Teat Dilators as Free Foreign Bodies in the Bovine Teat– Two Case Studies

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Abstract

The objective of this study is to report two cases of foreign bodies in teats of cows with milk flow disorders. Foreign bodies and the causes of the milk flow disorders were diagnosed and treated by using teat endoscopy. In the first case, a teat dilator was found in the teat along with inflammation of the teat cistern lining. The milk flow disorder was caused by teat canal skin which had ruptured and inverted into the teat cistern. In the second case, a wax teat insert was found in the teat cistern. The milk flow disorder was caused by a narrowed inner opening of the teat canal. In both cases the milk from the affected quarters showed signs of subclinical mastitis. The foreign bodies were removed through the teat canal by using forceps. The causes of the milk flow disorders were treated surgically. Antibiotics were administered into the affected teats and a sterile silicone implant was inserted into the teat canal. The teat was bandaged and rested for several days. On re-examinateion four weeks later, milk flow and milk quality were significantly improved. Our findings indicate that the alterations in the teat canal area were the cause of the milk flow disorders rather than the foreign bodies. We conclude that in teats with milk flow disorders, a diagnosis should be made first and then a causal treatment initiated. Teat dilators and wax inserts without heads may slip into the teat and act as foreign bodies. Teat dilators may be deleterious to udder health.

Introduction

Straws, quills, metal tubes, hairpins, teat dilators and projectiles have been described as free foreign bodies in the bovine teat.[3,10,12] Besides these true foreign bodies that are introduced into the teat from outside, there can be free bodies originating from inside the teat. These are milk clots or stones (lactoliths), blood clots, inflammatory cell clots (granuloma) and detached tumors (polyps, papilloma).[3,5,6,9,10,11,18] Free bodies in the teat may cause milk flow disorders when they block the inner opening of the teat canal. These bodies are not always easy to diagnose with conventional examination techniques. The objective of this article is to report on two cases of foreign bodies in the teat that were diagnosed and treated successfully by using teat endoscopy (theloscopy[a]).

Case One - "Blanka"

On August 2, 1999, a Brown Swiss cow named "Blanka" was referred to the Veterinary Clinic Babenhausen because of a 10 day old milk flow disorder in the front left teat. She belonged to a herd of 18 lactating dairy cows kept in tie-stalls and was 72 days into her fifth lactation. She had been pretreated for this disorder. The affected teat showed a vertical latero-caudal scar. Palpation showed evidence of a free body in the teat cistern. When milked by hand a thin stream of milk was expressed. When milked by machine the milk flow from the affected teat was considerably less than that from the remaining teats. The milk from the affected teat also showed signs of subclinical mastitis (>100,000 cells/mL of milk and pathogens detected)[1] (Table 1). The canal of the affected teat was 5 mm longer than the canal of the contralateral teat.

A teat dilator was found inside the teat by using theloscopy via the teat canal (axial theloscopy) (Figure 1) as well as through the lateral teat wall (lateral theloscopy). The teat dilator was bent into a U-shape; the bend was pointed towards the inner opening of the teat canal and the ends of the dilator were directed towards the teat basis (Figure 2). The teat cistern lining

[a]endon (Greek) = inside, skopein (Greek) = view, thele (Greek) = nipple

Table 1. Clinical and laboratory findings for the affected quarter and means of the remaining quarters for Case One - "Blanka".

Parameter	First examination		Reexamination one month later	
	Quarter Affected	Remaining	Quarter Affected	Remaining
Teat tip to floor distance (cm)	36	37	36	39
Teat length (mm)	70	58	65	57
Teat tip circumference (mm)	18	15	17	16
California Mastitis Test[18]	+++	+	+	-
Flakes	No	No	No	No
SCC (1000 cells/mL of milk)[7]	9411	105	107	43
Pathogens[21,d]	Strep E+	Staph P-	Staph P-	Staph P-
Residues[21]	No	No	No	No
Milk fat (%)[e]	4.94	5.14	3.95	2.72
Milk protein (%)[e]	3.65	3.40	3.76	3.83
Milk lactose (mmol/l)[e]	4.08	4.74	4.67	4.84
Milk urea (mmol/l)[e]	0.07	0.15	0.22	0.27
Teat canal width (mm)[16,f]	13	9	9	9
Teat canal length (mm)[8,g]	2	2	1.5	2
Maximal milk flow (kg/min)[22,h]	0.12	0.71	0.29	0.72
Quarter milk yield (kg)[22,i]	0.06	2.37	1.57	3.37
Duration of milking (min.sec)[j]	1.00	4.45	7.00	7.00
Daytime (h.min)[k]	13.35	13.35	18.25	18.25

