PEER REVIEWED

Effect of Different Castration Methods on Growth Performance and Behavior Responses of Postpubertal Beef Bulls

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Abstract

Fifty mixed-breed, 790 lb (359 kg) preconditioned bulls were utilized to examine the effect of different castration methods on animal performance and behavior response. Cattle were blocked by weight and randomly assigned to one of five treatments: non-castrated control (CNT); castrated using high-tension rubber bands (BND); castrated using high-tension rubber bands with lidocaine local anesthesia (BNDL); castrated surgically (SURG); and castrated surgically with lidocaine local anesthesia (SURGL). Cattle were fed individually for 28 days post-castration. Castrated cattle tended to have lower dry matter intake (DMI) than CNT cattle throughout the study (P=0.12). BND/BNDL cattle had higher DMI than SURG/SURGL cattle during the first week post-castration (P=0.04), however, SURG/SURGL cattle had higher DMI than BND/BNDL cattle during the last week of the study (P=0.05). Castrated cattle had lower average daily gain (ADG; P<0.01) and gain efficiency (GE; P<0.01) than CNT cattle. SURG/SURGL cattle had more favorable ADG (P<0.01) and GE (P<0.01) than BND/BNDL cattle during the study. There were minimal to no behavioral differences observed post-castration between treatment groups. Use of local lidocaine anesthesia had no effect on performance, post-castration behavior or vocalization during castration, regardless of castration method utilized. A positive correlation was found between scrotal circumference and vocalization (P=0.05); however, the correlation between body weight and vocalization was not significant.

Keywords: bovine, bulls, castration, lidocaine, anesthesia

Résumé

Un total de 50 taureaux de race croisée de 790 livres (359 kg) préconditionnés ont été utilisés pour examiner l'effet de différentes méthodes de castration sur la performance des animaux et leur réaction comportementale. Les bovins ont été classés selon le poids et alloués aléatoirement à l'un des cinq traitements suivants : (1) groupe témoin sans castration, (2) groupe avec castration par des bandes élastiques (BND), (3) groupe avec castration par des bandes élastiques avec anesthésie locale à la lidocaïne (BNDL), (4) groupe avec castration chirurgicale (SURG), et (5) groupe avec castration chirurgicale avec anesthésie locale à la lidocaïne (SURGL). Les bovins ont été nourris individuellement pendant 28 jours suivant la castration. La prise alimentaire en matières sèches était marginalement moindre chez les bovins castrés que chez les bovins témoins dans l'ensemble de l'étude (p = 0,12). Pendant la première semaine suivant la castration, la prise alimentaire en matières sèches était plus élevée chez les bovins BND et BNDL que chez les bovins SURG et SURGL (p = 0,04). Toutefois, dans la dernière semaine de l'étude, les bovins SURG et SURGL avaient une prise alimentaire'en matières sèches plus élevée que les bovins BND et BNDL (p = 0,05). Le gain moyen quotidien et la conversion alimentaire étaient moindres chez les bovins castrés que chez les bovins témoins (p < 0,01). Le gain moyen quotidien et la conversion alimentaire étaient plus élevés chez les bovins SURG et SURGL que chez les bovins BND et BNDL pendant l'étude (p < 0,01). Les différences comportementales après castration selon la méthode de castration étaient minimes ou absentes. L'utilisation de la lidocaïne dans les deux types de cas-

tration n'a pas réduit la vocalisation. Il y avait une corrélation positive entre la circonférence du scrotum et la vocalisation (p = 0,05) mais il n'y avait pas de corrélation significative entre le poids et la vocalisation.

Introduction

Male calves are commonly castrated by farmers, ranchers and veterinarians to decrease secondary sex characteristics and to improve beef quality. Many different methods of castration can be used. Today, the most common methods of castration are surgical castration and use of high-tension rubber bands (banding). Each method of castration has positive and negative attributes, but all methods of castration result in some stress on the animals.

