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CASE REPORT

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First report on surgical management of an intersex Goat (*Capra hircus*) with urogenital anomalies in Bangladesh

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ABSTRACT

This case study documents the first surgical management aimed at alleviating urinary discomfort and improving the quality of life of an intersex condition in a one-month-old goat (*Capra hircus*) in Bangladesh. The case was presented at the Professor Mosleh Uddin Ahmed Chowdhury Veterinary Teaching Hospital, Sylhet Agricultural University. The kid exhibited clinical signs of diarrhea, anorexia, and unusual bleating during urination. Physical examination revealed the presence of both male and female reproductive structures, including two conspicuous testicles and a vaginal tract. Diagnosis was confirmed through external evaluation. Surgical intervention included gonadectomy and urogenital reconstruction under general anesthesia. The procedure, conducted via an open surgical technique, successfully removed the non-functional gonadal tissue while ensuring proper closure and sealing of skin/muscle over the empty scrotum. Post-operatively, the animal received appropriate antibiotic and anti-inflammatory treatments, resulting in an uneventful recovery characterized by resolved dysuria and a normal urine stream. This case underscores the importance of early detection and intervention in managing reproductive anomalies in goats, and highlights the need for further genetic studies to better understand the etiology of intersex conditions.

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Introduction

Intersex (Disorder/Difference of Sex Development; DSD) Condition is characterized by the presence of both male and female reproductive organs, which is rare in goats and poses significant challenges in terms of fertility, behavior, and herd management [1–3]. Although the intersex condition is more frequently seen in fish and invertebrates as a natural reproductive strategy, it is uncommon in mammals, especially tame animals like goats (*Capra hircus*), and is sometimes linked to intersex disorders or genetic abnormalities [4]. Goat intersex condition is a rare but important reproductive abnormality. Because of a recessive gene connected to diseases of sexual differentiation [1], it is frequently linked to genetic and chromosomal anomalies, especially in polled (hornless) breeds. Goats that are affected may exhibit behavioral problems, sterility, and ambiguous external genitalia [5]. Intersexual goats often exhibit mixed sexual behaviors, such as male-pattern libido and behaviors despite having female external genitalia. These behaviors can influence social dynamics within herds, potentially affecting the social hierarchy and interactions among goats [6]. This case study highlights the value of veterinary intervention in enhancing the quality of life for

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afflicted animals by documenting a surgical management aimed at alleviating urinary discomfort and improving quality of life in a young goat with an intersex condition. Polled intersex syndrome, a genetic condition linked to the polled (hornless) feature in goats, is typically associated with an intersex condition [1]. The disorder is inherited in a complicated way, and because of a deletion on chromosome 1 that impacts sex differentiation genes, the lack of horns is frequently linked to intersex development. Goats that are hermaphrodites may display different levels of reproductive organ development, from ambiguous genitalia to the presence of both testicular and ovarian tissue (ovotestis) [7]. Because hermaphrodite goats are usually infertile and incapable of aiding in herd reproduction, their presence presents serious problems for breeders and farmers. Effective breeding management and genetic counseling in goat farming depend on an understanding of the physiological and genetic mechanisms behind this illness. Therefore, surgical intervention was considered not only to correct the anatomical abnormality but also to address significant animal welfare concerns [8], as urinary difficulties can lead to pain, recurrent infections, and poor growth, while hormone-driven behavioral issues may increase stress for both the animal and herd [9].

Diagnostic confirmation of intersex conditions in field settings is often limited due to the unavailability of advanced tools such as physical examination, ultrasonography, hormonal assays, and cytogenetic analysis [10]. As a result, diagnosis typically relies on external anatomical assessment, including history. On December 21, 2023, a baby goat (kid) exhibiting symptoms of diarrhea was brought to the Professor Mosleh Uddin Ahmed Chowdhury (PMAC) Veterinary Teaching Hospital, Sylhet Agricultural University. Following physical condition monitoring and diagnosis, the patient underwent surgical management and continued to be monitored till they recovered. The efficacy of the surgery and therapy in this case, as well as the goat's speedy recovery, make it remarkable and can serve as a standard strategy for managing this disease in the future.

