

The use of clenbuterol in large animal obstetrics: Manual correction of bovine dystocias

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Abstract

This study was undertaken to test the effect of clenbuterol, a smooth muscle relaxant, as an aid for the manual correction of bovine dystocias in a rural Quebec practice. The drug was given initially by intravenous coccygeal or jugular injection at a dose of 0.6 µg–0.8 µg/kg of body weight to parturient cows affected with fetal malpresentations (n=37), malpostures (n=112), or uterine torsions (n=70). These cases comprised 32% (219/688) of the manually corrected dystocias encountered in cattle during the trial. Ease provided for obstetrical maneuvers of different types of dystocias was the evaluation criteria used in this report. The drug's myometrial relaxant effect made corrections easier for the veterinarian, and shorter and less traumatic for the dam. The success rates achieved for vaginal corrections and delivery of uterine torsions were 84% (76/91) and 77% (70/91), respectively. Other recorded benefits included the need for less frequent use of epidural anesthesia and a significantly lower incidence of retained fetal membranes ($\chi^2 = 11.18$, $p < 0.001$). No adverse reactions were observed at any time. Clenbuterol proved to be a useful drug for manual correction of dystocias in cattle.

Résumé

L'utilisation du clenbutérol lors de la correction manuelle de dystocias chez la vache

Cette étude a été entreprise pour évaluer l'effet du clenbutérol, un relaxant des muscles lisses, comme aide à la correction manuelle de dystocias bovines dans le cadre d'une pratique rurale du Québec. Cette drogue fut administrée initialement par voie intraveineuse coccygienne ou jugulaire en raison de 0.6 µg–0.8 µg/kg de poids vif à des vaches parturientes affectées de problèmes de présentations (n=37) et de postures (n=112) fœtales ainsi que de torsions utérines (n=70). Ces cas ont représenté 32 % (219/688) des dystocias corrigées manuellement chez l'espèce bovine durant cette expérience. La facilité obtenue pour les manœuvres obstétricales de différents types de dystocias fut le critère d'évaluation utilisé dans ce rapport. L'effet relaxant de cette drogue sur le myomètre rendit les corrections du vétérinaire plus faciles, courtes et moins traumatisantes pour la vache. Le taux de succès atteint pour les corrections et l'extraction fœtale par le vagin lors de torsions utérines fut de 84 % (76/91) et de 77 % (70/91), respectivement. Parmi les autres avantages on nota un usage moins fréquent de l'anesthésie épidurale et une incidence significativement moins forte de rétentions placentaires ($\chi^2 = 11.18$, $p < 0.001$). Aucune réaction adverse fut observée au cours de cette étude. Le clenbutérol s'est avéré un médicament utile à

l'aide des corrections manuelles de dystocias chez la vache.

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Introduction

In bovine obstetrics, abdominal straining can be briefly interrupted with epidural anesthesia but uterine contractions cannot (1–3). However, some sympathomimetic compounds selectively block smooth muscle contraction and their effect on the uterus is known as tocolysis (4–7). One of these, clenbuterol, is a potent smooth muscle relaxant, noted for its rapid, strong, durable, and safe action (4,8). The drug's tocolytic properties have been reviewed (9) and its effectiveness as an aid for surgical corrections of dystocias in cows and ewes has been reported (10). Although publications on the use of clenbuterol for manual correction of dystocias exist (4,5,11–19), very few provide detailed information on the practical application of the drug in the field.

This paper discusses the use of clenbuterol in manual corrections of dystocias involving 219 cows.

Materials and methods

Data were collected in the course of obstetrical work conducted over an 8.5 year period using a standard reporting form. Dystocias were managed by two veterinarians according to accepted principles and guidelines (1,2,20–24). Case selection for the use of clenbuterol followed a fixed working plan. First, a thorough examination of the animal's genital tract was made by the attending veterinarian. After determining the cause of the problem, an attempt was made at dystocia correction and fetal extraction. Abdominal straining that hindered obstetrical examination and maneuvers was controlled by low epidural analgesia with 5–7 mL of 2% mepivacaine hydrochloride (Carbocaine-V, Winthrop Laboratories, Aurora, Ontario).

Cases in which these operations proved to be too difficult or dangerous were chosen for clenbuterol treatment; this involved the intravenous (coccygeal) injection of 0.6 µg–0.8 µg/kg body weight (BW) of the drug (Ventipulmin Solution, 30 µg per mL, Boehringer Ingelheim, Burlington, Ontario) 15–20 min before the start of obstetrical corrections. In eight dystocias, the duration of tocolysis was extended by giving intramuscular injections of clenbuterol q4h or q6h at a dosage of 0.8 µg–1.0 µg/kg BW. In 20 dystocias, the drug was mixed and administered with various other commercial solutions given by intravenous jugular injection for the treatment of concomitant milk fever. Dystocias resulting from either abnormal presentations or postures of the fetus and all uterine torsions were selected to evaluate the drug's effectiveness as an aid for their correction. Dystocias caused by fetomaternal disproportion, uterine inertia, or combinations of both were not treated with clenbuterol when they could be resolved

