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RESEARCH ARTICLE

Comparison between Two Cecostomy Techniques for Treatment of Atresia Coli in Cattle and Buffalo Calves

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ABSTRACT

The study aimed at determination of the cecostomy technique that will preserve the long-term maximal diameter of the created fistula. The subjects of the study were 79 newly born cattle and buffalo calves suffered from atresia coli, recti and ani. The calves were grouped into four groups for evaluation of incisional and herniation cecostomy techniques either on the right or left flank. With each technique, 4 cm diameter permanent fistula was created and evaluated at the 1stweek, and 1st, 4th and 8th months post-surgery. Both of the short and long-term complications were recorded and managed conservatively. Follow up could be achieved for 45 calves only and all of them showed stunted growth. The results revealed wider stoma in the calves operated by herniation technique, and in those operated on the right flank, moreover the operated cattle calves had wider stoma than buffalo calves. It is concluded that the right flank herniation technique has a beneficial effect on long-term preserving of a wider diameter of the created fistula.

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INTRODUCTION

Intestinal atresia is a congenital anomaly, of four major types, and may be associated with other anomalies. It is frequently observed in newly born animals during the first few days post-parturition and these animals will die within two weeks unless they are surgically treated (Kumar *et al.*, 2009; Bademkiran *et al.*, 2009; Suthar *et al.*, 2010; Ellison and Papazoglou, 2012).

Treatment of the condition is primarily surgical and it should be conducted as early as possible, otherwise both post-surgical short and long-term survival rates will be low (Kilic and Sarierler, 2004). Correction of the condition involves removing the defective section of bowel and reattaching the normal sections in case of atresia coli (Anderson and Rings, 2009). Unfortunately, surgical correction of atresia coli has a poor overall success rate, with a short-term survival rate of less than 50% (Sureshkumar *et al.*, 2011) and a long-term survival rate 12 to 37% (Steiner, 2004).

As a result of lack of literatures discussing alternative cecostomy techniques adopted for treatment of this congenital anomaly and their effect on the diameter of the created fistula, we decided to evaluate the long-term effect of two surgical techniques of cecostomy on the diameter of created stoma when they applied on right or left flank of the affected calves. It should be noted that the main purposes of treatment of these calves were preservation of continued milking of the dams for the longest possible period by saving the life of calves and using of the operated animal for fattening.

MATERIALS AND METHODS

The study was conducted on 79 newly born native or mixed breed cattle and buffalo calves, of ages up to 9 days, and affected with atresia coli, during the period from 2006 to 2010 (Table 1). Only the calves that had no severe signs of depression and appeared apparently suitable for surgery were selected for the study. They were subjected to minimal invasive diagnostic procedures and clinical investigation to avoid stress, during which rehydration and preparation for surgery were conducted to save time. Only 62 calves completed the surgery and the remaining 17 calves were euthanized either prior to or during surgery.

Incisional cecostomy technique: It was performed on the right flank in 7 and 8 cattle and buffalo calves respectively

Table 1: Circumference of the created fistula by different techniques over the period of experiment (Mean±SD)

Technique		Species	No. Operated	No. Alive	Period of Experiment			
					1st week	1st month	4th month	8th month
Incisional technique (I)	Right flank (A)	Cattle	7	5	12.66±0.32a	12.06±0.15b	11.56±0.13c	11.05±0.13d
		Buffalo	8	6	12.61±0.22a	11.78±0.16b	11.04±0.28c	10.10±0.56d
	Left flank (B)	Cattle	10	7	12.61±0.20a	11.89±0.20b	9.56±0.71c	7.18±0.31d
		Buffalo	9	5	12.69±0.15a	11.24±0.37b	8.79±0.28c	6.72±0.25d
Herniation technique (II)	Right flank (A)	Cattle	7	5	12.50±0.13a	12.12±0.15b	11.56±0.13c	11.18±0.15d
		Buffalo	8	6	12.56±0.18a	11.78±0.16b	10.89±0.30c	10.36±0.36d
	Left flank (B)	Cattle	7	5	12.62±0.13a	10.93±0.24b	9.80±0.54c	7.47±0.24d
		Buffalo	6	6	12.56±0.18a	10.78±0.23b	9.42±0.60c	7.12±0.65d
		Total	62	45				

Statistical analysis was made by one way analysis of variance (ANOVA). Values that don't have the same letter in the same row differ significantly ($P<0.05$).

(Group I A) and on the left flank in 10 and 9 cattle and buffalo calves respectively (Group I B). The calves were tranquilized with intravenous diazepam (0.5 mg/ kg) and intramuscular xylazine HCl (0.22 mg/kg), and then they were placed in lateral recumbency and prepared for aseptic surgery, and a flank paralumbar fossa exploratory celiotomy was performed under effect of local analgesia.