Case History and Clinical Presentation

Details of the patient

At PMAC Veterinary Teaching Hospital, a 1-month-old Jamunapari, horned goat (kid) weighing 5 kg was presented with a medical history of diarrhea, anorexia, and unusual bleat upon urination. The farm goat was raised on a farm in Jahanpur, Majortila, Sylhet, which has a total of four goats. There is no other goats on the farm that showed similar abnormalities, and the owner reported no prior history of intersex cases within the herd.

Clinical signs

Following a period of relaxation, the goat's vital signs were taken upon arrival, and any outward symptoms were examined physically. On physical examination, the kid displayed two conspicuous testicles within the scrotum along with a well-formed vulva and vaginal opening. Urination was observed to occur exclusively through the vulvar/vaginal opening, with no functional urethral opening identified on the penis. Thus, the external genitalia consisted of both male (testes, scrotum) and female (vulva, vaginal tract) structures, confirming ambiguous genitalia.

Diagnosis

The veterinarian at the PMAC Veterinary Teaching Hospital made the diagnosis through phenotypic and descriptive only after conducting a thorough physical examination (Fig. 1A). The kid presented with two conspicuous testicles within the scrotum together with a well-formed vulva and vaginal opening. Urination was observed to occur through the vulvar/vaginal opening (Fig. 1B), with no patent urethral opening identified on the penis. Thus, the urinary tract was aligned with the vaginal outlet, while male gonadal tissue was also present. Furthermore, exposed two conspicuous testicles. To illustrate this anatomy more clearly, a schematic diagram is provided (Fig. 1C), showing the coexistence of testes, scrotum, penis (without urethral opening), and vulva/vaginal tract.

Surgical procedure

Following an external inspection, the kid was placed on the operating table and restrained in lateral recumbency for gonadectomy.

The surgical site was clipped and sterilized with tincture of iodine and ethanol. For general anesthesia, atropine sulphate (0.04 mg/kg, IM), xylazine hydrochloride (0.10 mg/kg, IM), and ketamine hydrochloride (11 mg/kg, IM) were administered.

An open approach was used to remove the testicles. An incision was made in the scrotum near the tip using the open castration technique, and the testes were externalized via the tunica vaginalis. Prior to extraction, the spermatic cords were tied

