Veterinary Integrative Sciences 2022; 20(2): 317-330. DOI; 10.12982/VIS.2022.025

Vet Integr Sci

Veterinary Integrative Sciences

ISSN; 2629-9968 (online)

Website; www.vet.cmu.ac.th/cmvj



Research article

Surgical interventions of udder and teat affections in dairy cows

Mohammad Raguib Munif[1,2], Moinul Hasan[1] and Md. Rafiqul Alam[1,*]

[1]Department of Surgery and Obstetrics, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh
[2]Veterinary Teaching Hospital, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

Abstract

Various udder and teat affections are most common in high yielding dairy cows which cause huge economic loss to the dairy sectors. This study focuses on the surgical affections of udder and teat in dairy cows to restore the moderate productive performance as well as the morphology of udder and teat through feasible surgical procedures. Fifty-four dairy cows with various surgical affections of udder and teat were experimented. The amounts of milk yield (litre/day), and the morphology of udder (symmetry of quarters and circumference) and teat (size, shape and height) were recorded just before and after 45 days of the relevant surgical approaches to evaluate the changes. The surgical affections included mostly the teat laceration and fistulae (12.96%), moderately the teat sores, udder abscess, gangrenous teat, papilloma of teat and udder; whereas teat canal polyps, gangrenous udder and caseous lump in udder were less frequent (5.56%) individual cases among the selected dairy cows. After surgical interventions, the milk yield (litre/day) was significantly ($P<0.01$) increased along with the positive significant ($P<0.01$) changes in the morphology of udder and teat of the affected cows. Thus, the surgical managements highly impacted on the improvement of the affected udder and teat in the dairy cattle maintaining their productive performances.

Keywords: Dairy cows, Milk yield, Surgical therapy, Udder and teat diseases, Udder morphology

Corresponding author: Md. Rafiqul Alam, Department of Surgery and Obstetrics, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh. Email: alammr@bau.edu.bd.

Funding; This research was financially supported by the Ministry of Science and Technology of Bangladesh (R & D grant No. 39.00.0000.012.002.05. 19-178).

Article history; *received manuscript: 12 December 2021, revised manuscript: 18 January 2022, accepted manuscript: 24 February 2022, published online: 28 February 2022*

Academic editor; *Korakot Nganvongpanit*

Open Access Copyright: ©2022 Author (s). This is an open access article distributed under the term of the Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution, and reproduction in any medium or format, as long as you give appropriate credit to the original author (s) and the source.

INTRODUCTION

The health of udder and teat of dairy cows is highly important to ensure better performance in milk production (Twardon et al., 2001). Milk alone contributes a vital portion of the total output from livestock (Tiwary et al., 2005). Diseases of udder and teat greatly influence the production of milk as well as the farmer's economy (Abd-El-Hady, 2015) which lead to negative economic effects including permanent loss of quarter(s) and culling of the dairy cows (Blowey and Edmondson, 2010). The udder and teats are highly at risk of accidental trauma or injury due to their anatomical location, increase in size during lactation, improper flooring, horn thrust, paralysis resulting from metabolic disturbances at parturition (Tiwary et al., 2005), sudden exposure to corrosive chemicals, insect bite and faulty milking machine (Sreenu et al., 2014). The suspensory ligament of udder often gets weakened, and the udder occupies a position that is predisposed to major injuries (Khan et al., 2020). However, microbial infection, repeated trauma to the teat mucosa, contused wound due to stepping by sharp hoof of the same animal (Singh et al., 2012), injury by teeth of calves, poor husbandry practices and environmental factors are also responsible for various teat and udder diseases and disorders. Lacerations and other external wounds of the udder and teats are often involved with the barbed wire-fencing around the farms. Mastitis is prone to the udder and teats in which various anomalies inhibit the normal outflow of milk, and may lead to several diseases and painful complications (Sahoo and Ganguly, 2016). Udder abscesses are clinically found in case of chronic suppurative mastitis as the circumscribed and localized lesions of the udder caused by the common environmental pathogens (Venkatesan et al., 2020), and further maggot infestation may significantly impair the productivity (Umadevi and Umakanthan, 2016). Management of teat trauma depends on the structures which have been traumatized, and in most of the cases the affected teat can be successfully corrected by reconstructive surgery (Devi et al., 2020). Teat stenosis derived from the mucosal lesions involving the streak canal as well as the Furstenberg's rosette can be treated successfully by theloresectoscopy (Bleul et al., 2005). Surgical treatment through the teat orifice would be successful in more than 80% cases for various teat affections in dairy cows (Abd-El-Hady, 2015). The gangrenous mastitis can be treated by the amputation of gangrenous quarter(s) to save the animal's life (Islam et al., 2008), and the further management is laborious. Indeed, surgical interventions are only focused to the betterment of the affected dairy cattle after failing to recover from medicinal treatment, and as a terminal treatment protocol which aims to prevent the unnecessary culling of farm animals. Therefore, considering the importance of udder and teat health of dairy cows in relation to milk production, this study was designed to improve the condition of diseased udder and teat through surgical treatment and management.

MATERIALS AND METHODS

This research work was carried out from January 2018 to May 2021 in the Veterinary Teaching Hospital of Bangladesh Agricultural University to find the effects of surgical treatment and management of udder and teat affections

in dairy cows. This experimental methodology was approved by the Animal Welfare and Experiment Ethics Committee of Bangladesh Agricultural University (Approval No. AWEEC/BAU/2021-34).

