Surgical Management of the Teat and the Udder

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KEYWORDS

• Teat • Laceration • Milk flow disorders • Surgery • Cattle

KEY POINTS

- Lacerations of the teat should be treated as emergency, and first intention repair should be attempted under sedation in lateral or dorsal recumbency.
- Surgeons should pay attention to the atraumatic manipulation of the tissue and the anatomic reconstruction using small-diameter absorbable suture material.
- Hand milking should be prohibited for 10 days postoperatively after laceration repair; prognosis is overall good.
- Ultrasound evaluation of the teat allows an excellent understanding of the internal lesions and should be performed before planning any elective surgery.
- Milk outflow impairment originating from the rosette of Fürstenberg or the streak canal is best treated using minimally invasive surgery (theloscopy).

Teats are extremely sensitive to trauma, and even the smallest trauma can lead to severe disturbances in milk outflow. Management of teat trauma is critical for the future of the cow in the herd. Minimal dysfunction of the normal physiologic barriers (the teat wall or streak canal) may lead to chronic inflammation or infection of the gland, resulting in premature culling of the animal as worst-case scenario.[1] Teats are well exposed to trauma.[2] Enlargement of the udder after calving puts the teat at risk of self-inflected injury. Trauma can also originate from other cows in the herd, hazardous/sharp objects in the barn, or even the milking machine. Teat disorders are divided into 2 types: external (not covered) and internal (covered).[3] Whether the lesion is acute or chronic, appropriate actions should be taken to preserve the function of the teat and the teat canal.

ANATOMY OF THE TEAT AND THE UDDER

The udder is divided into 4 quarters. Each has its independent gland that produces milk. The milk excreted by the acini travels through ducts of increasing sizes that coalesce into a large lactiferous sinus (gland cistern).[4] The gland cistern is separated from

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the teat cistern by the annular ring. The most distal barrier to the teat is the streak canal, and it is through this that milk is evacuated from the teat. The proximal aspect of the streak canal is called the rosette of Fürstenberg (Fig. 1). Blood is supplied to the udder primarily by the external pudendal artery traveling through the inguinal ring, and secondarily by the mammary branch of the ventral perineal artery.[5,6] Blood return is mainly via the cranial epigastric vein and secondarily by the external pudendal vein. The vascularization is extremely dense and ramified within the whole udder. Two vascular plexus are present at the proximal and distal extremities of the teat: close to the annular ring and around the streak canal. Those 2 plexus are connected with longitudinal vessels lying immediately underneath the submucosa of the teat. The teat wall is composed of 5 layers. The mucosa is a double-layered epithelium firmly attached to the submucosal layer. Immediately underneath the submucosa lies a conjunctive layer followed by a smooth muscle layer. The entire teat is protected from the outside by a stratified squamous epithelium (skin). On a study of 148 quarters of 38 cows, the rear teats were shorter and thicker than front teats, whereas teat canal length and teat wall thickness did not differ by quarter.[7] The teat mucosa ends at the rosette of Fürstenberg. The streak canal (ductus papillaris mammae) is an invagination of the teat skin and is composed of a stratified squamous epithelium in which the stratum corneum produces keratin. The netlike integrated elastic system containing smooth muscular fibers at the level of the streak canal functions as a sphincter.

DIAGNOSIS OF SURGICAL CONDITIONS

Clinical Examination

Milk flow impairment is a common cause for presentation of lactating cows to the veterinarian and warrants a thorough evaluation of the teat. Palpation of the udder and teat will allow the clinician to determine whether a portion of the teat and udder is inflamed, fibrotic, and/or painful. Careful attention to the palpation of the teat by gently rolling it between the thumb and index finger may allow one to locate the site of the lesion. Wearing examination gloves during the evaluation is recommended. Whenever possible, a California Mastitis Test (CMT) should be performed on all quarters to assess for possible subclinical mastitis. If stripping milk by hand is impossible, it is the author's opinion that it is more beneficial to first perform an ultrasound examination rather than to blindly try to force a cannula into the streak canal to avoid iatrogenic damage to the teat (Fig. 2). Even with a negative CMT, a milk sample should be

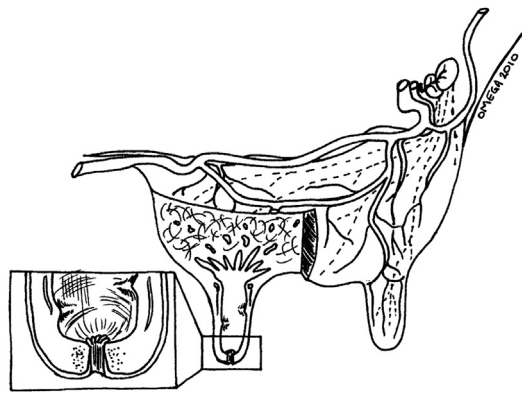

Fig. 1. Anatomy of the udder and the teat.