In September of 2022, a 2-year-old approximately 682-kg apparently healthy Angus bull was referred to Auburn University Large Animal Teaching Hospital due to a “mal-structured right testicle” found during a routine bull breeding soundness examination approximately a week prior to presentation. In the record from the referring veterinarian, the scrotal circumference was 39 centimeters (cm) and ejaculated sperm was classified as having very good motility. Using eosin/nigrosin-stained smears, 87% of the sperm examined was morphologically normal. The abnormal sperm morphology consisted of 7% head, 0% mid-piece, and 6% tail defects.

At presentation to Auburn University, it was determined that the bull was in good body condition. The scrotal sac was asymmetrical (Figure 1) and measured 39 cm in circumference. The scrotal sac contained both testicles, with no apparent external abnormalities. The testicles were grossly similar in size on visual examination. On palpation, the right testicle was determined to be mildly firmer than the left testicle. The left testicle and epididymis were within normal parameters. In contrast, the epididymal tail was unable to be identified at the right testicular pole. No pain was elicited on palpation of any scrotal structure.

Using an 8.5-MHz linear probe (ExaPad Mini; IMV Imaging), a trans-scrotal ultrasound examination was performed to assess the testicles and related structures. The left and right testicles had similar echogenicity and were approximately 5.4 and 5.8 cm in diameter on cross section, respectively (Figure 2), but the distance from the proximal to distal pole was too long to measure via ultrasound. The left and right heads of the epididymes were ultrasonographically identified and appeared to be structurally normal. The ultrasonographic visualization of...
the left epididymal tail as a distinct structure from the left testicle was consistent with its normal appearance (Figure 3). Upon trans-scrotal ultrasound, the right epididymal tail could not be identified.

Diagnosis

Based on the clinical findings and assessment of this bull, segmental aplasia of the mesonephric duct affecting the right epididymal tail was diagnosed. This diagnosis was based on the absence of a right epididymal tail upon palpation and ultrasonography. An alternative diagnosis could be a previous epididymectomy. Because this bull had been owned by the same producer since birth, this alternate diagnosis was ruled out. Additionally, epididymectomy is routinely performed bilaterally, which was inconsistent with this bull’s presentation.

Surgical removal for gross and histological examination of the testicle and epididymis would serve as an additional diagnostic tool to determine whether the aplasia extended to the ductus deferens. Post-mortem examination would be required to determine the complete extent to which
the mesonephric duct(s) were affected, as the part of the ductus deferens that traverses through the inguinal ring is not readily palpable externally or transrectally.

**Treatment and Outcome**

Due to the substantial impact of segmental aplasia of the epididymis on the bull’s reproductive efficiency and concerns regarding inheritance, it was recommended that the bull be removed from the breeding program. Therefore, examination of the internal reproductive organs, penis and prepuce, and ejaculate was not performed at the referral center.

Despite this recommendation, the owner made the decision to sell the bull to an individual interested in breeding a bull with this pedigree to a reduced number of females. It is important to note that this choice carries the risk of perpetuating the defect within the breeding population. The long-term effects on fertility and heritability of the condition in subsequent generations remain concerning. Subsequently to the owner’s decision to breed the bull, it was recommended that the bull only be used as a terminal sire. In other words, it was recommended that his offspring should not enter the breeding population. Follow-up information regarding the bull’s reproductive performance and breeding outcomes was not available due to sale of the bull.

**Discussion**

The presented case demonstrates the significance of a thorough clinical evaluation when diagnosing and treating congenital defects affecting the bull’s genital tract, specifically the scrotal contents. The epididymis is a vital anatomical organ as it stores sperm prior to ejaculation and is the final site of spermatoozoa maturation. Aplasia of any part of the tubular reproductive tract, such as the epididymis, ductus deferens, and/or ampulla, decreases reproductive efficiency by obstructing spermatoozoal outflow from the testicle. A potential sequela to spermatoozoal outflow obstruction is sperm granuloma formation; inflammation from sperm granulomas may affect the fertility of the contralateral testicles. In the normal bull, spermatozoal output is correlated to testicular circumference. This bull’s right epididymis was not competent to transport the sperm from the testicle to the ductus deferens for ejaculation. Therefore, this bull’s ejaculate could only contain up to 50% of the total possible sperm that could be produced, despite an acceptable scrotal circumference by Society for Theriogenology standards. For this to be confirmed, the bull would have to be collected via artificial vagina to obtain a physiologically normal ejaculate, as sperm concentration and volume of the ejaculate differs when collected by electroejaculation. The spermatoozoic output of this bull was not determined because semen collection and evaluation were not necessary to make breeding recommendations, electroejaculation is nonphysiologic, and collecting via artificial vagina requires a teaser animal and related biosecurity screening.

The mode of inheritance for this disorder in bovine species is not well defined. The analysis of the pedigree of 18 Simmental bulls that were affected with mesonephric duct aplasia revealed a pattern of inheritance that is consistent with autosomal recessive inheritance. Further studies would be beneficial to determine the genes involved in the studied pedigree, if the heritability extends to other pedigrees, and if there are other, nongenetic causes. Congenital anomalies occur secondary to defects during embryonic development. During normal embryologic development, the elongation and coiling of the mesonephric duct leads to epididymal development. The prevalence of congenital defects of the genital tract of bulls at slaughter is estimated to be 7%. The partial or complete absence of various mesonephric duct-derived structures is a characteristic of mesonephric duct segmental aplasia. This duct gives rise to the epididymis, ductus deferens, seminal vesicles, and ampullae. Aplastic conditions have been sporadically reported and can be unilateral or bilateral. Epididymal aplasia may lead to dilation of the ipsilateral head of the epididymis and testicle. Interestingly, dilation of the upstream tubular organs (eg, head of the epididymis) was not appreciated in this case. In 4 Shorthorn bulls, ampullae were found to be hypoplastic or absent. All 4 cases had concurrent hypoplastic seminal vesicles. In this case, the referring veterinarian stated the seminal vesicles were bilaterally normal on palpation. Although this bull was diagnosed with aplasia of the tail of the epididymis, postmortem examination would be required to determine the complete extent to which the mesonephric duct(s) were affected. In particular, the part of the ductus deferens that traverses through the inguinal ring is not readily palpable externally or transrectally. The presence of ipsilateral kidney agenesis is frequently observed in human males who have been clinically diagnosed with congenital unilateral absence of the ductus deferens. The investigation regarding the presence of kidneys in the aforementioned bull was not conducted.

To achieve reproductive efficiency, it is essential for a bull to ejaculate a sufficient number of sperm that consist of a considerable proportion of morphologically normal and progressively motile sperm. The absence of the right epididymal tail in this bull, confirmed by palpation and ultrasound examination, indicated segmental aplasia of the epididymis on the affected side. The lack of a patent tube from the testicle to the urethra would result in lower ejaculate total sperm number and very likely reduced reproductive efficiency. Limited evidence suggests the condition may be inherited, which is of additional concern for a breeding individual. In conclusion, careful diagnosis regarding the extent of the aplasia was not necessary to make the recommendation to remove this bull from the breeding population. Both
scrotal circumference and palpation of scrotal contents are critical components of a bull breeding soundness exam.

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