Public concern about the welfare of farm animals has led to interest in pain caused by routine husbandry practices, and has stimulated research into better understanding pain in livestock and how best to alleviate it.[13] Various modalities of analgesics have been investigated to reduce pain and stress in animals. Earley and Crowe evaluated the use of ketoprofen, a non-steroidal anti-inflammatory drug, and the use of lidocaine for local anesthesia, to alleviate pain in surgically castrated cattle.[6] Ting *et al* evaluated stress of castration when using ketoprofen, lidocaine local anesthesia, or combined xylazine and lidocaine caudal epidural anesthesia.[15]

Much research regarding castration techniques has been conducted in European countries, where there is a legal requirement to provide anesthesia when castrating calves greater than six months of age.[1] *The Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching* recommends that calves older than two to three months of age be administered a local anesthetic.[2]

The National Cattlemen's Beef Association's *The Cattle Industry's Guidelines for the Care and Handling of Beef Cattle*, recommends that calves weighing more than 500 lb (227 kg) be castrated using a bloodless castration technique, such as an elastic banding device, unless pain management is used, such as local anesthesia.[10] Lidocaine is commonly used for local anesthesia, with 10 to 15 minutes onset of action and 60 to 120 minutes duration of action.[8,12] The objective of this study was to compare the effects of either surgical castration or banding on the subsequent performance and behavior patterns of bulls weighing over 500 lb at the time of castration. In addition, we examined effects of local anesthesia using lidocaine in combination with each castration method on feeder calf performance and behavior during the 28-day study.

Materials and Methods

Animals and treatments

Fifty mixed-breed, preconditioned bulls (790 ± 77 lb; 359 ± 35 kg) were used to determine the effects of castration method and use of local anesthesia on behavior and performance. Upon arrival, bulls were vaccinated with a modified-live viral IBR, BVD type 1 and 2, BRSV and PI3 vaccine,[a] and treated for internal and external parasites with doramectin pour-on[b] at label dosage. All calves were uniquely identified with an ear tag in the left ear.

Cattle were blocked by weight and randomly assigned by the order they entered the chute to one of five treatments within blocks (n=10): 1) untreated control (CNT); 2) banded using a high-tension elastic rubber band (BND); 3) banded following local anesthesia with lidocaine (BNDL); 4) surgically castrated (SURG); or 5) surgically castrated following local anesthesia with lidocaine (SURGL). Bulls were housed at the Kansas State University Beef Research Unit in individual stalls measuring five feet by 12 feet (1.52 m by 3.66 m) with individual feed bunks and shared water supplies between adjacent pens. Bulls assigned to BND and BNDL treatments were vaccinated with an 8-way clostridial bacterin-toxoid that contained tetanus toxoid.[c] Bulls in the CNT, SURG and SURGL treatment groups were vaccinated with 7-way clostridial bacterin-toxoid.[d]

Bulls were allowed to acclimate to their environment and individual pens for seven days prior to trial initiation. Cattle were fed a starter ration *ad libitum* (Table 1) during the acclimation period, and were fed the same diet throughout the 28-day study. After trial initiation (day 0), individual dry matter intake (DMI) was measured daily by removing, weighing and recording the amount of feed remaining in the bunk for each animal before new feed was weighed, placed in the feed bunk and recorded. Cattle were weighed on days 0, 7, 14, 21 and 28. At day 0, individual animals were processed according to treatment group. Baseline weight and scrotal circumference were recorded for each animal on day 0.

Experimental procedures

Upon trial initiation, all bulls were weighed and the respective clostridial bacterin-toxoid was administered. At this time, 2% lidocaine was administered to provide local anesthesia to cattle in the SURGL and BNDL treatment groups. By doing this, all bulls had equal trips through the chute, regardless of treatment.

