Elsevier. <https://doi.org/10.1016/B978-0-7234-3832-8.00007-9>.
- Lemarchand, T. X., T. N. Tully Jr., S. M. Shane, and D. E. Duncan. 1997. "Intracellular *Campylobacter*-Like Organisms Associated With Rectal Prolapse and Proliferative Enteroproctitis in Emus (*Dromaius novaehollandiae*)."
Veterinary Pathology 34, no. 2: 152–156. <https://doi.org/10.1177/030098589703400209>.
- Lera, R. 2022. "Prolapse in Laying Hens (Control and Prevention of Conditions That Provoke Prolapse in Laying Hens)." Hendrix Genetics laying hens (online). <https://layinghens.hendrix-genetics.com/en/articles/prolapse-in-laying-hens>.
- Lightfoot, T. L. 2020. "Reproductive Disorders of Pet Birds." MSD veterinary manual (online). <https://www.msddvetmanual.com/bird-owners/disorders-and-diseases-of-birds/reproductive-disorders-of-pet-birds>.
- Lima, H. C., A. C. T. Alves, M. R. C. Mendes, A. Moresco, and S. C. Rahal. 2023. "Partial Amputation of a Nonreducing Prolapsed Phallus in an Ostrich (*Struthio camelus*)."
Journal of Avian Medicine and Surgery 37, no. 2: 188–192. <https://doi.org/10.1647/20-00088>.
- Macwhirter, P. 2009. "Basic Anatomy, Physiology and nutrition." In *Handbook of Avian Medicine*, edited by T. N. Tully, G. M. Dorrestein, A. K. Jones, and J. E. Cooper, 2nd ed., 25–55. Philadelphia: WB Saunders. <https://doi.org/10.1016/B978-0-7020-2874-8.00002-X>.
- Miao, Z. H., P. C. Glatz, and Y. J. Ru. 2003. "The Nutrition Requirements and Foraging Behaviour of Ostriches." *Asian-Australasian Journal of Animal Sciences* 16, no. 5: 773–788. <https://doi.org/10.5713/ajas.2003.773>.
- Munif, M. R., and M. R. Alam. 2021. "Surgical Management of Ileocolic Intussusception in Two Dogs." *Bangladesh Journal of Veterinary Medicine* 19, no. 2: 151–157. <https://doi.org/10.33109/bjvmdj2021crl>.
- Murrells, E. 2017. "Husbandry Guidelines for Ostrich *Struthio camelus* (Aves: Struthionidae)." Australian Society of Zoo Keeping.

<https://aszk.org.au/wp-content/uploads/2020/06/Ostrich-Struthio-camelus-Murrells-E.-2017.pdf>.

Penrith, M. L., A. J. Bezuidenhout, W. P. Burger, and J. F. Putterill. 1994. "Evidence for Cryptosporidial Infection as a Cause of Prolapse of the Phallus and Cloaca in Ostrich Chicks (*Struthio camelus*)."
Onderstepoort Journal of Veterinary Research 61, no. 4: 283–289. <https://pubmed.ncbi.nlm.nih.gov/7501359>. Accessed 1 December 2024.

Primary Industries Standing Committee: Model Code of Practice for the Welfare of Animals. 2003. *Farming of Ostriches (SCARM Report 84)*. Collingwood, Victoria, Australia: CSIRO Publishing. <https://www.publish.csiro.au/ebook/download/pdf/3526>.

Okasha, M., A. Attia, and K. Mahrose. 2019. "Ostrich Breeding in China." *Zagazig Journal of Agricultural Research* 46, no. 5: 1583–1591. <https://doi.org/10.21608/zjar.2019.48177>.

Qasim, A. M., U. Musa, P. E. Emennaa, et al. 2012. "Cloacal Prolapse in a 9-Week Old Japanese Quail (*Coturnix coturnix Japonica*)—A Case Report." *Vom Journal of Veterinary Science* 9: 93–95. https://www.researchgate.net/publication/242347793_CLOACAL_PROPLAPSE_IN_A_9-WEEK_OLD_JAPANESE_QUAIL_Coturnix_coturnix_Japonica_-_A_CASE_REPORT.

Ray, S., P. S. Swain, R. U. Amin, et al. 2013. "Prolapse in Laying Hens: Its Pathophysiology and Management: A Review." *Indian Journal of Animal Production and Management* 29, no. 3–4: 17–24. https://www.researchgate.net/publication/342067734_PROLAPSE_IN_LAYING_HENS_ITS_PATHOPHYSIOLOGY_AND_MANAGEMENT_A_REVIEW.

Rosen, L. B. 2012. "Avian Reproductive Disorders." *Journal of Exotic Pet Medicine* 21, no. 2: 124–131. <https://doi.org/10.1053/j.jepm.2012.02.013>.

Schrader, L., K. Fuhrer, and S. Petow. 2009. "Body Temperature of Ostriches (*Struthio camelus*) Kept in an Open Stable During Winter Time in Germany." *Journal of Thermal Biology* 34, no. 7: 366–371. <https://doi.org/10.1016/j.jtherbio.2009.07.001>.

Shanawany, M. M., and J. Dingle. 1999. *Ostrich Production Systems*. Rome: Food and Agriculture Organization of the United Nations. <https://www.fao.org/4/x2370e/x2370e.pdf>.

Singh, L. K., W. Pipelu, G. K. Mishra, et al. 2017. "Management of Egg Bound and Oviductal Prolapse in Duck." *International Journal of Current Microbiology and Applied Sciences* 6, no. 11: 3972–3974. <https://doi.org/10.20546/ijcmas.2017.611.464>.

Stewart, J. 1994. *Avian Medicine: Principles and Application*. Lake Worth: Wingers Publishing. <https://www.harrisonsbirdfoods.com/wp-content/uploads/2024/03/1284-1328-Ch48-Ratites.pdf>.

Strydom, M., T. S. Brand, B. B. Aucamp, and J. M. van Heerden. 2009. "Effect of Supplementary Feed and Stocking Rate on the Production of Ostriches Grazing Irrigated Lucerne Pasture." *South African Journal of Animal Science* 39, no. Suppl 1: 173–178. <https://doi.org/10.4314/sajas.v39i1.61317>.

Tully, T. N. Jr. 2021a. "Digestive System Disorders of Ratites." MSD veterinary manual (online). <https://www.msdevetmanual.com/exotic-and-laboratory-animals/ratites/digestive-system-disorders-of-ratites>.

Tully, T. N., Jr. 2021b. "Management of Ratites." MSD veterinary manual (online). <https://www.msdevetmanual.com/exotic-and-laboratory-animals/ratites/management-of-ratites>. Accessed 29 July 2024.

Warui, C. N., K. H. Erlwanger, and E. Skadhauge. 2009. "Gross Anatomical and Histomorphological Observations on the Terminal Rectum and the Cloaca in the Ostrich *Struthio camelus*." *Ostrich* 80, no. 3: 185–191. <https://doi.org/10.2989/OSTRICH.2009.80.3.9.972>.

Zaheer, O., H. Beaufrère, S. Jajou, and S. Gardhouse. 2020. "Asymmetrical Cloacoplasty for the Treatment of Chronic Cloacal Prolapse in Psittaciformes: A Case Series." *Journal of Avian Medicine and Surgery* 34, no. 2: 172–180. <https://doi.org/10.1647/1082-6742-34.2.172>.