[d] E+ = esculin positive, P- = penicillinase negative
[e] determined with the "MilcoScan" from Foss, Hilleröd/Denmark
[f] determined with a probe by Medl[16]
[g] determined with a probe by Johansson[8]
[h] determined for each quarter individually with the "Lactocorder" from Foss, Hilleröd/Denmark[22]
[i] After the first examination the remaining milk in the affected quarter was drained by using a sterile milking tube. The drained milk is not part of the quarter milk yield.
[j] The affected teat was only milked for one minute to save this teat. The remaining quarters were fully milked.
[k] The first examination took place in the Veterinary Clinic Babenhausen. The reexamination took place in the herd of the patient.

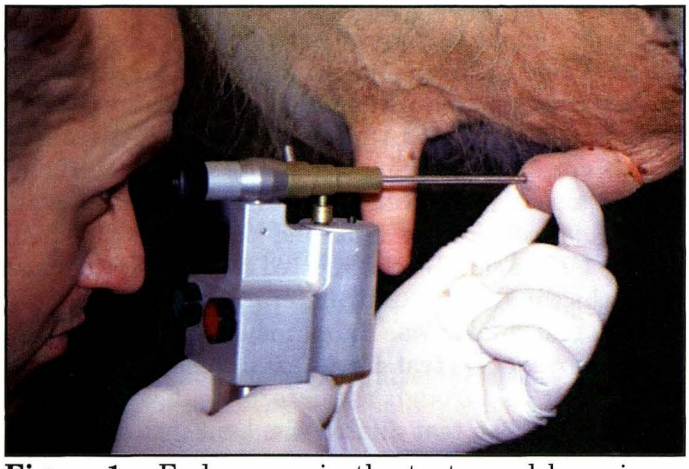

Figure 1. Endoscopy via the teat canal by using a wireless theloscope with built in air pump and light source.[l]

[l]Theloscope, Eickemeyer, Nashville, TN

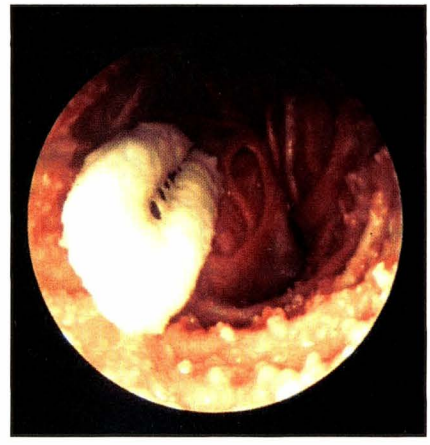

Figure 2. U-shaped teat dilator as a free foreign body in the teat cistern. View via teat canal.

was inflammed ("cisternitis"), and the teat canal skin was ruptured and inverted into the cistern (Figure 3). The teat dilator was removed through the teat canal by using forceps. The inverted tissue was removed by using a punch that was inserted through the teat canal. This surgery was controlled by lateral theloscopy. Finally, an antibiotic[b] was administered into the teat cistern, a sterile silicone implant[c] (Figure 4) was inserted into the teat canal, the teat was bandaged and then rested (not milked) for three days. On the fourth day after surgery, the silicone implant was removed and the milk was drained using a sterile milking tube. Again, an antibiotic[b] was administered into the cistern, a sterile silicone implant[c] was inserted into the teat canal, the teat was bandaged and then rested for another two days. On the sixth day following surgery, the affected teat was routinely milked again. The remaining teats were milked as usual during the treatment period. At re-examination a month later, milkability and milk quality, as well as the teat canal length of the affected teat, were improved. Pathogens detected prior to treatment of the affected quarter were not found. However, milk from the affected quarter now had the same pathogens as those found in the right neighboring quarter (Table 1).