Experimental animals

A total of fifty-four dairy cows, irrespective of breeds with various surgical affections of udder and teat, were chosen for this experiment among the regular cases admitted to the Veterinary Teaching Hospital of Bangladesh Agricultural University. The animals were thoroughly evaluated in terms of milk production (litre/day) as well as the morphology of udder (symmetry of quarters and circumference) and teat (size, shape and height) just before and after forty-five days of appropriate surgical interventions.

Surgical cases

The surgical cases (Figure 1) of udder and teat in these cows included fibrosis of teat canal and cistern, teat canal polyps, teat laceration and fistulae, gangrenous teat and udder, caseous lump in udder, enlarged teat with superficial cracks, teat stenosis, teat sores, papilloma of teat and udder, udder abscess and myiasis.

Surgical interventions

Specific surgical procedure was practiced in each case to restore the function and morphology of udder and teat as much as possible in the cows. The animals were kept off feed and water for 12 hours and then restrained carefully in lateral recumbency casted with ropes having the affected teats and udder exposed. Premedication with intramuscular injection of Atropine Sulphate@ 0.04 mg/kg BW (Atrovet®, Techno Drugs Ltd., Narsingdi, Bangladesh) followed by intravenous injection of Xylazine Hydrochloride@ 0.07 mg/kg BW (Xylaxin®, Indian Immunologicals Ltd., Telangana, Hyderabad, India) was done. After 10 minutes, local anaesthesia with 2% Lidocaine Hydrochloride (Jasocaine®, Jayson Pharmaceuticals Ltd., Tejgaon, Dhaka, Bangladesh) in a 'ring block' as well as 'field block' fashion was performed to desensitize the selective areas. The case-wise given surgical treatment and managements are furnished in Table 1.

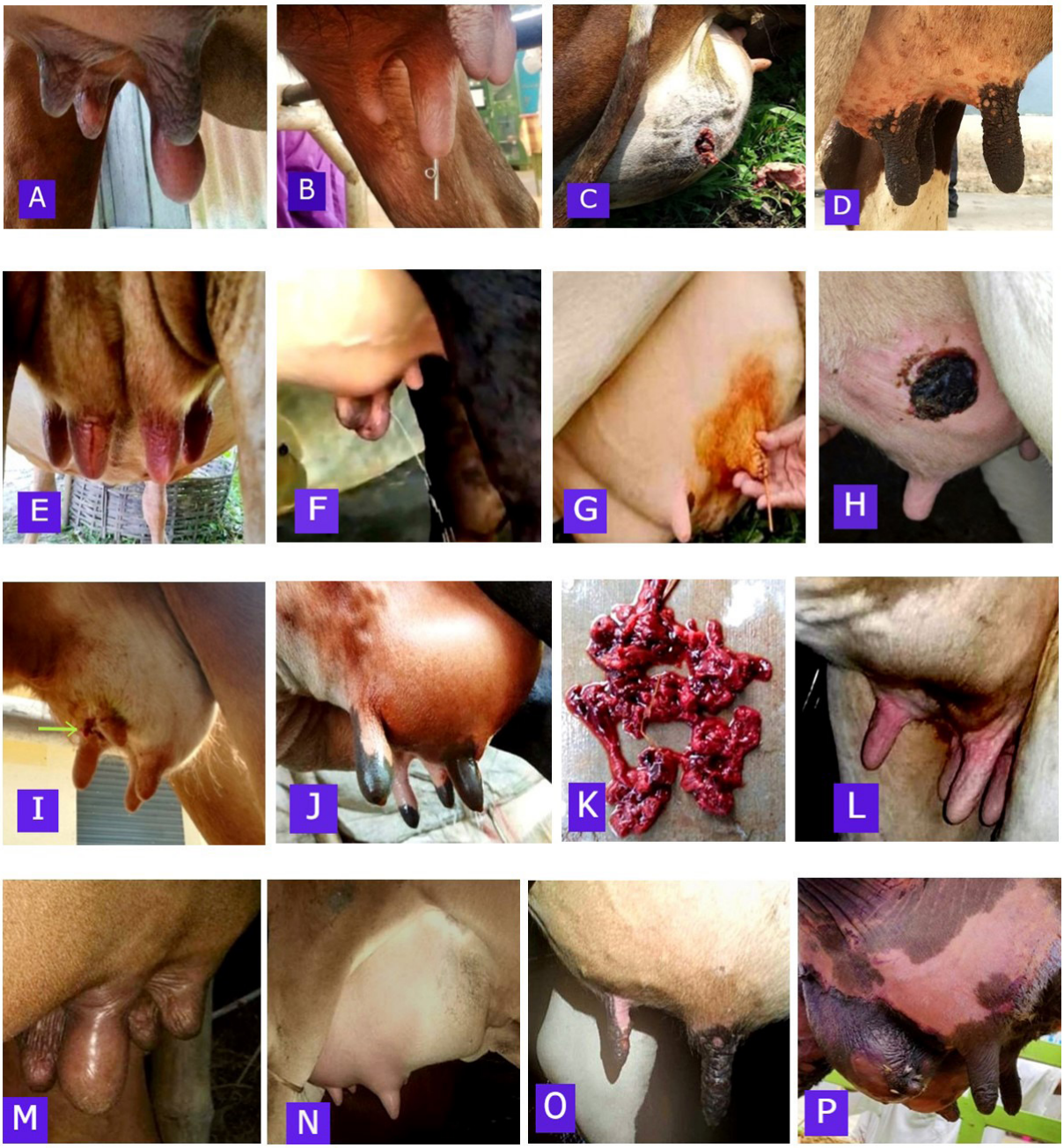


Figure 1 Fibrosis of teat canal and cistern (A), Teat siphon insertion into the fibrosed teat (B), Udder myiasis (C), Papilloma of teat and udder (D), Teat laceration (E), Teat fistula (F), Surgical repairing of teat fistula (G), Udder abscess with scab (H), Udder abscess; open (I), Caseous lump in udder (J), Evacuated caseous mass (K), Enlarged teat with superficial cracks (L), Teat canal polyps (M), Teat stenosis (N), Teat sores (O), Gangrenous teat and udder (P).

