The reproductive rate in Camelidae has always been described as low. Many theories have been advanced to explain this low reproduction rate based on physiological characteristics of these species. Management may explain some of the reproductive failures but there is a substantial amount of infertility problems due to pathological processes in the male or the female genitalia. The objective of this chapter is to give the reader an account of the disorders known to occur in male Camelidae.

There are limited reports on the pathology of the male reproductive tract in Camelidae. Although the guidelines for breeding soundness examination of male camelids are in their infancy, there is evidence that thorough examination of males may help identify many infertility problems [1]. It is very important that all studs be examined for at least the following parameters: Testicular size, testicular consistency, ability to extend the penis and ability to ejaculate and produce viable semen. Scrotal circumference in adult camels should be about 34 cm during the breeding season. The testicles should be resilient and non-painful. Each part of the genital tract can be the site of congenital or acquired lesions that need to be identified [2].

Pathology of the Penis and Prepuce
Several abnormalities of the prepuce and penis have been described in the male camelid. The most frequent are preputial swelling, paraphymosis, phymosis and urolithiasis. Preputial swelling - preputial swelling is due to local inflammation caused by contact with chemical or physical irritant, parasitic (tick) infestation, trauma or by rupture of the urethra. It is also seen in acute cases of trypanosomiasis (Fig. 1) [3]. Swelling at this level can also be due to urethral rupture in the case of urolithiasis. Traumatic lesions of the prepuce are possible but occur rarely in well-managed herds. Adequate clinical management of all wounds in this area prevents the formation of adhesions and complication of the conditions. Surgical management of these cases requires phalectomy (penile amputation) [4].

Figure 1. Preputial swelling in a male dromedary. Preputial swelling can be due to systemic diseases such as trypanosomiasis with generalized edema, local inflammation or urolithiasis with urethral rupture.

Paraphymosis - paraphymosis which is the inability of the penis to return into the preputial sheath is rare in Camelidae. However, protrusion of a small part of the glans penis can be observed during sexual activity. Paraphymosis can lead to balanoposthitis with sometimes necrosis of the tip of the penis. Cleaning and replacement of the prolapsed tip of the penis into the prepuce may require sedation of the animal and application of a gel containing antibiotics and anti-inflammatory cream. Systemic antibiotics and anti-inflammatory treatment allow recovery within a week [5]. Surgical debridement, urethrostomy and amputation of the penis may be required if severe adhesions and gangrene develop.

Phymosis - inability to exteriorize the penis is normal in young llama and alpacas less that two years of age because of the presence of a preputial attachment. True phymosis in post-pubertal animal is largely due to a congenitally small preputial opening or to the presence of a lesions (abscesses, nodules) preventing exteriorisation of the penis during copulation.
Urolithiasis - urolithiasis has been reported in the male Camelidae. Most of these calculi occur at the level of the distal part of the urethra or at the level of the sigmoid flexure. The affected animal may show signs of abdominal discomfort, which become more and more frequent. At later stages of the condition, the animal becomes lethargic and anorexic. Health deterioration usually signals rupture of the bladder and presence of peritonitis. Catheterization is not possible and a urethrostomy should be performed. Prevention of urolithiasis is based on better nutritional management assuming that the etiopathogenesis of the condition is similar to that seen in sheep. In the dromedary, urethral obstruction is frequently associated with intra-urethral adhesions produced by chronic urethritis or calculi or by mechanical compression of the urethra with a tight strap in working camels [4,6]. Symptoms of uremia will develop if this condition is not relieved by urethrostomy within 3 days.

Pathology of the Scrotum and Testicles
Scrotal and testicular pathology in the camelid can be acquired (trauma, orchitis, hydrocele, degeneration) or congenital (hypoplasia, cryptorchidism).

Scrotal and testicular trauma - scrotal trauma due to bites from other males is the most common complaint in the male dromedary [3,7]. Prognosis for the reproductive life of the individual male depends on the extent of the injury. The trauma can be closed with no laceration of the scrotal skin and the only visible change is the increased size of the scrotal sac due to edema and/or testicular hemorrhage (Fig. 2). The condition should be differentiated from orchitis or hydrocele. Differential diagnosis is easily done by palpation and ultrasonographic examination of the testicles. Deep lacerations are frequently complicated by testicular hemorrhage and testicular hematoma (Fig. 3). Infection and development of schirrous cord require urgent surgical intervention (castration).