Each bull in the SURGL and BNDL groups was restrained in a squeeze chute to administer the local anesthesia. Local anesthesia was performed by injecting 5 mL of 2% lidocaine into each spermatic cord as far

Table 1. Diet composition and chemical analysis.[9,11]

Diet composition (DM basis)	Percent
Steam flaked corn	47.80
Alfalfa	36.46
Steep	10.62
0512 Cont	2.84
R-T Premix*	2.28
Chemical analysis	
Crude protein %	17.28
NDF %	23.29
Calcium %	0.59
Phosphorus %	0.35
Potassium %	1.20
Magnesium %	0.21
Sulfur %	0.32
Zinc ppm	84.34
Copper ppm	12.44
Manganese ppm	70.82
Iron ppm	111.89

*Rumensin®-Tylan® Premix, Elanco Animal Health

anterior as could be palpated, and 10 mL of 2% lidocaine was administered along the circumference of the neck of the scrotum using a 1.5 inch, 16-gauge needle. After administration of lidocaine, bulls were released into a holding pen. After a minimum 10-minute waiting period, cattle from all treatments were brought back through the chute and castrated or left as a control based on their respective treatment assignment. When surgical castration (SURGL) was performed, the veterinarian performing the surgery confirmed that lidocaine was present in the spermatic cords of all calves in that treatment group. It was not possible to confirm that lidocaine had been properly injected into the spermatic cords of bulls castrated by banding (BNDL).

Prior to castration, scrotal circumference was measured by placing a scrotal tape around the greatest circumference of the intact scrotum of all bulls, and measured to the nearest centimeter. Surgical castration, SURG and SURGL, was performed using a Newberry knife to open the distal one-third of the scrotum. Testicles were then exteriorized and removed with a drill-driven castration tool[e] clamped proximal to the testicle on the spermatic cord. The castration device was connected to a portable electric drill used to spin the tool until the spermatic cord was severed by twisting, effectively closing the cord.

Bulls in the BND and BNDL treatment groups were banded using a purpose-built band application device.[f] Wide rubber bands were placed around the neck of the scrotum proximal to the testes, and tightened using a built-in ratchet. Tension on the band was indicated by a non-quantitative measuring device built into the banding instrument. When the correct tension was reached, the rubber band was secured by compressing the metal clip, which was designed to prevent slippage and loss of band tension. Bands were then severed midway between the metal clip and the banding instrument. Banded bulls were observed daily; the day the scrotum fell off was recorded for each animal.

Behavioral assessment

Behavioral assessment of cattle was conducted the day before castration, the day of castration and daily for 28 days post-castration. During the first 14 days of the study, cattle were evaluated twice daily, at 6:30 AM and at 5:00 PM. From day 15 to day 28, calves were evaluated and scored once daily. Scoring was based upon visual evaluation of five categories: attitude, scrotal swelling, gait and posture, appetite and lying (Table 2). Masking of evaluators was not possible because treatment assignments were readily visible.

Vocalization was scored by evaluating phonation during the castration procedure. A score of 0 was assigned when there was no vocalization, 1 for slight vocalization and 2 for extended vocalization.

Statistical Analysis

Descriptive statistics were generated and presented in graphical or tabular formats. For analytical purposes, mixed-models methodologies were used such that within each model, the random effect of block was included. Where models were constructed to evaluate an effect over time, repeated-measures methodologies were also used. Block by treatment and block by time were included as random variables. In addition, within-animal dependency over time was modeled using first-order autoregression covariance matrices.[7] Continuous outcomes were modeled using general linear models, whereas categorical outcomes were modeled using generalized linear models. Where appropriate, least square means were computed and plotted.

Results

Performance

One animal in the BNDL treatment group died of tetanus. Data from this animal were removed from the data set. There were no castration method by local anesthesia interactions, suggesting that cattle that received local anesthesia prior to castration had similar performance and behavior responses to calves castrated without local anesthesia, regardless of castration method applied, and vice versa. Therefore, only the main effects are reported.

Table 2. Post-castration behavior scoring system.