Table 1 Surgical treatment and managements of various teat and udder affections in dairy cows

Surgical affections of teat and udder	Surgical treatment and managements	
	Surgical approaches	Medications
Fibrosis and stenosis in teat cistern, streak canal, teat orifice or even in the gland cistern of mammary quarter	The obstruction was removed or cut using teat siphon followed by teat slitter and teat dilator to facilitate the normal milk flow, and a thin polyvinyl or rubber catheter as well as a plastic teat siphon dabbed with 5% Povidone-Iodine (Viodin® 5% Ointment, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) was placed for 7 days in that teat canal to prevent recurrence.	Ceftiofur Sodium @ 2.2 mg/kg BW (Ceftiren® Vet, Renata Ltd., Gazipur, Dhaka, Bangladesh) for 14 days, Ketoprofen @ 3.3 mg/kg BW (Ketovet, Techno Drugs Ltd., Narsingdi, Bangladesh) for 5 days, and Pheniramine Maleate @ 1 mg/kg BW (Antihista-Vet®, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) for 7 days along with probiotic formulation composed of Lactobacillus spores, Vitamin A and Amino Nitrogen (Masticare Plus® Powder, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) for 15 days postoperatively were maintained.
Teat canal polyps	Polyps and lactoliths were successfully removed by teat tumor extractor, and further intramammary infusion (Mastijet® Forte, Intervet, MSD Animal Health, United States) was done twice daily for 4 days.	Ceftriaxone @ 15 mg/kg BW (Trizon Vet, ACME Laboratories Ltd., Dhaka, Bangladesh) for 7 days, Ketoprofen @ 3.3 mg/kg BW (Ketovet, Techno Drugs Ltd., Narsingdi, Bangladesh) for 5 days, and Pheniramine Maleate @ 1 mg/kg BW (Antihista-Vet®, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) for 7 days along with probiotic formulation composed of Lactobacillus spores, Vitamin A and Amino Nitrogen (Masticare Plus® Powder, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) for 15 days postoperatively were maintained.
Teat sores, lacerations and superficial cracks	These lesions were treated as open wounds, and cleaning twice daily with antiseptic solution (Viodin® 10% Solution, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) was ensured for 3 days. Finally, the wounds were debrided to make fresh and sutured using Polyglactin 910 of size 1-0 (Vicryl™, Ethicon, J & J Medical Devices Companies, United States) if necessary, and Mupirocin 2% (Bactrocin® 2% Ointment, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) was applied topically thrice daily up to recovery.	Ampicillin @ 10 mg/kg BW (Ampicin-Vet®, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) for 7 days, Ketoprofen @ 3.3 mg/kg BW (Ketovet, Techno Drugs Ltd., Narsingdi, Bangladesh) for 5 days, and Pheniramine Maleate @ 1 mg/kg BW (Antihista-Vet®, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) for 7 days were continued as supportive treatments. Fly repellents were used regularly.
Teat fistulae	The fistulae were repaired carefully after proper aseptic procedures by suturing with Vicryl™ (2-0) while keeping the teat canal and cisterns patent for milk let-down with the help of rubber tube. After 14 days, the tube was removed from the teat canal.	Ceftriaxone @ 15 mg/kg BW (Trizon Vet, ACME Laboratories Ltd., Dhaka, Bangladesh) for 14 days, Ketoprofen @ 3.3 mg/kg BW (Ketovet, Techno Drugs Ltd., Narsingdi, Bangladesh) for 5 days, and Pheniramine Maleate @ 1 mg/kg BW (Antihista-Vet®, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) for 7 days along with probiotic formulation composed of Lactobacillus spores, Vitamin A and Amino Nitrogen (Masticare Plus® Powder, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) for 15 days postoperatively were maintained.

Table 1 Surgical treatment and managements of various teat and udder affections in dairy cows (Cont.)