When no visible lethal malformation or pathologic changes could be detected, the cecal blind end was exteriorized gently without twisting, and fixed to the three abdominal muscular layers in the ventral commissar of the wound in concentric manner by chromic catgut 3\0 in an interrupted horizontal mattress suture pattern, without involvement of the mucosa. Then the rest of the flank incision was sutured leaving an abdominal defect of about 4 cm diameter through which the blind end of the cecum was protruded. The skin dorsal to the created fistula was sutured while that around the created fistula was sutured to the cecum involving the cecal mucosa, by silk (Fig. 1). Finally, the bulging cecum was excised to create the fistula through which decompression of meconium was performed.

Following decompression, a flexible hand-made silicon cylinder of 4 cm diameter was used to plug the created stoma and a purse string suture pattern, by using chromic cat gut No 2, was applied to the cecal wall and the surrounding muscles to fit its diameter to 4 cm, after which the cylinder was removed and decompression continued.

The aftercare included intramuscular injection of one dose of Oxytetracycline 20% 1 ml/10 kg and a single dose of vitamin AD3E, gradual feeding, and daily dressing of the surgical wound with povidone iodine for 5 days, with removal of stitches 10-12 days post-surgery. Follow-up information was obtained by phone calls and visits to animals of near localities at 1st week, and 1st, 4th, and 8th months post-surgery.

Follow-up aimed at detection of immediate and long-term complications with measuring the diameter of the fistula, by gentle insertion of vaseline lubricated hand-made silicon cone into the created stoma and a calliper. Animals that euthanized, or their follow-up information couldn't be achieved for at least 8 months, were excluded from the study.

Cecostomy by herniation technique: It was performed on the right flank in 7 and 8 cattle and buffalo calves respectively (Group II A), and on the left flank in 7 and 6 cattle and buffalo calves respectively (Group II B).

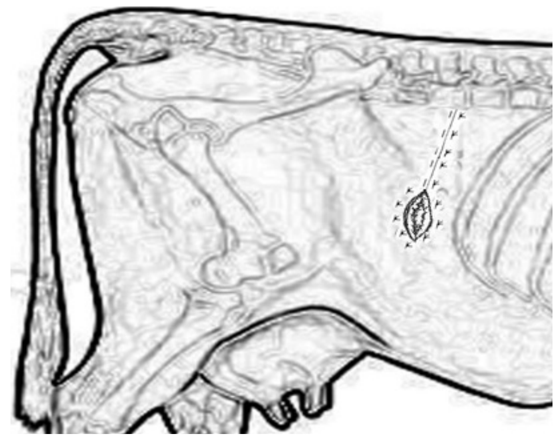

Fig. 1: Diagrammatic illustration of incisional cecostomy technique through right flank of a calf, showing the final appearance of created fistula (slit like fistula).

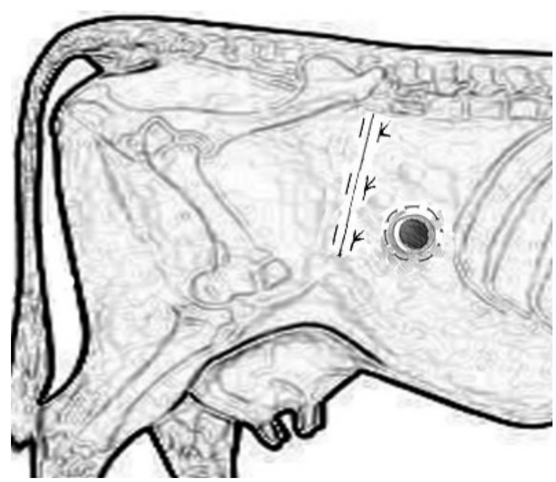

Fig. 2: Diagrammatic illustration of herniation cecostomy technique through right flank of a calf, showing the final appearance of created fistula (circular fistula)

The calves were prepared for surgery and anesthetized in the same mentioned manner. Then after paralumbar fossa exploratory celiotomy was made for exploration and a circular disc of abdominal wall, including the skin and muscles, was excised 5 cm cranial to the original incision to create a hernia. The cecal blind end was grasped through the created ring to create a vesicle. The muscles were fixed to the cecum in the same mentioned manner, and then the flank incision was closed in layers (Fig. 2).

Finally the skin around the created ring was sutured to the cecum including the mucosa after which the blind cecal end was excised to permit decompression of the distended viscera. The flexible hand-made silicon cylinder of 4 cm diameter was used in the same mentioned manner to fit the diameter of the created stoma to 4 cm diameter and the same aftercare and follow-up information were applied to these two groups as the other technique.

Statistical analysis of the circumference of the fistula over the period of experiment was made by one way analysis of variance (ANOVA).

RESULTS AND DISCUSSION

Six calves were euthanized prior to surgery (1 cattle calves and 5 buffalo calves) as a result of severe depression, subnormal temperature, and severe abdominal distension and had 5-9 day-old ages. Another 11 calves were euthanized during surgery (3 cattle calves and 8 buffalo calves) as a result of severe fibrinous peritonitis and necrosis of the distended ischemic bowel, and they had 7-9 day-old ages. Follow up information for 8 months could be achieved for 45 calves only, out of the 62 operated calves, and the remaining 17 calves were excluded from the experiment as a result of difficulty of collecting follow-up information (Table 1, Diag. 1).