Table 1. Bovine dystocias manually corrected with clenbuterol (n = 232)

Dystocias	Total
Fetal	
oversize ^a	6
sacropubic ^b	35
transverse	2
forelimb retention	25
head deviation	41
breech	41
hock flexion	5
Maternal	
uterine torsion	70
slow dilating cervix	7
Total	232

^a Refers to relative fetomaternal disproportion

^b Cranial and caudal presentations

medically or by gradual dilation of the birth canal followed by moderate traction. If these procedures were judged inadequate to allow safe delivery of the fetus, tocolysis was induced with clenbuterol to facilitate surgical intervention or interrupt the labor process.

Interruption of labor was attempted, after client consent, in cases where further preparation of the birth canal might allow labor to resume normally later on, delivery to be resolved by traction, or surgery to be performed at a more convenient time. Duration of labor interruption was measured from the time that elapsed between the onset of tocolysis and the return of contractions or the start of delivery procedures by traction or surgery. Duration of second stage labor at the time of first clenbuterol treatment was estimated from information gathered upon initial examination of the dystocia.

Treatment efficacy was based on the practitioner's evaluation of uterine relaxation before and after use of clenbuterol. Tocolysis was recorded as good, adequate, or poor, depending on the ease with which specific obstetrical maneuvers were performed. Other benefits derived from the use of clenbuterol were also recorded. Conclusions on safety and adverse effects to dam and offspring were drawn from data recorded under adverse side effects, placental retention, and calf survivability. The placenta was considered to be retained if it was not expelled within 24 h. Calf viability was scored, one day after delivery, as alive or dead. Statistical analysis of the data was done by the 2×2 chi-square test (25) using StatXact version 2 (Cytel Corporation, Cambridge, Massachusetts, USA).

Results

Eight hundred and forty-six bovine dystocias were managed in the course of this trial. No adverse reactions following the use of clenbuterol were observed. All surgically corrected cases (n=158) received clenbuterol. Manually corrected cases (n=688) were separated into two groups: clenbuterol treated (n=232) and nontreated controls (n=456). This report presents cases (n=219) in which corrective maneuvers were made with the use of

Table 2. Influence of clenbuterol treatment on the retention of fetal membranes

Dystocias	Yes	No	Total
Treated	48	184	232
Control	150	306	456
Total	198	490	688

$\chi^2 = 11.18, p < 0.001$

clenbuterol. Typical dystocias involved are shown in Table 1. Parturient paresis was diagnosed in 9% (20/232) of the treated and in 10% (44/456) of the control cases. Treated and control groups presented similar abortion and premature parturition rates of 5% and 3%, respectively. More often only adequate instead of good relaxation was recorded in dystocias arising from these two conditions. Twinning was slightly higher in the treated group: 13% (28/219) versus 10% (45/456). Epidural anesthesia was used, prior to clenbuterol, in 37% (80/219) of treated cases; controls required its use in 70% (319/456) of the cases. Rates of retained fetal membranes (RFM) were compared and found to be significantly lower ($\chi^2 = 11.18, p < 0.001$) in the clenbuterol treated group (Table 2).

Uterine torsion

An 11% (91/846) incidence of bovine uterine torsion was recorded during this study. Twenty-one cases (23%) were delivered surgically. Seventy cases (77%) were delivered vaginally (Table 3). Seventy-six torsions (84%) were corrected vaginally by hand (n=41), detorsion rod (n=9), or rolling technique (n=26). Detorsion was not attempted in nine cases, while attempts were unsuccessful in another six cases.

Malpresentation

Cranial and caudal sacropubic (n=35) and dorsotransverse (n=2) presentations represented 17% (37/219) of the manually corrected dystocias using clenbuterol. Fetal repulsion and rotation or advancement of its nearer extremity to the birth canal became easier after the onset of tocolysis.

Malposture

Abnormal postures totaled 51% (112/219) of the dystocias in this report. Retropulsion of the fetus and repositioning of the limbs were facilitated when the uterus was relaxed in cases of forelimb retention (n=25), hock flexion (n=5), and breech presentations (n=41). Twin calves were present in 49% (20/41) of the breech presentations. Locating and repositioning head and neck deviations (n=41) were also easier when clenbuterol was used.

Discussion

Two hundred and thirty-two dystocias were managed manually with the aid of clenbuterol. Management of six cases of fetal oversize and seven cases of slow dilating cervix was achieved by delaying the calf's delivery. It will be the topic of another report.