Surgical affections of teat and udder	Surgical treatment and managements	
	Surgical approaches	**Medications**
Gangrenous teat and udder	Amputation of the affected portion along with some fresh tissue was performed, then proper ligation and closure of the wounds by Vicryl™ (1-0 and 1) and Chromic Catgut of size 1 and 2 (Trugut™, Sutures India Pvt. Ltd., Bangalore, India) were executed based on the pattern of cases having proper skin closure with nylon threads.	Ampicillin @ 10 mg/kg BW (Ampicin-Vet®, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) for 14 days, Ketoprofen @ 3.3 mg/kg BW (Ketovet, Techno Drugs Ltd., Narsingdi, Bangladesh) for 5 days, and Pheniramine Maleate @ 1 mg/kg BW (Antihista-Vet®, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) for 7 days along with vitamin-mineral supplements (Calfostonic Powder, ACI Animal Health, Tejgaon, Dhaka, Bangladesh) for 21 days were provided carefully.
Caseous lumps in udder and udder abscesses	Contents were evacuated through small incision on the ventro-lateral wall of the affected quarter, and then the cavity was flushed with mild antiseptic solution and treated as open wound with regular medicated dressing for 5 days.	Ceftriaxone @ 15 mg/kg BW (Trizon Vet, ACME Laboratories Ltd., Dhaka, Bangladesh) for 7 days, Ketoprofen @ 3.3 mg/kg BW (Ketovet, Techno Drugs Ltd., Narsingdi, Bangladesh) for 5 days, and Pheniramine Maleate @ 1 mg/kg BW (Antihista-Vet®, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) for 7 days were maintained properly. After 2 weeks, feeding supplements of vitamin A, D and E (Renasol® AD3E Vet, Renata Ltd., Gazipur, Dhaka, Bangladesh) were maintained for another 15 days. Fly repellents were used regularly.
Wart (papilloma) of teat and udder	Treatments involved surgical excision of warts along with autogenous vaccine	Ampicillin @ 10 mg/kg BW (Ampicin-Vet®, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) for 7 days, Ketoprofen @ 3.3 mg/kg BW (Ketovet, Techno Drugs Ltd., Narsingdi, Bangladesh) for 3 days, and Pheniramine Maleate @ 1 mg/kg BW (Antihista-Vet®, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) for 5 days along with vitamin-mineral supplements (Calfostonic Powder, ACI Animal Health, Tejgaon, Dhaka, Bangladesh) for 14 days were provided carefully. Mupirocin 2% (Bactrocin® 2% Ointment, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) was applied topically on the raw surfaces thrice daily up to recovery.
Maggot infestations (myiasis) in udder quarters	These cases were managed through placing gauze soaked with oil of turpentine, then the maggots were manually removed followed by surgical debridement, and dressing of the wound cavity with Viodin® 10% solution was carried out regularly for 3 days.	Subcutaneous administration of Ivermectin @ 0.2 mg/kg BW (Vermic, Techno Drugs Ltd., Narsingdi, Bangladesh) was done at 1st day and 14th day, Ketoprofen @ 3.3 mg/kg BW (Ketovet, Techno Drugs Ltd., Narsingdi, Bangladesh) for 3 days, and Pheniramine Maleate @ 1 mg/kg BW (Antihista-Vet®, Square Pharmaceuticals Ltd., Mohakhali, Dhaka, Bangladesh) for 5 days were maintained. Fly repellents were used regularly.

Assessment of milk yield

The amounts (litre) of milk production per day of the cows were recorded just before and after 45 days of the relevant surgical interventions through proper contact with the animal owners. The changes in the amounts (litre) of milk production/day were carefully monitored.

Evaluation of udder and teat morphology

For all the cases, the udder and teat morphology of the affected cows were evaluated just before and after 45 days of surgical interventions to find out the efficacy of the surgical treatment and management. The circumference and symmetry of the quarters of udder, and the height, size and shape of the teats were considered as categorical data according to the scoring: good (slight alteration of udder and teat structures having no negative effect on milk production) = 4, moderate (mild structural alterations having little negative effect on milk production) = 3, poor (definite structural alterations having negative effects on milk production and udder health) = 2 and worse (severe structural alterations having extreme negative impacts on milk production leading to quarter loss) = 1 during evaluation. The scoring was based on the average of the clinical observation of the same variables from apparently healthy cows.

Statistical Analysis

The data obtained in this investigation were calculated as 'mean ± standard deviation' for all cases. Paired t-tests and Wilcoxson signed rank tests were performed for data analysis using IBM SPSS Statistics (Version 20) to compare the differences between before and after surgical interventions for milk production and morphology of udder and teat. $P<0.01$ was considered as statistically significant for the tests.

RESULTS

The percentages of various surgical affections of udder and teat in dairy cows are presented in Figure 2. The teat affections were fibrosis of teat canal and cistern (7.41%), teat canal polyps (5.56%), teat laceration and fistulae (12.96%), gangrenous teat (9.26%), enlarged teat with superficial cracks (7.41%), teat sores (9.26%) and teat stenosis (7.41%). On the contrary, udder affections included gangrenous udder (5.56%), caseous lump in udder (5.56%), udder abscess (9.26%) and udder myiasis (11.11%). However, papillomas were found in both teat (3.70%) and udder (5.56%) of the dairy cows.

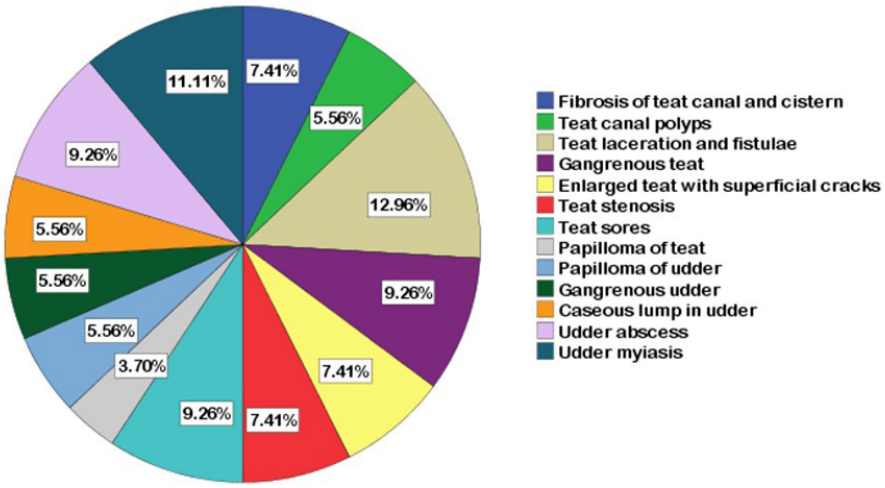


Figure 1 Surgical affections (%) of udder and teat in dairy cows.