Attitude 0=Bright, alert, responsive 1=Quiet but rouses when approached 2=Quiet but rouses only when pen is entered 3=Does not move when pen is entered or has to be touched to get up
Scrotal swelling 0=None 1=Minor redness/swelling 2=Inflamed with seepage 3=Inflamed with major drainage
Gait and Posture 0=Normal 1=Reluctant to move, stiff gait 2=Mild incoordination when stimulated, hunched posture 3=Obvious ataxia or head tilt, hunching, drags one or both limbs
Appetite 0=Normal, eats daily ration, evidence of urine and feces, food missing from feeder or floor 1=Food is not completely consumed, normal hydration and feces 2=No interest in food, hydration normal, no fresh feces or urine 3=No interest in food, appears dehydrated (skin "tents")
Lying 0=Lying normal, ruminating, head up 1=Lying, with head down 2=Lying, with full or partial extension of hind legs 3=Lying, in lateral position

There was no overall difference in feed intake during the 28-day feeding trial (P=0.12) attributable to castration method or use of local anesthesia. However, there was a castration method-by-week interaction for DMI (Figure 1). In the first week of the trial, cattle that were banded had higher DMI than cattle surgically castrated (P=0.04). During the second and third weeks of the study, no differences in DMI between treatment groups (P=0.47 and P=0.52, weeks 2 and 3, respectively) were observed. In week 4, banded cattle had lower DMI (P=0.05) than cattle that were surgically castrated. Use of local anesthesia had no effect on DMI intake, regardless of method of surgery (P=0.23; Table 3).

Intact bulls (CNT) had greater average daily gain (ADG) than castrated animals during the 28-day study (P<0.01; Figure 2), regardless of castration method or use of local anesthesia. There were, however, differences in gain between cattle surgically castrated and those that were banded; cattle in the SURG and SURGL groups gained more (P<0.01) than those in the BAND and BANDL groups. Use of lidocaine had no effect on ADG in castrated cattle, regardless of method used (Table 3).

CNT cattle had significantly higher gain efficiency (GE) than castrated cattle, regardless of method used (P<0.01; Figure 3). Surgically castrated cattle had higher GE compared to those that were banded (P<0.01). Use of lidocaine did not affect GE in castrated bulls, regardless of castration method (P=0.24; Table 3).

Behavioral effects

Five categories of behavior were evaluated: attitude, scrotal swelling, gait and posture, appetite and lying. No differences were observed in attitude, appetite or lying behavior between treatment groups during the study.

SURG and SURGL cattle had more post-castration scrotal swelling than CNT or BAND/BANDL cattle (P<0.01; Figure 4). In Figure 4, observation times two through 29 correspond to twice-a-day visual inspections during the first 14 days of the study, whereas observation times 30 through 46 correspond to once-a-day visual inspections taken the last 14 days of the study. As days-on-feed increased, scrotal swelling in BAND and BANDL cattle increased, but decreased in SURG and SURGL cattle.

Abnormal gait behavior was more pronounced in castrates than CNT cattle (P<0.01; Figure 5). There

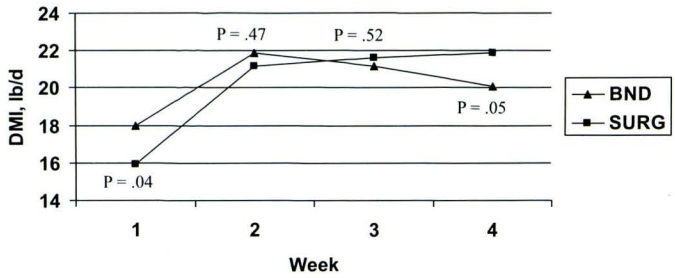

Figure 1. Effect of castration method and local anesthesia on subsequent DMI in feeder calves.

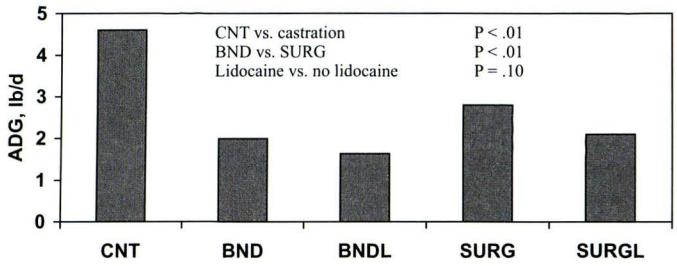

Figure 2. Effect of castration method and local anesthesia on subsequent ADG in feeder calves.

