Castrating Beef Calves: Age and Method

Guide B-227

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INTRODUCTION

Castration is the disruption of testicular function, usually by removal of the testes of male animals, and has been a routine management procedure for most bull calves since ancient times. Historically, bulls were castrated to prevent propagation of inferior genetics and to simplify management, especially of draught animals. Bulls are still castrated to prevent reproduction and simplify management, but, most importantly, cattle are castrated to improve marbling and tenderness of the finished beef, which improves calf marketability.

Castration methods are generally divided into two categories: surgical or bloodless. Surgical castration involves excision of the testes by splitting or removing the lower third of the scrotum and removing the testes by severing the spermatic cord in a manner that minimizes bleeding, usually with an emasculator (Figure 1), Henderson castrating tool, or knife. Bloodless castration is generally accomplished by using an emasculatome (i.e., burdizzo; Figure 2) or elastic band. When using an emasculatome, the scrotum remains intact while the spermatic cord of each testicle (within the scrotum) is placed in the jaws of the tool and crushed. The resulting damage causes a loss of blood flow to the testes and eventual testicular atrophy within the scrotum. Banding involves using an elastrator (Figure 3) to place a heavy elastic band around the neck of the scrotum with both testes inside. The band cuts off blood flow to the testes and scrotum, which atrophy over a short period of time and slough off. This guide summarizes research comparisons of methods of castration and age at which castration is performed so that managers can make informed decisions about castration method and timing.

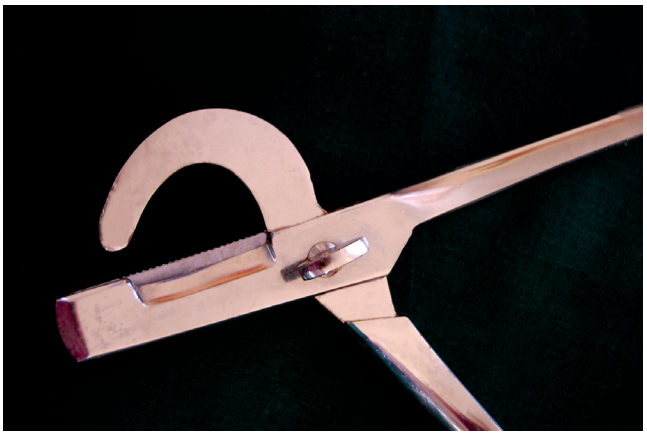

Figure 1. **Emasculator used for severing the spermatic cord during surgical castration. Note the rough surface behind the blade that crimps the spermatic cord to minimize bleeding when the blade cuts.**

PAIN

Pain is inherently a part of castration and cannot be avoided. The pain of castration occurs first as acute, short-term pain associated with the actual castration procedure. Chronic pain is the longer-lasting pain that occurs in the days following castration until the injury is healed. Minimizing castration-induced pain is important for animal welfare, growth performance, and immune suppression that may be associated with castration. While consideration of acute pain is important, chronic pain should be given more weight when making management decisions due to the length of time chronic pain is experienced.

Pain is difficult to quantify in animals; however, blood concentration of the adrenal hormone cortisol is often used as an indicator of stress that is related to pain. According to researchers at the University of Nebraska, using blood cortisol as an indicator, calves experience acute stress immediately after castration. However, this stress generally lasts only 3 to 8 hours. The sensation

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Figure 2. **Emasculatome used to crush the spermatic cord of the testes while still inside the scrotum.**

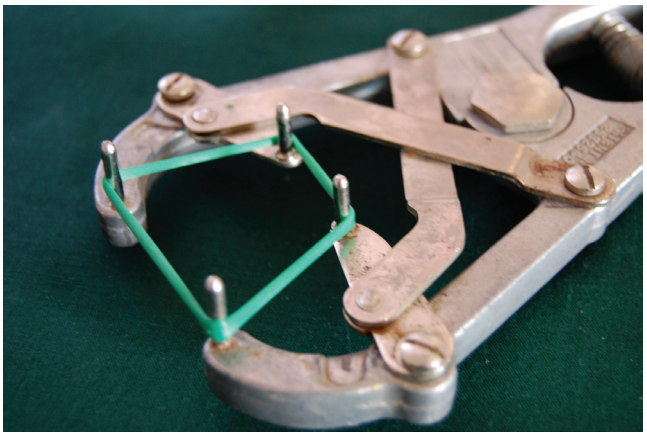

Figure 3. **Elastrator used to stretch the rubber band while the band is positioned around the neck of the scrotum above the testes.**