The effects of surgical interventions on milk production (litre/day) in the affected dairy cows are presented in Figure 3. The mean value of milk production (litre/day) just before the surgical approaches in the cows with various teat affections was 10.75±1.69 litre/day; which significantly (P<0.01) increased to 12.59±1.74 litre/day after 45 days of surgical treatment and management. Likewise, the mean value of milk production (litre/day) just before surgery in the cows with various udder affections was 8.70±1.60 litre/day; which significantly (P<0.01) increased to 11.20±1.58 litre/day after 45 days of surgical interventions.

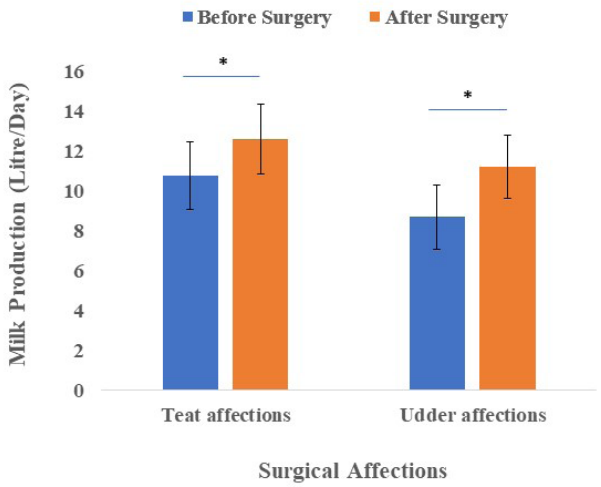


Figure 3 Effects of surgical interventions on milk production for various surgical affections of teat and udder in dairy cows (*= P<0.01).

As it can be seen in Table 2, the differences between before surgery and after surgery scores of the morphology of udder and teat in dairy cows with various teat and udder affections were found to be significant (P<0.01). In addition, during the experiment in respect of all the differences, the after surgery scores were found to be higher which indicated positive changes.

Table 2 Wilcoxon Signed Rank Test results according to before surgery - after surgery scores of the morphology of udder and teat in dairy cows

Experimental cases (N=54)					
Surgical affections of dairy cows	**n**	**Mean scores (Mean±SD)**		**Wilcoxon Signed Rank Test**	
		Before surgery	**After surgery**	**Z**	**P**
Teat affections (i.e., fibrosis of teat canal and cistern, teat canal polyps, teat laceration and fistulae, gangrenous teat, enlarged teat with superficial cracks, teat sores, teat stenosis and papilloma of teat)	34	1.76±0.78	3.65±0.54	5.095	0.000*
Udder affections (i.e., gangrenous udder, caseous lump in udder, udder abscess, papilloma of udder and udder myiasis)	20	1.50±0.55	3.83±0.41	4.030	0.000*

*= P<0.01, SD= Standard Deviation

The market values (BDT) of the dairy cows on the time of the experiment based on their milk production (litre/day) and body weight (kg) are presented in Table 3. Before surgery, the mean market values of the cows with various teat and udder affections were lesser than the corresponding mean values after surgery. The mean differences of market values were 25950.00 and 25882.35 BDT between the before and after surgical interventions in case of various teat and udder affections in the dairy cows respectively.

Table 3 Values (BDT) of the dairy cows based on milk production and body weight on the time of experiment

Types of affected dairy cows	**Value in BDT (Mean)**		
	Before surgery	**After surgery**	**Difference ***
Cows with teat affections (n=34)	62750.00	88700.00	25950.00
Cows with udder affections (n=20)	65470.59	91352.94	25882.35

BDT= Bangladeshi Taka
*= After surgery − Before surgery

The cost benefit analysis for surgical interventions of various teat and udder affections in the dairy cows has been shown in Table 4. The treatment costs for the cows mainly involved in surgical procedures, post-operative medications and managements were lesser than the benefit of surgical interventions involved in the increment of market values of the cows after surgery. The mean differences between the treatment costs and the increased market values through surgical interventions were 12993.32 and 13746.35 BDT in case of various teat and udder affections in the dairy cows respectively.

Table 4 Cost benefit analysis for surgical interventions of various teat and udder affections in dairy cows

Types of affected dairy cows	Value in BDT (Mean)		
	Treatment costs [1]	Benefit of surgery [2]	Difference [*]
Cows with teat affections (n=34)	12956.68	25950.00	12993.32
Cows with udder affections (n=20)	12136.00	25882.35	13746.35

BDT= Bangladeshi Taka
[1]= costs of surgery, post-operative medications and managements
[2]= difference in the values of cows between before and after surgical intervention
[*]= Benefit of surgery − Treatment costs