Table 3. Comparative rates of correction and delivery methods reported in this and two other studies on bovine uterine torsion

Uterine torsion	Detorsion			Delivery	
	Vaginal ^a		Abdominal ^b	Vaginal ^c	Surgical ^d
	Hand	Rod	Rolling		
Ménard n = 91	41(45%)	9(10%)	26(29%)	15(16%)	70(77%)
Manning ^e n = 96	23(24%)	7(7%)	5(5%)	61(64%)	35(36%)
Pearson ^f n = 168	64(38%)			104(62%)	31(18%)

^a Manual detorsion of the uterus through the vagina

^b Detorsion by laparotomy

^c Manual delivery of the fetus through the vagina

^d Delivery by cesarean section or fetotomy

^e Manning J *et al* (29)

^f Pearson H (30)

Good myometrial relaxation was obtained in most bovine dystocias and allowed better access, easier correction, and greater lubrication of fetal parts and segments of the genital tract. Thus, fetal extractions performed on dystocias of normal or long-standing duration often required less force and were less traumatic (2,26).

The observation that clenbuterol's action was less potent in dystocias arising from abortions and premature parturitions confirmed an earlier report (28). An improper ratio of myometrial alpha and beta receptors at the time of these untoward events might explain the drug's reduced efficacy (4-7).

Poor relaxation was recorded in three of six uterine torsions where vaginal attempts at detorsion were unsuccessful. These were long-standing cases where torsion was greater than 360 degrees. Impeded circulation may have prevented the drug from reaching or activating a sufficient number of receptor sites (10). Otherwise, clenbuterol proved to be a very useful aid for detorsion. Better assessment of the direction of the torsion, easier passage of the hand through the vaginal folds, and easier rotation of the fetus by manual purchase were obtained after treatment in most cases. The recourse to detorsion by laparotomy was used much less frequently in this study than in two earlier reports (29,30) because of the high success rate of manual corrections through the vagina obtained with the use of clenbuterol. Also, the number of surgical deliveries was decreased, because the uterus could be effectively maintained in a relaxed state after detorsion, allowing for better relaxation and dilation of the soft tissues of the birth canal. Thus, more vaginal deliveries became possible and were performed.

Corrections of malpresentations and malpostures could be effected more easily and rapidly with the use of clenbuterol. Repulsion and rotation of the fetus in sacropubic presentations was easier. Repulsion of the fetus and advancement of its nearer extremity to the birth canal was made possible in two cases of dorsotransverse presentations; this form of presentation had never been corrected and delivered manually in the practice before the use of clenbuterol. Maneuvers applied for the correction of forelimb retention, hock flexion, breech pre-

sentations, and head deviations were also greatly facilitated. The common occurrence of twin calves in breech presentations was also observed in this study (27). Lack of maneuvering space makes corrections more difficult and increases the likelihood of uterine perforation in this type of dystocia (1,2). However, the application of tocolysis greatly improved maneuverability and prevented injuries to the dam in the twenty cases managed in the study. Likewise, resolution of simultaneous engagement of twins where the first calf had a forelimb retention was facilitated in five cases.

Other benefits from the use of clenbuterol were recorded. Epidural anesthesia was needed less frequently in the clenbuterol treated cases, because the drug's tocolytic effect relieves labor pains to some extent (13,15) and allows obstetrical maneuvers to be carried out easily when straining is moderate. Therefore, its use could be reserved for cases showing strong abdominal straining, as a complement to clenbuterol, in order to facilitate dystocia corrections or to help prolong the delay of delivery. The admixture of clenbuterol to commercial solutions for the treatment of milk fever was convenient and caused no undesirable reactions in the twenty cases of this study.

The drug's myorelaxant effect did not increase RFM. Analysis of the data shows that RFM rates between treated and control groups are statistically different ($p < 0.001$). The lower incidence of this condition in cows treated with clenbuterol is consistent with past reports (10-13,31). Despite these findings, the influence of drug treatment on RFM will need to be further investigated because of the great number of other variables involved.

Clenbuterol consistently provided ease for manual corrections of at term dystocias and produced no adverse effects. Therefore, it can be considered as an efficacious drug for use in the management of dystocias in cattle.

CVJ

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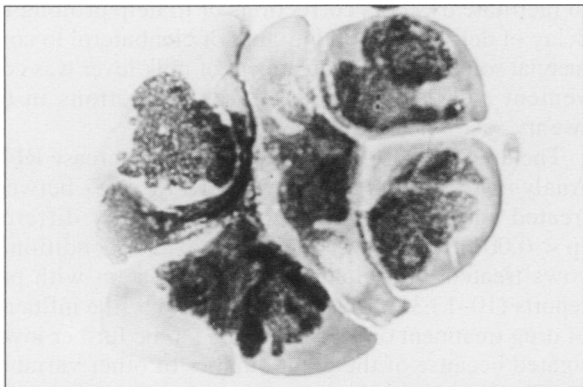


Figure 1. Cerebrospinal fluid of cat 13 with an ependymoma. Neoplastic cells are evident in cytocentrifuge preparation. Wright's stain 1000 x.

Correction

Clinical, cerebrospinal fluid, and histological data from thirty-four cats with primary non-inflammatory disease of the central nervous system

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Dean Percy, Robert Jacobs**

Unfortunately, the wrong photo of Figure 1 was printed. The correct photo is reprinted here.