Case Two - "Zange"

On September 6, 1999, a Brown Swiss x Simmental cow named "Zange" was referred to the Veterinary Clinic Babenhausen because of an older milk flow disorder in the right hind teat. "Zange" was 208 days in milk in her second lactation and belonged to a herd of 26 lactating dairy cows that were kept in tie-stalls. She had been treated

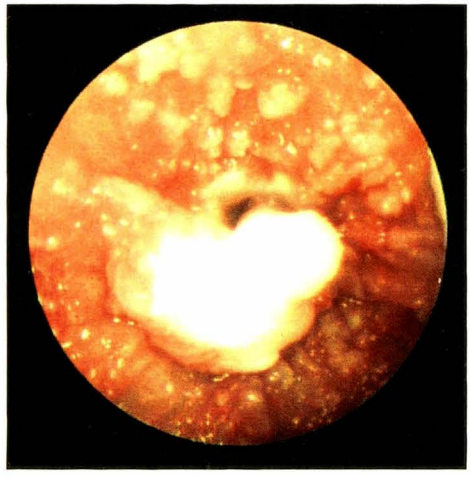

Figure 3. Proliferative inflammation of the teat cistern lining (red) after use of a teat dilator ("teat dilator cisternitis"). Inversion of ruptured teat canal skin (white) into the teat cistern as the cause of a milk flow disorder. View via the lateral teat wall.

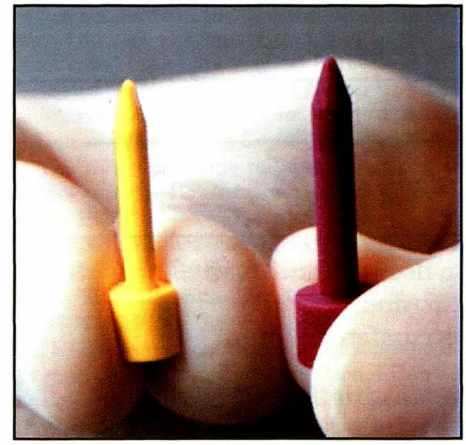

Figure 4. Silicone implants (yellow – thin, purple – thick) used for the prevention of teat canal stenosis after surgery. The head prevents the silicone implants from slipping into the teat.

a year previously for a milk flow disorder in the same teat. Externally, the affected teat was normal. A free body was found in the teat cistern when the teat was palpated. When milked by hand, a thin stream of milk was expressed. When milked by machine, the milk flow from the affected teat was slightly less than that of the remaining teats. The milk from the affected teat showed signs of subclinical mastitis (2.3 million cells/mL of milk and pathogens detected) (Table 2). The canal of the affected teat was 4 mm longer than the canal of the contralateral teat.

A wax teat insert was found inside the teat by using axial and lateral theloscopy. The teat cistern lining was normal (Figure 5). The inner opening of the teat canal was narrowed and irregularily shaped. The teat insert was removed through the teat canal by using forceps. The narrowing of the teat canal was treated with two incisions (at 0 and 180°). The surgery was controlled via lateral theloscopy. Finally, the teat was rested for four days (two times for two days) as described above and milked regularily thereafter. Upon re-examination a month later, milkability and milk quality, as well as teat canal length, were satisfactory. Pathogens previously detected in the milk of the affected quarter were no longer present (Table 2). However, the milk from the left front neighboring teat now showed signs of subclinical mastitis (730,000 cells/mL of milk and pathogens detected).

Discussion

In both cases the suspected free foreign bodies in the teat cistern were verified by theloscopy. Axial theloscopy was used to diagnose the foreign bodies while lateral theloscopy was used to diagnose the causes of milk flow disorders.

[b]Two doses of Celidocin (300 mg of Cefazolin each), Merial, Halbergmoos/Germany
[c]SIMPL, The Butler Company, Dublin, OH

Table 2. Clinical and laboratory findings for the affected quarter and means of the remaining quarters for Case Two - "Zange".

Parameter	First examination		Reexamination one month later	
	Quarter Affected	Remaining	Quarter Affected	Remainig
Teat tip to floor distance (cm)	47	47	48	47
Teat length (mm)	55	57	55	60
Teat tip circumference (mm)	14	12	16	15
California Mastitis Test	++	-	-	-
Flakes	No	No	No	No
SCC (1000 cells/mL of milk)	2314	108	19	270
Pathogens	Staph	No	No	Staph P-
Residues	No	No	No	No
Milk fat (%)	4.04	4.08	4.30	4.01
Milk protein (%)	3.70	3.70	4.01	4.02
Milk lactose (mmol/l)	4.68	4.97	5.19	5.04
Milk urea (mmol/l)	0.15	0.16	0.15	0.18
Teat canal length (mm)	10	6	10	8
Teat canal width (mm)	2	2	2.5	2
Maximal milk flow (kg/min)	0.62	0.76	0.62	0.65
Quarter milk yield (kg)	0.76	0.93	1.38	1.21
Duration of milking (min.sec)	1.00	2.10	3.50	3.50
Daytime (h.min)	14.05	14.05	18.10	18.10