DISCUSSION

The present study showed that the teat laceration and fistulae (12.96%) were the most frequent affections in dairy cows, whereas udder myiasis (11.11%) was the second highest occurred case. Moreover; teat sores, gangrenous teat and udder abscess were found as fairly moderate cases, whereas fibrosis of teat canal and cistern, enlarged teat with superficial cracks and teat stenosis were mild; the teat canal polyps, gangrenous udder, papilloma of udder and caseous lump in udder were less frequent affections. Papilloma of teat was the lowest occurred case. Related researches on udder and teat affections in cows were also performed by Nouh et al. (2014), Morwal (2017), Ragab et al. (2017) and Kumar et al. (2018). In this study, the occurrence of teat affections was higher than the udder affections which is in agreements with the findings of Misk et al. (2018) and Weaver et al. (2005). Surgical treatment and management of udder and teat affections aided to restore the milk flow, lower the risk of complete quarter(s) loss and avoid culling of dairy cows (Couture and Mulon, 2005). The affected dairy cows recovered after surgical treatment and management showing normal udder and teat morphology as well as function, as also reported by Ansari et al. (2019). Moreover, surgical interventions were associated with the increment of milk yield than before in affected the cows, which are consistent with other investigations (Couture and Mulon, 2005; Roberts and Fishwick, 2010). In some cases (i.e., gangrenous teat and udder, teat laceration and fistulae and enlarged teat with superficial cracks), after surgery the milk yield restoration was not that much satisfactory than the other teat and udder affections. As in case of gangrenous teat and udder, the affected quarters were surgically treated through mastectomy (Gutierrez-Blanco et al., 2016), and hence, there were loss of quarters resulted in comparatively less restoration of milk yield. Teat laceration and fistulae caused less milk yield even after appropriate surgical managements than the normal cows. This might be due to some basic morphological changes in the teat and udder tissues during healing through repairing as also observed by Nichols (2008). Enlarged teat with superficial cracks in chronic cases revealed healing through surgical approaches with mild restoration of milk yield. This might be attributed as the morphological changes in the teat streak canal, Furstenberg's rosette, cistern and the associated internal and external contour and texture of teat due to repairing. Changes in the qualitative and quantitative balance in the continuous proliferation and differentiation of the teat canal epithelium and superficial strata, alterations in the functional anatomy of teat canal epithelium and basic regulatory mechanism involving the turnover of

teat canal keratin ultimately affected the milk production in the cows, as also reported by Paulrud (2005). The uses of Xylazine Hydrochloride (Abd-El-Hady, 2015; Ansari et al., 2019) and 2% Lidocaine Hydrochloride (Steiner and von-Rotz, 2003; Sreenu et al., 2014; Khan et al., 2020) during surgical repair of udder and teat were found satisfactory. The suturing patterns of udder and teat layers including skin followed in this study were harmonious as explained by Nichols and Anderson (2007) and Nichols (2009). Removal of fibrous obstruction from teat canal and cistern, and intubation of thin catheters were done in the present study, which were found effective in maintaining the patency and for drug delivery (Aruljothi et al., 2012). In addition, intubation is recommended as an excellent method of treatment for internal affections of the teat such as membranous obstruction, occlusion of teat, teat fistulae and laceration (Ansari et al., 2019). Similarly, plastic teat siphon insertion, and leaving it for a week in teat canal was effective to correct the milk flow obstruction in cows (Sreenu et al., 2014). Teat stenosis was corrected through sufficient dilatation and removal of blockage from teat canal and cistern, and the related protocols were also reported by Weaver et al. (2005). Mastectomy was performed to deal with gangrenous udder and teat, which is reported by several researchers (Cable et al., 2004; Gilbert and Fubini, 2004; Gutierrez-Blanco et al., 2016; Phiri et al., 2010). Caseous lump in udder resulted from chronic cases of abscesses were incised as like as udder abscesses through the udder skin, and evacuation of the contents were done followed by antiseptic cleaning (Misk et al., 2020). Udder myiasis was treated successfully with complete recovery, which was similar with the treatment procedures of Rahman et al. (2009). The uses of autogenous vaccine for udder and teat papilloma (wart) were effective and corresponding to the researches of Khalid et al. (2021), Nethra and Babu (2018) and Kale et al. (2019). The management procedures of teat canal polyps, superficial teat cracks and teat sores were feasible to bring positive outcomes in terms of morphology and function of mammary tissue, and were collateral as described by Rathod et al. (2009), Nouh et al. (2014), Khan et al. (2020) and Sharma et al. (2020). The present study showed that the milk production (litre/day) fell down in the affected cows, and the market values of such cows on that time were minimum which were based on their milk production (litre/day) and body weight (BW). If the farmers wanted to cull the cows on that time, they would get the minimum market values as culling is considered as one of the major costs for the dairy farms (Ahlman et al., 2011; Olechnowicz and Jaskowski, 2011), and more than 20% culling of dairy cows are associated with udder disorders influencing the lactations (Rilanto et al., 2020). On contrary, the affected cows after definite surgical interventions got improved in terms of milk production but not as good as the normal ones. Despite the moderate gain in the performance of milk production, the market values of the cows increased after proper surgical managements which were higher than the associated treatment costs. Thus, proper surgical interventions can be beneficial for the management of various udder and teat affections in dairy cows at farm levels than culling of the animals. At the same time, the farmers should maintain proper hygienic environment in the cow sheds to minimize the infections and other complications during the post-operative period. The reported post-operative complications included various types of mastitis, cessation of milk flow, purulent discharge, ulcerative

dermatitis, wound contamination, dehiscence of suture sites and fibrosis (Ali et al., 2020; Khan et al., 2020; Premsairam et al., 2020) due to contamination during surgical approaches, and further surgical site infections. However, this study observed no such kind of post-operative complication in the cows which might be due to the aseptic surgical procedures and strict hygienic post-operative managements.