The recorded high long-term survival rate (45/62) in this study agree with Ghanem *et al.* (2004); Ellison and Papazoglou (2012) and disagrees with that recorded with large bowel surgery by Cecen *et al.* (2010); Sureshkumar *et al.* (2011); Smith *et al.* (1991) and it might be related to the early surgical correction in our study, as our operated calves had ages of no more than 48 hours, and this emphasise the importance of early surgical intervention as mentioned by Ghanem *et al.* (2005).

Establishment of the continuity to the descending colon by end-to-side or side-to-side anastomosis, as described by Steiner (2004); Sureshkumar *et al.* (2011), had many disadvantages including peritonitis, failure of anastomosis, chronic cecal dilation, impaction at the anastomosis site, functional obstruction of the spiral colon, and adhesive bowel obstruction. Moreover, the complicated bypass and anastomosis procedures are best performed in hospital settings not under field condition (Meylan, 2008) in contrast to the used techniques in our study that avoided these complications, consumed shorter surgery-duration, had less invasive surgical procedures and stress, and of lower cost.

The only observed immediate complication after surgery, with both techniques, was wound infection and this is consistent with Azizi *et al.* (2010) and it could be controlled by parenteral injection of antibiotics. None of the operated calves suffered from leakage of feces to the peritoneum and peritonitis and although this disagrees with Cecen *et al.* (2010), it might be due to the three layer fixation of the cecum to the abdominal muscles with fixation of the cecal mucosa to the skin, prior to excision of the cecum.

Long term complications included skin scalds by the watery feces in all groups, and intermittent accumulation of the watery feces in the cecum in left flank groups which might be due to pressure of the growing rumen on the cecum. The first complication could be managed by periodic swapping of the area below the fistula with vaseline or paraffin oil, while the second one could be resolved by frequent manual evacuation using warm normal saline and gentle finger massage.

Cecal prolapse had never been seen in the four groups despite the relative low position of the created stoma, and this lowers the need for high positioning of the fistula as performed with colostomy technique by Azizi *et al.* (2010). Absence of prolapse might be due to placing a purse string like stitches at the stoma during fitting its diameter to 4 cm and this agrees with Cecen *et al.* (2010).

All of the operated calves had reduced growth rate than normal calves of the same age and it was the main complaint of the owners and this is consistent with Kilic and Sarierler (2004); Smith *et al.* (1991). This reduced growth weight was presumably either due to failure in post-ruminal fermentation and reduced absorption of hind gut fermentation products, or decreased fluid absorption from the colon and utilization of nutrients because of the free flow of fecal matter from the stoma (Kilic and Sarierler, 2004). However not all of the operated calves had the same regimen of feeding, husbandry, vaccination, or hygienic measures, and neither the accurate weights of these animals nor their feeding programs could be recorded, but the reduced weight was a general complaint of the owners. Generally, the outcome was favourable and accepted by the owners because of both continued milking of the dams (Azizi *et al.*, 2010) and saving of the animal life that could be used for meat as veal calves or yearling.

Eight months post-surgery, it was observed that the mean circumference of the created stoma was greater in calves subjected to right flank cecostomy than those subjected to left flank cecostomy, and it was greater in animals subjected to herniation technique than those subjected to incisional technique, when the techniques applied at the same side of the animal. At the same time the mean circumference of the created stoma was greater in cattle calves than buffalo calves within the same group (Table 1, Fig. 1).

Although we are unaware of any other reports documenting the fate of the created fistula of cecostomy, the recorded stenosis of the fistula in I B and II B groups, can be explained in the light of pressure of the growing rumen on the cecum that predisposed to intermittent retention of the watery fecal matter and permitted rapid healing of edges of the fistula, controversial to the right flank fistula that permitted continuous incontinence of liquid feces and preserved a wider diameter of the fistula, accordingly it is not preferred to induce cecostomy on the left side. At the same time, the observed stenosis with incisional technique than herniation technique can be explained in the light of the greater possibility of traumatic inflammation at incision site during exploration that acts as a recipient for the translocated cecum, leading to production of higher amount of fibrous tissue with much more stenotic changes around the created fistula. Moreover, the created fistula is round in herniation technique and slit like perpendicular in incisional technique, accordingly faster fusion of wound lips in incisional technique ensued. Regarding buffalo calves, they had narrower fistula after 8 months than cattle calves, unfortunately there is no available literatures explaining this observation.

Conclusion: It is concluded that there are two main factors adversely affect the circumference of the fistula, including creation of the fistula on the left side of the animal, and creation of the fistula by incisional technique. Accordingly, we are led to conclude that the right flank herniation cecostomy technique seemingly has a beneficial effect on long-term preserving of a wider diameter of the created fistula for treatment of atresia coli in calves, at the same time a fistula wider than 4 cm diameter should be created in buffalo calves to overcome the expected greater probability of stenosis in that species than cattle.

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