Figure 2. Testicular hematoma (right testicle) in the dromedary. This is usually caused by testicular trauma due to fighting with other males. The condition should be differentiated from orchitis, periorchitis or hydrocele.

Figure 3. Ultrasonogram of a testicular hematoma in the male dromedary. The arrow points to a very echogenic rete testis. Note strands of fibrin between the testicle and the scrotal wall.

Hydrocele and pyocele - hydrocele is the abnormal collection of various quantities of fluid between the visceral and the parietal layers of the tunica vaginalis. Hydrocele can be due to an inflammatory or non-inflammatory edema. The scrotal sacs become pendulous and increased in size. The scrotum is not painful and the testes are usually free within the scrotal sac and fluid can be isolated in one area. Confirmation is easily done by visualization of the fluid by ultrasonography of the scrotal sac (Fig. 4).

Figure 4. Ultrasonogram of a hydrocele in a male dromedary (P= normal testicular parenchyma, F= fluid, E= tail of the epididymis). Hydrocele is observed in some males during the hot season or as part of a systemic illness with generalized edema.

The nature of the fluid varies from anechoic to slightly echoic with presence of debris. Hydrocele may also be due to high ambient temperature and is a sign of heat stress. A case of hydrocele in a llama was attributed to the presence of an abscess at the level of the external inguinal ring. Long standing hydrocele affects the thermoregulation of the testicle and decreases the quality and quantity of semen. Pyocele or accumulation of pus in the tunica vaginalis, has been reported in the dromedary [6]. This condition is painful and the camel has a stiff gait. Orchitis - parasitic orchitis due to filaria infestation (Dipetalonema evansi) has been described in the dromedary [8]. Filarial infestation is most prevalent in wet areas and very rare in arid zones. Acute orchitis has also been reported win the dromedary [8]. Infectious orchitis can be treated with systemic antibiotics but in most cases this treatment is not effective. Castration of the affected testicle in unilaterally affected valuable males may increase the chance of salvaging the non-affected testicle and the reproductive life of the animal [9].
Testicular hypoplasia and degeneration - testicular degeneration is probably the most common cause of infertility in old males. The incidence of testicular degeneration is increased by age (> 20 years in the dromedary) and scrotal and testicular insults such as hematoma and hydrocele \[10,11\]. The degenerated testicles are smaller than normal and either soft or hard and fibrous. Partial or total testicular hypoplasia or atrophy has also been reported in the *Camelidae*. In the dromedary, the incidence of hypoplastic testicle has been estimated at 1.6% in slaughtered animals \[8,12\]. Histology of the testicular parenchyma shows small seminiferous tubules with absence of spermatogenesis. Testicular biopsy is a good tool for the diagnosis of this condition.

Cryptorchidism - cryptorchidism or failure of testicular descent into the scrotum, is a relatively rare condition in *Camelidae* but has been described in the dromedary \[8\], llama and alpaca \[13\]. Cryptorchism can be unilateral or bilateral and is suspected when inspection of the perineal region shows a flat or absent scrotum. The retained testicle can be abdominal or in a cranial position, near the sigmoid flexure. Cryptorchidism may be a hereditary defect so treatment to promote testicular descent should be discouraged. Differential diagnosis between cryptorchidism and castration can be made using an hCG or GnRH stimulation test.

Testicular neoplasia - testicular tumors are rarely reported in *Camelidae*. Seminomas seem to be the most commonly diagnosed tumors in dromedaries \[8\].

Pathology of the Epididymis
There are few reports of on pathology of the epididymis in *Camelidae*. Epididymal cysts have been reported in camels and are generally due to segmental aplasia \[14\]. Epididymitis with enlargement of the tail of the epididymis is seen in some cases of filaria infestation and can also be associated with orchitis \[3,15\]. In unilaterally affected animals, the best approach is hemicastration.

Other Pathological Problems Resulting in Infertility
Several other reproductive problems are reported in the *Camelidae* but their exact etiology is not known. Amongst the most commonly reported problems are lack or reduced libido, ejaculatory problems and unexplained sub-fertility or infertility. Lack of libido may be associated with hormonal imbalance, high temperature, stress and presence of debilitating diseases. Decreased libido in the dromedary can be one of the first signs of acute systemic diseases such as hemorrhagic diseases and trypanosomiasis. Reduced spermatogenesis and testicular hypoplasia are often seen in racing dromedaries especially if they have been treated with anabolic steroids. Sub-standard semen quality can be observed in male infertility especially in overused or old animals.

References


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