CONCLUSION

The surgical interventions for various udder and teat affections in dairy cows were found effective to restore the milk yield and the morphology of udder and teat at desired level. Thus, proper surgical treatment and management at proper time can minimize the unnecessary culling of dairy animals and the economic loss in the farm sectors. Therefore, the dairy farmers and small livestock holders should be aware of these surgical affections and their managements.

ACKNOWLEDGEMENTS

The facilitation from the authority of the Veterinary Teaching Hospital of Bangladesh Agricultural University is highly appreciated for carrying out the research work smoothly.

CONFLICT OF INTEREST

The authors have declared no conflict of interest.

AUTHOR CONTRIBUTIONS

MRM: Study design, research implementation, data acquisition, statistical analysis, manuscript preparation
MH: Guidance of literature, result reviewing, revision of manuscript
MRA: Research concept, technical guidance and support, result interpretation, revision of manuscript.

REFERENCES

Abd-El-Hady, A.A.A., 2015. Clinical observations on some surgical udder and teat affections in cattle and buffaloes. Sch. J. Agric. Vet. Sci. 2, 270−281.

Ahlman, T., Berglund, B., Rydhmer, L., Strandberg, E., 2011. Culling reasons in organic and conventional dairy herds and genotype by environment interaction for longevity. J. Dairy Sci. 94, 1568−1575.

Ali, K., Farghali, H.A.M.A., Shamaa, A.A.E., 2020. Udder and teat surgical affections in sheep and goats in state of Kuwait. Int. J. Nat. Soc. Sci. 7, 94−99.

Ansari, M.M., Makhdoomi, D.M., Sarkar, T.K., Muzammil, S., 2019. Innovative technique using modified infusion set tubing for rectification of milk outflow disorders in cows. Pharma Innovation J. 8, 795−798.

Aruljothi, N., Balagopalan, T.P., Rameshkumar, B., Alphonse, R.M.D., 2012. Teat fistula and its surgical management in bovines. Intas Polivet. 13, 40−41.

Bleul, U.T., Schwantag, S.C., Bachofner, C., Hassig, M.R., Khan, W.K., 2005. Milk flow and udder health in cows after treatment of covered teat injuries via theloresectoscopy: 52 cases (2000 – 2002). J. Am. Vet. Med. Assoc. 226, 1119−1123.

Blowey, R., Edmondson, P., 2010. Mastitis Control in Dairy Herds, second ed. CAB International, Oxfordshire, UK, pp. 1−4.

Cable, C.S., Peery, K., Fubini, S.L., 2004. Radical mastectomy in 20 ruminants. Vet. Surg. 33, 263−266.

Couture, Y., Mulon, P.Y., 2005. Procedures and surgeries of the teat. Vet. Clin. North Am. Food Anim. Pract. 21, 173−204.

Devi, R., Sharma, M., Baishya, M.P., Sarma, B.K., Thakuria, P., Ahmed, N., 2020. Teat laceration and its successful surgical management in a crossbred cow. J. Entomol. Zool. Stud. 8, 841−843.

Gilbert, R.O., Fubini, S.L., 2004. Surgery of the bovine reproductive system and urinary tract, in: Fubini, S.L., Ducharme, N.G. (Eds.), Farm Animal Surgery, first ed. Elsevier, Philadelphia, USA, pp. 351−427.

Gutierrez-Blanco, E., Ortega, A., Jimenez-Coello, M., Tzab, R., Aguilar-Caballero, A., 2016. Total mastectomy in a cow with gangrenous mastitis. Vet. Rec. Case Rep. 4, 1−4.

Islam, M.N., Hoque, M.F., Rima, U.K., Fatema, B.Z., Aziz, F.B., Faruk, M.I., Akter, M.R., 2008. Gangrenous mastitis in cows: pathological, microbiological and surgicotherapeutical investigation. J. Soil Nat. 2, 29−36.

Kale, M., Saltik, H.S., Hasircioglu, S., Yildirim, Y., Yavru, S., Mamak, N., Atli, K., 2019. Treatment of bovine papillomavirus-induced teat warts in a cow by using podophyllin magistral formula and autologous vaccine applications together. Indian J. Anim. Res. 53, 832−836.

Khalid, N., Kamaruzaman, I.N.A., Yahya, S.N.C., Azeez-Okene, I.A., Reduan, M.F.H., Shaharulnizim, N., 2021. Application of autogenous vaccine for the treatment of bovine cutaneous papillomatosis Type 2 in Malaysia. J. Anim. Health Prod. 9, 1−4.

Khan, S., Manjusha, K.M., Banu, S.A., 2020. Surgical affections of udder and teats in large ruminants. Raksha Technical Review. 9, 16−21.

Kumar, A., Verma, M.K., Saini, R., Verma, R., Singh, S.P., 2018. Surgical condition of udder and teats in cows. Int. J. Trend Res. Dev. 2, 2908−2909.

Miranda, F.G., Cabala, R.W., Lima, J.A.M., Nepomuceno, A.C., Torres, R.C.S., Gheller, V.A., 2017. Ultrasonography and theloscopy for the diagnosis of obstructive fibrosis in the Furstenberg venous ring in the four quarters of the udder of a cow: a case report. Arq. Bras. Med. Vet. Zootec. 69, 1125−1129.

Misk, N., Misk, T., El-Khamary, A., Semeika, M., 2018. A retrospective study of surgical affections of mammary glands in cattle and buffaloes and their management in the field. J. Vet. Med. Sci. 80, 1576−1583.