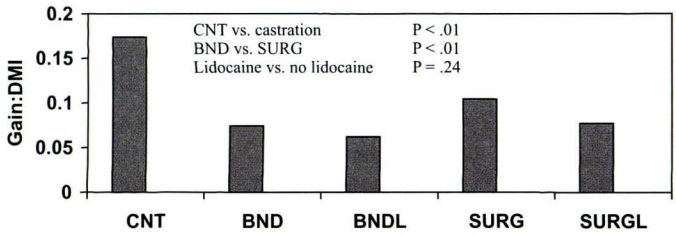

Figure 3. Effect of castration method and local anesthesia on subsequent gain efficiency in feeder calves.

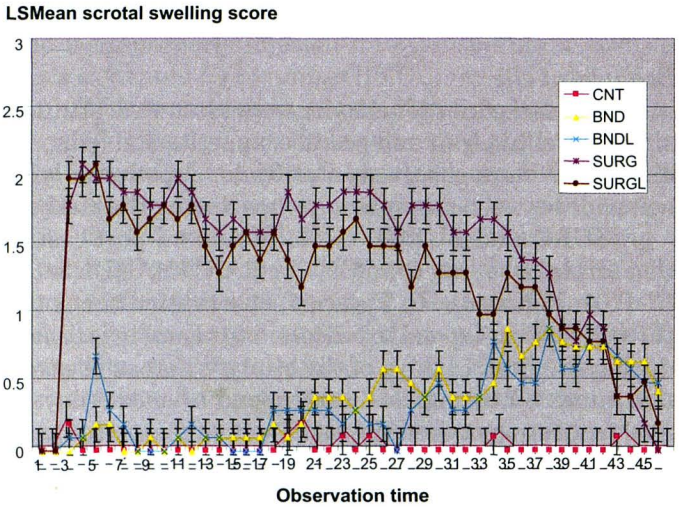

Figure 4. Effect of castration method and local anesthesia on post-castration scrotal swelling in feeder calves.

Table 3. Effect of castration method and local anesthesia (lidocaine) on subsequent weekly performance of feeder calves.

Dry matter intake, lb/day

		Surgery		Band		*P*-values		
Week	Control	Lido	No lido	Lido	No lido	CNT vs SURG	BND vs SURG	Lido vs no lido
1	18.2	15.2	16.6	17.5	18.4			
2	22.4	20.2	22.1	21.8	22.0			
3	22.4	20.6	22.6	21.4	20.9			
4	23.3	21.5	22.4	20.1	20.2			
overall	21.6	19.4	20.9	20.2	20.4	0.12	0.89	0.23

ADG, lb/day

		Surgery		Band		*P*-values		
Week	Control	Lido	No lido	Lido	No lido	CNT vs SURG	BND vs SURG	Lido vs no lido
1	3.50	-1.10	1.10	0.03	1.11			
2	5.34	4.16	3.80	3.80	3.03			
3	4.12	2.94	2.96	0.59	1.38			
4	5.44	2.38	3.34	2.12	2.43			
overall	4.60	2.10	2.80	1.63	1.99	< .01	< .01	0.10

Gain/DM intake

		Surgery		Band		*P*-values		
Week	Control	Lido	No lido	Lido	No lido	CNT vs SURG	BND vs SURG	Lido vs no lido
1	0.1504	-0.0660	0.0419	-0.0039	0.0497			
2	0.1972	0.1658	0.1432	0.1479	0.1010			
3	0.1524	0.1161	0.1067	0.0199	0.0574			
4	0.1954	0.0911	0.1231	0.0862	0.0872			
overall	0.1739	0.0768	0.1037	0.0625	0.0738	< .01	< .01	0.24

