Does the Method of Castration Affect Calf Performance?[1]

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Introduction

This publication discusses the purpose of castration in male calves as well as the different methods used to castrate. Most methods of castration cause a certain amount of pain and stress for calves, which can affect calf performance. UF/IFAS researchers recently tested different methods of castration in calves to determine the effects of each method on calf health and performance. This publication presents these results.

Purpose of Castration

Castration can effectively diminish the behavior associated with intact males and can also reduce the undesirable carcass attributes observed in intact males. Consumers in the United States prefer the tenderness, juiciness, and flavor associated with beef from young fed steers and heifers. However, cow-calf producers often cite concerns about decreased growth rate associated with castrated male calves (Lents et al. 2006) as a reason not to castrate prior to sale. Consequently, many intact male calves are sold at weaning. The task of castration often falls on the first buyer of the calf shortly after weaning. Unfortunately, castration becomes increasingly traumatic as calves grow older and heavier.

Methods of Castration

There are many accepted methods of castration for beef cattle. Some methods are more suitable for certain situations than others. The methods available for castration can be broadly classified as either surgical or bloodless. Surgical methods are more invasive and possibly more painful than bloodless methods. Surgical methods include practices such as knife cutting, the emasculator method, and the Henderson Castrating Tool™. Bloodless methods include banding techniques, Burdizzo emasculatomes, and chemical castration. In 1997, the USDA National Animal Health Monitoring System (NAHMS) reported that 55.4% of cow-calf producers used surgical castration as the primary method of castration for male beef calves. However, herd size was a factor in the method used, as 80.5% of operations with ≥300 head used surgical castration. Operations with ≤50 head were almost equally split between using either a surgical method (49.4%) or a banding method (43.7%) (NAHMS 1997).

Surgical Methods

Surgical castration can be accomplished through a variety of methods and combinations of methods. Jensen, Parsons, and England (2006) describe that the initial incision or opening of the scrotum can be accomplished with either a knife or scalpel. The testicles should be pushed into the upper portion of the scrotum with the lower half being removed; this provides adequate drainage. Additionally, a Newberry castrating knife may be used during the surgical procedure. This tool is used to incise the scrotum on the

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sides, leaving an anterior and posterior flap to access the testicles and provide drainage.

Once the scrotum has been incised using any of these methods, the testicles must be removed. This can be accomplished by severing the spermatic cords, scraping the spermatic cord to gradually separate the tissues and vessels, and gently pulling the testicle until the spermatic cord breaks, or by using the emasculator tool or Henderson Castrating Tool™. The emasculator tool can be used to remove the testicles during surgical castration by cutting the spermatic cord and crushing the blood vessels to mitigate post-castration bleeding and hemorrhage. The Henderson Castrating Tool™ is designed to be more effective on older bulls. The tool fits on a variable speed drill and is clamped on the spermatic cord near the testes. The drill is then slowly rotated until the testicle is removed by approximately 20 rotations of the drill (Jensen, Parsons, and England 2006).

Bloodless Methods

There is also a variety of bloodless castration methods that castrate cattle with minimal blood loss and perceivably less stress. Capucille, Poore, and Rogers (2002) report that these methods involve interrupting the blood supply to the testes and scrotum without causing hemorrhaging. The processes commonly used are the elastrator, Callicrate Bander™, EZE Bloodless Castrator™, California Bander™, and Burdizzo emasculatome.

Elastrators are used to stretch an elastrator band, so the band can be applied around the scrotum as close to the body as possible. The Callicrate Bander™ and EZE Bloodless Castrator™ require larger elastic tubes that are fitted around the scrotum and then tightened by a ratcheting mechanism on the tool. A metal grommet is then crimped around the band to hold tension on the band. The tools have been designed with a tension indicator because under-tightening can cause complications and over-tightening can lead to broken bands and unsuccessful castration. The California Bander™ is different than other methods because it requires large elastic bands. The bands are manually stretched around the scrotum and fitted into a metal clip, which holds tension on the band.

There is a risk of anaerobic infections such as tetanus when using banding methods. Calves should be vaccinated with tetanus toxoid 7–10 days before banding and receive boosters at castration to mitigate the risk of tetanus.

Another method of bloodless castration is the Burdizzo emasculatome. This tool was designed to castrate calves without the potential complications associated with surgical castration or the banding procedure. The Burdizzo facilitates castration by crushing the spermatic cords without incising the scrotum, so there is no open or bleeding tissue. This method is intended for use in young immature male calves as older, heavier bulls tend to have larger cremaster muscles that may hinder proper crushing of testicular vasculature (Capucille, Poore, and Rogers 2002).

Stress Associated with Castration

Each method of castration discussed in this article causes a certain level of pain in cattle. This pain can potentially cause poor calf performance because of decreased feed and water intake. Pain may not be the sole inhibitor of performance, as the suppression of immune function results in increased incidence of morbidity and subsequent loss of appetite. Monitoring different blood parameters as potential indicators of stress can help to determine acuteness and duration of pain caused by stressors such as castration. Increases in cortisol concentration, acute phase protein concentrations, and white blood cell counts can be indicators of stress and/or pain.

Chase et al. (1995) observed that plasma cortisol concentration increased immediately following castration. However, cattle castrated both surgically and by banding had similar post-castration plasma cortisol concentration two days after castration. The acute pain response associated with surgery was immediate and of short duration. The pain response associated with banded calves was delayed, of less initial intensity, and also short in duration.