and effects of chronic pain may be best measured by evaluating weight change following castration. Two studies in Ireland showed that calves lost weight during the first 7 days after castration, but by 35 days after castration there was generally no difference in calf weight between castrated and uncastrated calves. These results indicate that the chronic pain associated with castration lasts around 1 week.

In several European countries, regulations require that castration be accompanied by anesthetics and longer-term analgesics, while other countries require the use of anesthetics when castrating animals over a certain age (e.g., 2 months in the UK). The use of local anesthetics alone has yielded mixed results in reducing castration stress, and the results seem to depend on castration method. However, researchers in New Zealand showed that the combination of local anesthetic (lidocaine) and a systemic anti-inflammatory agent (ketoprofen) eliminates the cortisol increase (stress) during the first 8 hours after castration. Using similar methods, scientists in Ireland reported similar weight gain in both castrated and uncastrated calves for the first 7 days after castration when local anesthetic and anti-inflammatory agents were used. In the U.S., there is no systemic anti-inflammatory pharmaceutical labeled for use for controlling pain in cattle, and the need to restrain calves twice to administer analgesics prior to castration limits the likelihood of broad scale adoption of this practice.

CASTRATION METHOD

Comparisons of castration methods have yielded mixed results, especially where average daily gain is considered. Generally, surgical castration elicits the most acute pain and least chronic pain. Conversely, banding normally causes the least acute pain (measured by cortisol response), but is associated with the longest duration of chronic pain. Calves studied in New Zealand castrated by a banding and emasculatome combination method took more than 20 days longer to reach the same stage of wound healing as calves castrated using surgical methods.

According to the American Veterinary Medical Association, calves castrated by elastic band have been observed to exhibit a pain response to palpation of the scrotal area after castration up to 4 weeks longer than calves castrated by emasculatome or surgery, indicating that greater chronic pain sensation is associated with the banding castration method. Researchers in Nebraska, Australia, and New Mexico observed that inadequate band tension allows some blood flow to the scrotum and testes, causing swelling and hemorrhaging within the scrotum. This can result in delayed detachment of the testes and scrotum that leads to persistent wounds. This condition may be a result of the band not being tight enough for very young calves, or from using bands that are old and do not adequately return to shape once stretched. Persistent wounds have also been observed in calves castrated by elastic bands, even after the scrotum has sloughed off.

Castration by emasculatome is an appealing approach because it seems to cause less chronic pain than elastic banding and less acute pain than surgical castration, but has all the benefits of bloodless castration. However, Swiss researchers reported that calves castrated by emasculatome when younger than 12 to 16 weeks may retain functional testes. It is not known whether