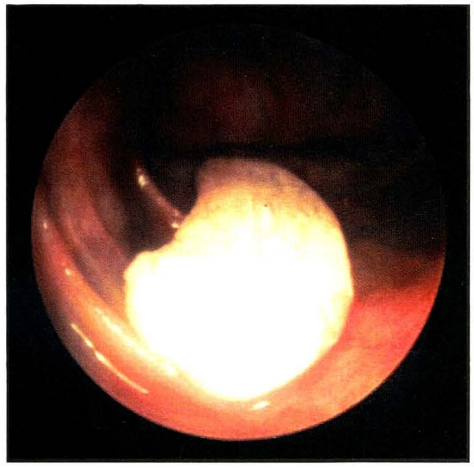

Figure 5. Wax teat insert (without head) as a free foreign body in the teat cistern. View via teat canal.

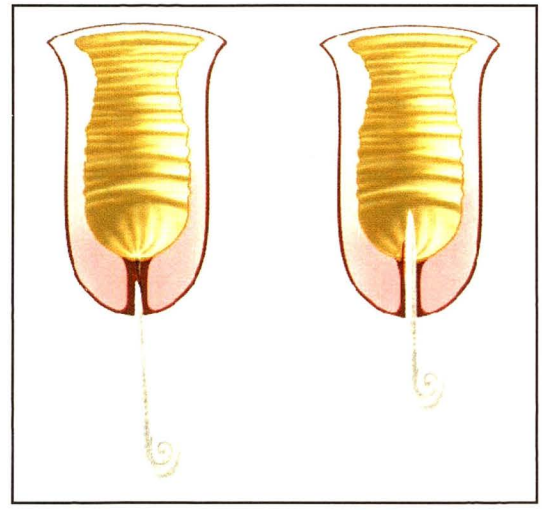

Figure 6. Inversion of ruptured teat canal skin with the insertion of a teat dilator (schematic representation).

In the "Blanka" case, the cause of the milk flow disorder was a rupture and inversion of teat canal skin. This is a frequent cause of milk flow disorders in our patients; it can be diagnosed easily and treated successfully with the aid of theloscopy.[2,14,15,16] When a teat dilator has been inserted into the teat, ruptured teat canal skin may be inverted into the teat cistern[13] (Figure 6). As a result, teat inserts should not be used prior to diagnosis and treatment of milk flow disorders. Furthermore, the "Blanka" case showed again that teat dilators may be lost in the teat[10] and are associated with severe inflammation of the teat cistern lining ("teat dilator cisternitis").[17,19]

In the "Zange" case, the cause of the milk flow disorder was a narrowing of the inner teat canal opening.

This is also a frequent cause of milk flow disorders in our patients; it can also be diagnosed easily and treated successfully with the help of theloscopy.[2,14,15,16] This case shows that wax teat inserts (without a head) may slip into the teat cistern and act as a foreign body. After migrating into the teat they no longer fulfill their purpose, which is to prevent adhesions and narrowing in the teat canal. We prefer to use silicone implants or natural teat inserts with heads[m] for prevention of teat canal stenosis after surgery.

Our findings indicate that foreign bodies were not the cause of the milk flow disorders, but were the consequence of faulty treatment. We conclude that with milk flow disorders, a diagnosis should be made first and then causal treatment should be intitated. Surgical treatment and aftercare as described may quickly improve milkability and milk quality.

The bacteriological findings may indicate that pathogens were exchanged among teats between the time when cows were first examined and re-examination one month later. Vacuum fluctuations may induce reverse flow and reverse spray of milk. As a result, pathogens may be transmitted from one quarter to the other.[4] Further research is needed to determine if this exchange of pathogens could be prevented by general antibiotic therapy or antibiotic treatment of all 4 teats, rather than antibiotic treatment of the affected quarter only.

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[m]NIT, The Butler Company, Dublin, OH