Effects of Castration on Performance

Decreased performance and morbidity in male calves are commonly observed following castration because of pain, stress, and suppressed immune function. The method of castration that causes the least amount of decreased performance may be the method that causes the least pain and stress, which would result in fewer animal welfare concerns. Brazle (1992) conducted two field trials to evaluate what effects different methods of castration have on the health and performance of stocker cattle. Purchased bull calves were either surgically castrated or banded with small rubber rings, and then compared with purchased steer calves. Average daily gain of purchased steers (2.12 lb/day) was greater compared to surgically-castrated calves (1.90 lb/day) and banded calves (1.70 lb/day). Morbidity, mortality, and cost associated with medical treatment were reported to be similar among all treatments.

Younger, lighter male calves may possibly experience less pain, stress, and decreased performance as a result of castration. Bruns and Pritchard (2004) observed that bulls banded at 9 months grew slower for 29 days post-banding than bulls surgically castrated at 2–3 months. The bulls banded at 9 months had increased feed intake but were less efficient, as shown by increased feed-to-gain ratio compared to bulls castrated at 2–3 months. This finding suggests that castrating bulls at younger ages potentially decreases pain response and allows for healing prior to those calves entering a feed yard.

UF/IFAS Study Results

In a study conducted at the University of Florida (Warnock et al. 2010), 75 male beef calves (498 ± 75 lb) were obtained from the UF/IFAS Santa Fe Beef Unit (Alachua, FL) at weaning. Calves were weaned for 7 days prior to being transported 217 miles to the UF/IFAS North Florida Research and Education Center's GrowSafe® feed efficiency facility in Marianna, Florida. Calves were organized by breed, age, and weaning weight, and randomly allocated to one of five treatment groups (15 calves/treatment):

1. Control steers (CON), which were castrated surgically prior to weaning at an average age of 52 days (8–85 days)

2. Intact bulls (BULL)

3. Bulls castrated using the Callicrate Bander™ (No-Bull Enterprises, LLC, St. Francis, KS; BAN)

4. Bulls castrated using the Henderson Castrating Tool™ (Stone Mfg & Supply Co., Kansas City, MO; HEN)

5. Bulls castrated surgically (SUR)

The experiment was comprised of two data collection periods, the post-castration period (day 0–14) and the overall period (day 0–84). Calves were randomly assigned to one of five pens, so all treatments were equally represented in all pens. Calves assigned to the BAN, HEN, and SUR treatments were castrated on day 0. Trained technicians under the supervision of a University of Florida veterinarian performed castration. Calves were restrained in a chute, and the same technician completed castration in the same manner for each calf in each treatment group. Body weights were collected and feed and water intake was recorded using the GrowSafe® system.

Castration of calves reduced calf average daily gain by an average of 76% during the post-castration period (day 0–14), regardless of method used (Table 1). Average daily gain over the entire experiment (day 0–84) was similar (mean = 1.94 lb/day) for all treatment groups, indicating that castrated calves were able to compensate and recover from castration regardless of castration method. Daily feed intake from day 0–14 (post-castration period) was similar (mean = 12.98 lb/day) for treatment groups. Daily water intake was similar (mean = 9.6 gal/day) among treatment groups from day 0–14 and from day 0–84 (mean = 8.2 gal/d). These results indicate that the short-term stress of castration did not suppress water intake. Gain-to-feed ratio was similar among treatments from day 0–14 (mean = 0.03) and from day 0–84 (mean = 0.09).

These results indicate all methods of castration reduce average daily gain compared to control steers during the first 14 days after castration. However, by day 84, average daily gain was similar regardless of castration technique. These results imply that the method of castration may not impact average daily gain long term when castrating single source weaned calves weighing approximately 500 lb.

All treatments had similar plasma acute phase protein concentrations (a measure of stress response) on day 0. There was a delayed increase in acute phase protein concentrations in BAN compared to CON, which suggests that BAN induced a delayed inflammation response compared to surgical methods of castration. HEN and SUR exhibited increased acute phase protein concentrations compared to CON, indicating there is an acute inflammatory response early post-castration in surgically-castrated calves, but it is decreased over time.

Summary

This research showed the method of castration used on post-weaning calves had minimal impact on average daily gain, feed efficiency, and water intake of beef calves castrated during a growing phase. Delaying castration and using banding techniques was not more favorable than surgical methods.

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Table 1. Effect of castration technique on measures of performance and intake in beef calves

	Treatments[1]						
Item	**CON**	**BULL**	**BAN**	**HEN**	**SUR**	**S. E.**[2]	***P*-value**
Average daily gain, lb/day							
d 0 to 14	1.60[a]	1.10[ab]	0.33[b]	0.53[b]	0.57[b]	0.33	0.06
d 0 to 84	1.98	2.21	1.76	1.98	1.98	0.13	0.42
Daily feed intake, lb/day							
d 0 to 14	13.6	12.5	12.8	12.1	13.9	1.2	0.80
d 0 to 84[3]	20.9	20.9	20.0	20.9	21.1	0.95	0.92
Daily water intake, gal/day							
d 0 to 14	10.67	8.74	9.61	9.16	9.66	0.87	0.61
d 0 to 84[3]	8.63	8.37	7.74	8.37	8.13	0.48	0.71
Gain: Feed							
d 0 to 14	0.10	0.06	-0.06	0.03	0.02	0.05	0.29
d 0 to 84	0.10	0.10	0.09	0.09	0.09	0.005	0.39

[1]CON = calves castrated pre-trial; BULL = intact male calves; BAN = calves banded on day 0; HEN = calves surgically castrated with Henderson castration tool on day 0; SUR = calves surgically castrated with emasculators on day 0.
[2]Standard Error
[3]Data reported as average daily intake by week
[a, b] Means within same row with different superscripts differ $P<0.05$