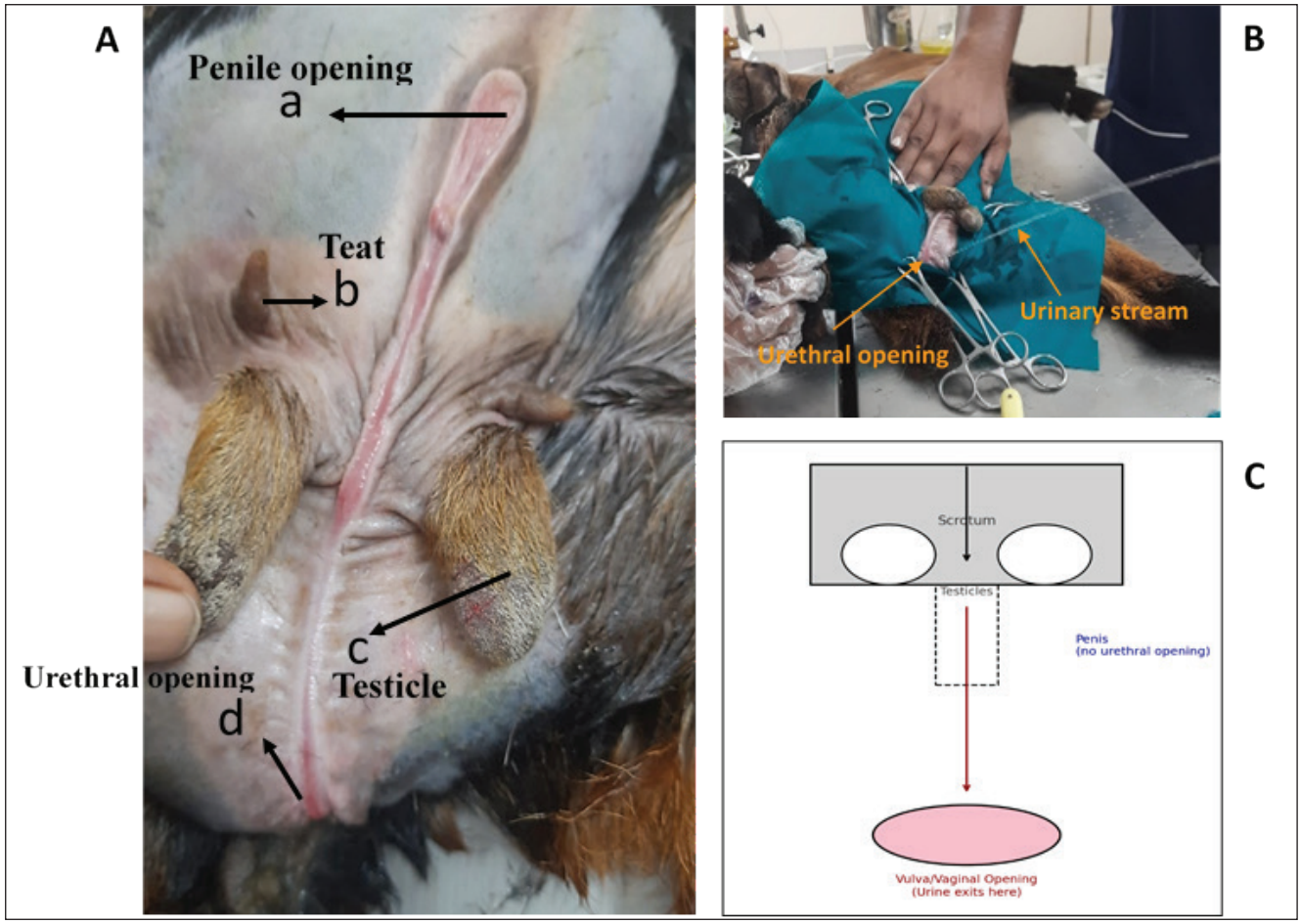

Figure 1 Intersex (DSD) case in a goat corresponds to (A) the external genitalia (testicles + vagina/urethra), (B) urination through the urethral opening, and (C) schematic representation showing the coexistence of male and female external reproductive structures. Two testicles are present within the scrotum (black arrow). A penis is visible but lacks a functional urethral opening (dashed outline). Urination occurred exclusively through the vulva/vaginal opening (red arrow), confirming the urinary tract alignment with the female outlet. This anatomical configuration demonstrates ambiguous genitalia with both male (testes, scrotum, and penis) and female (vulva, vaginal tract) structures.

with a double surgeon's knot, and hemostasis was verified. The accessory male structures, including the primitive penis or penile urethra, were carefully dissected and removed. The male urethra was sealed with absorbable sutures, securing it to the surrounding skin and abdominal muscle. The existing urethral openings near the vulvar vestibule were enlarged and sutured to create a suitable stoma. Any excess or malformed tissue resembling the penile shaft was excised to improve conformation. The vestibular and vulvar tissues were approximated using absorbable sutures to restore anatomical appearance. Finally, the abdominal and scrotal incisions were closed in layers with absorbable sutures (muscle and skin), and an antibiotic ointment was applied to the surgical wound (Fig. 2).

Following surgery, tolfenamic acid (2 mg/kg IM, single dose) was administered for analgesia and anti-inflammatory support. Antibiotic coverage was provided with a combination of streptomycin and penicillin, as available at the facility. Supportive therapy included oral anti-diarrheal, probiotics, and topical antiseptic ointment. The owner was instructed on wound dressing twice daily for seven days and informed of potential complications.