LSMeans gait scores

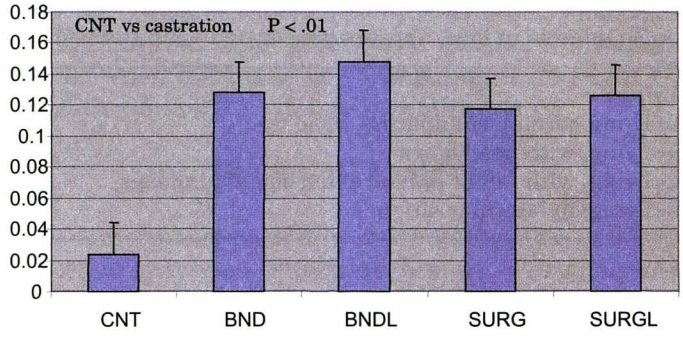

Figure 5. Effect of castration method and local anesthesia on post-castration gait score in feeder calves.

was no castration method-by-day interaction for gait score. Cattle were scored twice daily for the first 14 days post-castration, and once daily from days 15 to 28. There were no statistical differences between any castration method for gait scores at any observation time.

Banding cattle had no effect on vocalization (data not shown) as compared to CNT animals. Surgical castration, however, caused increased vocalization in bulls relative to CNT and banded cattle. Local anesthesia did not decrease vocalization scores, regardless of castration method utilized.

Average scrotal circumference of bulls was similar across all treatments (30.2 cm; P=0.88). Average scrotal sizes by treatment were: CNT-29.3 cm; BND-30.0 cm; BNDL-30.8 cm; SURG-30.6 cm; and SURGL-30.5 cm. Multiple regression was used to analyze the effects of scrotal circumference and body weight on vocalization (Table 4). Cattle in the CNT group were not utilized in the analysis of vocalization because they were

Table 4. Effect of scrotal circumference and body weight on vocalization at the time of castration.

Effect	Estimate	Error	DF	t value	Pr>t
Intercept	-0.5213	1.6854	9	-0.31	0.77
Scrotal circumference	0.04611	0.02238	38	2.06	0.05
Average weight	-0.00083	0.002153	38	-0.39	0.70

not castrated. A positive correlation was found between scrotal circumference and vocalization (P=0.05); however, the correlation between body weight and vocalization was not significant. To further illustrate this point, if scrotal circumference was less than or equal to 28 cm, mean vocalization score was 0. When the scrotal circumference was greater than 28 cm and less than or equal to 32 cm, mean vocalization score was 0.2, while a scrotal circumference greater than 32 cm was associated with a mean vocalization score of 0.46.

Discussion

Performance

In this study, there was no statistical difference in DMI between treatments during the 28-day study (Figure 1), which is in agreement with other reports.[6,15] However, this study showed a treatment-by-week interaction for DMI. In week one, banded cattle had higher DMI than surgically castrated animals, but this reversed during week four, with the surgically castrated animals consuming more dry matter than banded animals. Fisher *et al* reported that for the first seven days post-castration, surgically castrated animals had lower DMI than control animals.[8] However, there was no effect of surgical castration on DMI after the first week following castration. This demonstrates the acute nature of stress associated with surgical castration of bulls, which has been demonstrated in previous studies by measuring cortisol levels.[3,4,5,14,15]

Intact bulls had higher ADG than castrated animals during the 28-day study period, regardless of method of castration or use of local anesthesia (Figure 2, Table 3). These findings are consistent with previously reported research.[3,5,6,15] There are very few published studies which compare banding to surgical castration. Results from our study showed that surgically castrated (SURG/SURGL) calves had higher ADG than banded (BND/BNDL) calves. This is in conflict with other studies. In a preliminary report, Wildman *et al* reported that banded calves outperformed surgically castrated calves for the first 159 days-on-feed.[16] Chase *et al* examined the potential interaction between breeds by using Angus, Brahman and Hereford bulls, as well as their response to stress of castration.[3] Bulls were either surgically castrated, banded or retained as bulls. No statistical difference in ADG was seen between surgically castrated and banded animals.

Stafford *et al* did not find a statistical difference in ADG between non-castrated controls or any method utilized (ring castration, band castration, surgical castration and clamp castration) to castrate bull calves during a 43-day study.[14] These bulls weighed an average of 210 ± 2.1 lb (95.25 ± 0.95 kg) at the time of castration, which was lighter weight than bulls utilized in our study. The lack of difference in ADG among the lightweight calves castrated using various techniques suggests that castrating animals at a younger age is less stressful than delaying the surgery until bulls are older.