Misk, T.N., El-Sherry, T., Misk, N.A., 2020. Retrospective study on body surface abscesses in farm animals. Assiut Vet. Med. J. 66, 47−61.

Morwal, S., 2017. Affections of udder and teat in cattle and buffaloes. Gavin J. Arch. Vet. Sci. Technol. VST-111.

Nethra, R., Babu, M., 2018. Bovine teat papillomatosis: a case report. Int. J. Environ. Sci. Technol. 7, 1463−1466.

Nichols, S., 2008. Teat laceration repair in cattle. Vet. Clin. North Am. Food Anim. 24, 295−305.

Nichols, S., 2009. Diagnosis and management of teat injury, in: Anderson, D.E., Rings, D.M. (Eds.), Food Animal Practice, fifth ed. Elsevier, Saunders, USA, pp. 398−406.

Nichols, S., Anderson, D.E., 2007. Breaking strength and elasticity of synthetic absorbable suture materials incubated in phosphate-buffered saline solution, milk, and milk contaminated with Streptococcus agalactiae. Am. J. Vet. Res. 68, 441−445.

Nouh, S.R., Korittum, A.S., Elkammar, M.H., Barakat, W.M., 2014. Retrospective study of teat surgical affections in dairy farms of armed forces and their treatment. Alex. J. Vet. Sci. 40, 65−76.

Olechnowicz, J., Jaskowski, J.M., 2011. Reasons for culling, culling due to lameness, and economic losses in dairy cows. Med. Weter. 67, 618−621.

Paulrud, C.O., 2005. Basic concepts of the bovine teat canal. Vet. Res. Commun. 29, 215−245.

Phiri, A.M., Muleya, W., Mwape, K.E., 2010. Management of chronic gangrenous mastitis in a 3-year-old cow using partial (quarter) mastectomy. Trop. Anim. Health Prod. 42, 1057−1061.

Premsairam, C., Aruljothi, N., Balagopalan, T.P., Alphonse, R.M.D., Abiramy-Prabavathy, A., 2020. Surgical management of traumatic teat fistulas with polyester sutures in crossbred cows. J. Agric. Vet. Sci. 13, 51−55.

Ragab, G.H., Seif, M.M., Abdel-Rahman, M.A., Qutp, M., 2017. Prevalence of udder and teat affections in large ruminant in Beni-Suef and El-Fayoum provinces. J. Vet. Med. Res. 24, 211–221.

Rahman, M.A., Hossain, M.A., Alam, M.R., 2009. Clinical evaluation of different treatment regimens for management of myiasis in cattle. Bangl. J. Vet. Med. 7, 348–352.

Rathod, S.U., Khodwe, P.M., Raibole, R.D., Vyavahare, S.H., 2009. Theloscopy- The advancement in teat surgery and diagnosis. Vet. World. 2, 34–37.

Rilanto, T., Reimus, K., Orro, T., Emanuelson, U., Viltrop, A., Motus, K., 2020. Culling reasons and risk factors in Estonian dairy cows. BMC Vet. Res. 16, 173–188.

Roberts, J., Fishwick, J., 2010. Teat surgery in dairy cattle. In Pract. 32, 388–396. Sahoo, S., Ganguly, S., 2016. Successful management of lactolith (milk stone) in a Red Sindhi cow- a case study. Int. J. Contemp. Pathol. 2, 47–48.

Sharma, S., Gupta, D.K., Bansal, B.K., 2020. Udder and teat skin lesions in bovines. Int. J. Livest. Res. 10, 1–14.

Singh, J., Singh, P., Arnold, J.P., 2012. The mammary glands, in: Tyagi, R.P.S., Singh, J. (Eds.), Ruminant Surgery, first ed. CBS Publishers and Distributers Pvt. Ltd., New Delhi, India, pp. 170–171.

Sreenu, M., Kumar, B.P., Sravanthi, P., Goud, K.S., 2014. Repair of teat laceration in a cow. Vet. Clin. Sci. 2, 52–54.

Steiner, A., von-Rotz, A., 2003. The most important local anesthesia in cattle; a review. Schweiz. Arch. Tierheilkd. 145, 262–271.

Tiwary, R., Hoque, M., Kumar, B., Kumar, P., 2005. Surgical condition of udder and teats in cows. Indian Cow. 1, 25–27.

Twardon, J., Dzieciol, M., Nizanski, W., Dejneka, G.J., 2001. Use of ultrasonography in diagnosis of the teats disorders. Med. Weter. 57, 874–875.

Umadevi, U., Umakanthan, T., 2016. Herbal treatment for myiasis in cattle- a field trial. J. Agric. Vet. Sci. 9, 25–26.

Venkatesan, M., Jayalakshmi, K., Poovarajan, B., Saravanan, M., Yogeshpriya, S., Selvaraj, P., 2020. Ultrasound guided percutaneous aspiration of udder abscess in dairy cows with chronic mastitis. Indian J. Vet. Anim. Sci. Res. 49, 53–57.

Weaver, A.D., Jean, G.S., Steiner, A., 2005. Teat Surgery, in: Weaver, A.D., Jean, G.S., Steiner, A. (Eds.), Bovine Surgery and Lameness, second ed. Blackwell Publishing, Oxford, UK, pp. 158–167.

How to cite this article;

Mohammad Raguib Munif, Moinul Hasan and Md. Rafiqul Alam. Surgical interventions of udder and teat affections in dairy cows. Veterinary Integrative Sciences. 2022. 20(2): 317- 330.