Post-operative outcome and follow up

The goat's recovery progressed smoothly (Fig. 3), demonstrating the effectiveness of the surgical intervention and post-operative care. Wound healing progressed without evidence of infection, and the surgical site closed completely within two weeks. At the 3-month follow-up, the animal remained in good health, and the owner reported improved comfort during urination. Specifically, the kid no longer exhibited bleating or straining

Figure 2 Post-operative closure of the scrotal incision following removal of the testicles. Skin and underlying tissues were sutured routinely after gonadectomy.

during urination, and a steady urine stream was consistently observed from the vulvar opening. Additionally, owner observations also suggested a reduction in aggressive mounting and dominance behaviors, but as no baseline quantification or hormonal assays were performed. Moreover, no complications (e.g., urethral stricture, recurrence of urinary signs) were observed during the 3-month follow-up.

Figure 3 Excised testicular tissue obtained after gonadectomy.

Discussion

Intersex conditions in goats pose unique challenges for clinical presentation and surgical management [5]. These cases typically involve the presence of both male and female reproductive structures, such as a uterus, vas deferens, and testicular tissues, indicating a complex interplay between male and female reproductive organs [11]. This condition in goats is a rare congenital disorder often associated with genetic mutations affecting sexual differentiation pathways [1,12]. The genetic basis of the intersex condition in goats has been well documented, with recent studies identifying mutations in the FOXL2 and SOX9 genes as key regulators of ovarian and testicular differentiation [1]. Hermaphrodite goats often exhibit ovotestes, ambiguous external genitalia, and reproductive dysfunction due to disrupted hormone signaling [7]. In many cases, this condition leads to infertility and behavioral abnormalities, posing significant challenges in livestock management [2,3]. In Bangladesh, cases of intersex individuals are rare, and this may be the first documented instance of surgical management for an intersex condition in a goat. Here, a 1-month-old crossbred, polled goat was presented at the PMAC Veterinary Teaching Hospital, Sylhet Agricultural University, with a history of diarrhea, anorexia, and discomfort during urination. Clinical examination revealed ambiguous genitalia, with the presence of a vagina and two conspicuous testicles. The external phenotype suggested intersex characteristics, prompting further diagnostic evaluation. Physical examination and observation of urination patterns confirmed the diagnosis. Surgical correction of affected animals enhances their quality of life, reducing stress and behavioral abnormalities linked to intersex conditions [13,14]. The surgical approach involved an open incision technique to remove the testicles, ligating the spermatic cord, and sealing the male genital tract with absorbable sutures. This method aligns with veterinary standards for correcting reproductive anomalies in livestock [7,14]. At the three-month follow-up, the animal showed complete recovery, with improved urination, reduced behavioral stress, and no signs of postoperative complications. This outcome demonstrates that surgical intervention is a viable

and effective strategy for managing intersex conditions in goats, as reported in similar veterinary cases [15,16].

Limitations

While surgical management can relieve urinary discomfort and behavioral abnormalities, it does not address the underlying genetic or chromosomal defects that cause intersex conditions. Furthermore, the lack of advanced diagnostic tools, such as karyotyping, hormonal assays, or histopathology, hampers accurate classification and prognosis, ultimately affecting long-term herd management. Future studies should incorporate cytogenetic and histopathological evaluations to achieve more accurate classification and enhance our understanding of the etiology of intersex conditions in goats.

Conclusion

This case study demonstrates the surgical management aimed at alleviating urinary discomfort and improving the quality of life of an intersex condition in a goat, highlighting the importance of early diagnosis and intervention. Surgical correction significantly improved urinary function and overall well-being, making it a feasible alternative for similar patients in veterinary practice. This case also offers practical guidance for veterinarians by showing how careful clinical observation and basic surgical intervention can effectively manage intersex conditions despite limited diagnostic resources. Further research is needed on the genetics to enhance breeding strategies and reduce the prevalence of intersex disorders in livestock.

Ethical approval

The surgical intervention was conducted at PMAC Veterinary Teaching Hospital, Sylhet Agricultural University, following the guidelines of the Sylhet Agricultural University Animal Ethics Committee, with owner consent obtained prior to treatment.

Conflicts of interest

None

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Author's contributions

Conception and design: M.B.U. and M.M.H. Case handling, Data acquisition and analysis: M.M.H., M.M.P., G.H., R.Z., M.J.N., M.K.I., M.M.H., and M.B.U. All authors contributed to the drafting, editing, and revision of the manuscript.

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