Use of lidocaine for analgesia during castration has long been debated. Ting *et al* evaluated the use of lidocaine and a non-steroidal anti-inflammatory drug to reduce stress and loss of performance due to castration.[15] They reported that neither lidocaine, ketoprofen nor caudal epidural had any effect on DMI or ADG when castrating bulls. Wildman *et al* did not find improvement in performance in cattle that received local analgesia when castrated as compared to cattle castrated without local anesthesia.[16] Results of our study agree that use of lidocaine had no effect to slightly negative effects on ADG in castrated bulls, regardless of method used.

Gain efficiency is an important variable to determine profitability of growth in production animals. As stated previously, there was no difference between treatments for DMI during the study. Gain efficiency of CNT calves was superior to SURG and SURGL groups, while GE of calves in the BND and BNDL groups was less than other treatments (Figure 3). Because there was no difference in DMI, the improvement in gain efficiency can be explained by the increase in gain. As with ADG, use of lidocaine had no effect on GE, regardless of castration method utilized (Table 3).

The inflammatory response due to castration can have a significant effect on ADG.[4,6] Ting *et al* reported an elevation in the acute phase protein, haptoglobin, in Burdizzo-castrated cattle compared to cattle not castrated.[15] Although not measured in our study, it is reasonable to believe that banded calves had a greater or longer inflammatory response compared to bulls surgi-

cally castrated, therefore contributing to decreased GE in banded animals. Longer duration studies should be performed to evaluate the timing of the peak inflammatory response to banding.

Behavior

Behavior of calves in each of the treatments was monitored and discretely scored on a daily basis for the 28 days of the study. There was a statistical difference in gait scores between non-castrated and castrated animals over the length of the study (Figure 5). CNT calves in this study were more likely to have a gait score of 0 (normal) than castrated animals. This is comparable to an earlier study that measured behavior and found a higher incidence of abnormal behavior in Burdizzo-castrated animals than in non-castrated animals; administration of lidocaine failed to minimize abnormal postures.[15]

An interaction between castration method and time of scrotal swelling ($P<0.01$) was found (Figure 4). Surgically castrated animals (SURG/SURGL) had an elevated swelling score in the beginning of the study, but with time their swelling scores declined to a point where swelling scores of banded animals (BND/BNDL) was higher than the swelling scores of surgically castrated animals. At the completion of the 28-day observation period, 45% (9/20) of banded bulls had lost their scrotum.

There was no difference in vocalization scores between CNT and banded animals. Bulls surgically castrated, however, had higher vocalization scores than CNT or banded cattle. Use of lidocaine did not decrease vocalization, regardless of castration method utilized. One possible reason for lack of benefit from use of lidocaine in cattle in the SURGL group is that the drill-driven castration tool causes the spermatic cord to twist and break-off proximal to where lidocaine was placed in the spermatic cord. Further work focusing on castration method and placement of lidocaine in larger bulls is warranted.

No difference was found in scrotal circumference between treatment groups. A positive correlation was found between scrotal circumference and vocalization (Table 4), but there was no significant correlation between body weight and vocalization. For every 1 cm increase in scrotal circumference, there was a corresponding 0.04 elevation in the vocalization score. In general terms, animals with a larger scrotum vocalized more during castration.

Conclusions

In this study, intact bulls had improved ADG and GE than bulls surgically castrated or those castrated using high-tension elastic bands. There was a greater loss of ADG and GE in banded calves compared to those surgically castrated. Administration of local anesthesia using lidocaine had no effect on performance, post-castration behavior or vocalization during castration. Cattle with greater scrotal circumference had higher vocalization scores during castration than cattle with smaller scrotal circumference, suggesting that castrating cattle at a younger age could result in less stress. This study also suggests that bull feeder calves should be discounted in the market place because of production loss associated with castration.

This study was conducted for only 28 days. Future studies should be conducted to determine the long-term effects of method of castration and use of anesthesia on performance of feedlot cattle. More meaningful production and economic evaluation can be done when the study period extends through the complete feeding period.

Acknowledgement

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Endnotes

[a] Bovi-Shield Gold 5, Pfizer Animal Health, New York, NY 10017.
[b] Dectomax Pour-on, Pfizer Animal Health, New York, NY 10017.
[c] Covexin 8, Schering Plough Animal Health, Union, NJ 07083.
[d] Fortress 7, Pfizer Animal Health, New York, NY 10017.
[e] Stone Manufacturing, Kansas City, MO 64127.
[f] Callicrate Bander, No-Bull Enterprises, St Francis, KS 67756.

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Abstracts

Ultrasonography of the omasum in cows with various gastrointestinal diseases

U. Braun, S. Blessing, B. Lejeune, M. Hässig
Vet Rec (2007) 160:865-869

The omasums of 30 healthy cows and 55 cows with various gastrointestinal disorders (10 with left displacement and eight with right displacement of the abomasum, 10 with abomasal volvulus, 10 with traumatic reticuloperitonitis, nine with ileus of the small intestines and eight with reticulo-omasal stenosis) were examined ultrasonographically on the right side of the body with a 3·5 MHz linear transducer. The dorsal and ventral margins of the omasum and its size in the fifth to 11th intercostal spaces were determined. Generally, the ultrasonographic appearance of the omasum did not differ between the healthy and abnormal cows. The omasum appeared as a semicircle, and the omasal wall closest to the transducer was visible as a thick echogenic line. In a few of the abnormal cows, the omasal laminae were visible and the omasum appeared to have motility. In the cows with left and right displacement of the abomasum and abomasal volvulus, the dorsal margin of the omasum was significantly further from the dorsal midline in some intercostal spaces than in the healthy cows. In the cows with left displacement of the abomasum, the ventral margin of the omasum was significantly further from the dorsal midline in the 7th intercostal space than in the healthy cows. In the cows with reticulo-omasal stenosis, traumatic reticuloperitonitis and ileus of the small intestine, the ventral margin of the omasum was significantly closer to the dorsal midline in some intercostal spaces than in the healthy cows. The mean (sd) size of the omasum in the healthy cows varied from 16·3 (1·5) cm to 56·9 (10·0) cm, depending on the intercostal space, and the omasum was significantly smaller in some intercostal spaces in the cows with reticulo-omasal stenosis, right displacement of the omasum, abomasal volvulus and ileus of the small intestine.

Factors affecting bacterial counts during preparation of the hands for aseptic surgery

K. Corder, T.G. Knowles, P.E. Holt
Vet Rec (2007) 160:897-902

This study was designed to compare the efficacy of four hand preparation techniques in removing bacteria from the hands preoperatively. The effect of bacteriological swabbing itself on bacterial counts was also investigated. The numbers of bacteria obtained from the dominant and non-dominant hands were also determined. The techniques all used 4 percent chlorhexidine gluconate, and consisted of rubbing for five minutes with one application of antiseptic; rubbing for five minutes with five applications of antiseptic; rubbing for one minute with one application of antiseptic; and scrubbing with a brush for five minutes with one application of antiseptic. The results showed that the four techniques were equally effective at removing bacteria. There was no significant difference in the bacterial counts obtained from the dominant and non-dominant hands. The wearing of gloves for up to 30 minutes after scrubbing had no effect on the bacterial counts. Swabbing itself significantly reduced the number of bacteria cultured from the hands.

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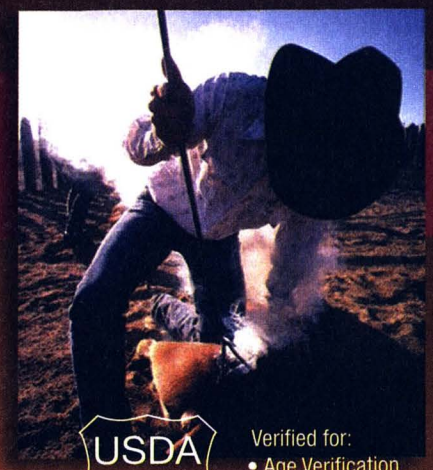

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