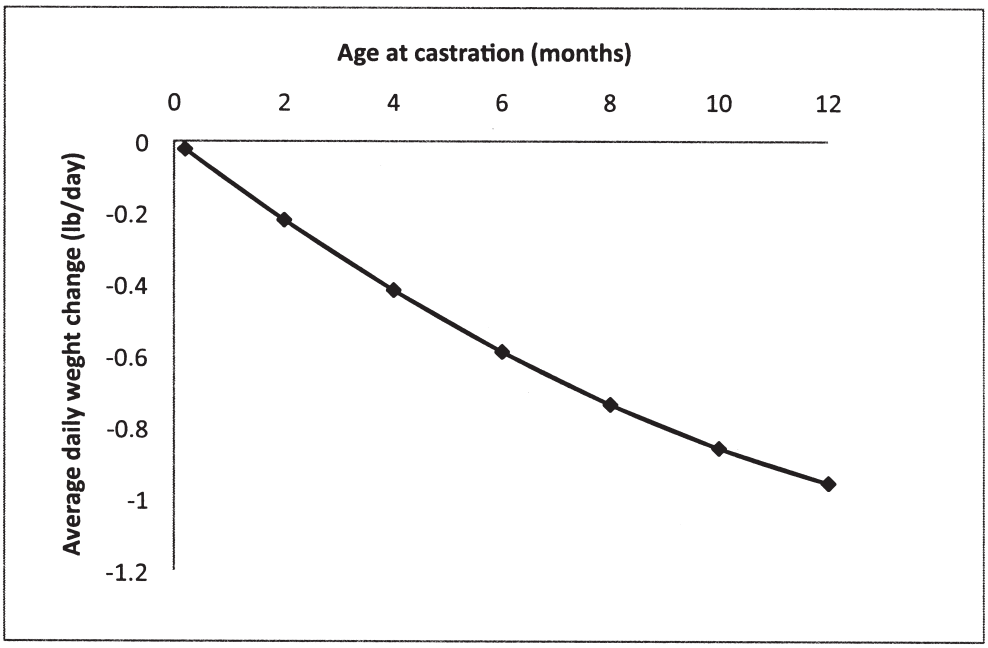

Figure 4. **Average daily weight change of calves castrated by elastic band and surgical castration for the first 30 days post-castration. Regression equation is: $Y = 0.0031X^2 - 0.1166X$. Adapted from Bretschneider (2005), originally published in kg/day with the equation of the regression line being $Y = 0.0014X^2 - 0.053X$ and $R^2 = 0.86$.** *Livestock Production Science, 97(2–3), pp. 89–100.*

the testes remained functional because the spermatic cord was too small at that age to fully crush or that regeneration occurred. Additionally, castration failure due to tool operator error has been reported more often for the emasculatome method than for other methods. Some studies have reported less weight loss for calves castrated using an emasculatome versus surgical castration. The greatest advantage of the emasculatome over other methods is that, because the spermatic cords are crushed within the scrotum, no open wound is exposed to the environment, protecting the injury from flies, mud, and infectious agents.

Most of the research done on castration indicates that method of castration does not affect lifetime performance or health of calves. However, when differences among methods were reported, it was generally during the first 7 days after castration, with almost no differences thereafter. Therefore, producers should use the castration method most appropriate to minimizing pain, depending on the situation and age of the calf.

CASTRATION AGE

It has been speculated that, because intact bull calves may grow more rapidly than steer calves, delaying castration until weaning (around 6 months old) can yield similar benefits to growth promoting implants administered when the calves are 1 to 3 months of age, but without additional cost. However, a University of Arkansas study showed that calves castrated near birth had the same lifetime average daily gain as those castrated after weaning (implanted in feedyard only). At slaughter, there were no differences in hot carcass weight, yield grade, quality grade, or marbling score. Researchers at Kansas State University reported that, following a 28-day backgrounding period, calves that were castrated at 90 days of age (early) and received a growth promoting implant had a 17-lb weight advantage over calves that were castrated at weaning (late; 226 days of age) or castrated early without implanting. Early castrated calves that were not implanted and late castrated calves performed similarly. These results indicate that early castration paired with growth promoting implants may yield more total pounds than either early or late castration alone when using a backgrounding program.

Researchers from Arkansas and Kansas also point out that intact calves marketed through conventional channels have historically suffered a price discount of around $4.50 to $6.00/cwt. Additionally, researchers from Nebraska have shown that as age of castration increases, weight loss resulting from the procedure increases (Figure 4). Further support for castrating calves as young as possible can be found in another study from Nebraska, which showed that steers castrated at

less than 500 lb exhibit greater marbling than steers castrated weighing more than 700 lb.

Timing of castration also affects morbidity. Research has shown that calves castrated on arrival at the feedlot are at higher risk for disease than steers castrated earlier in life. A study at Texas Tech University found that calves castrated on arrival had more than twice the morbidity rate (17.5% vs. 38.4%) and almost double the mortality (4.0% vs. 7.6%) of steers that were castrated at an earlier age. This is supported by more recent work conducted in Arkansas, which revealed a 17 to 58% increase in morbidity when calves were castrated on arrival compared to calves that arrived as steers (i.e., castrated at a younger age). As a result, calves arriving as steers had up to $5.56/head lower medical costs.

Collectively, these studies suggest that there is no lifetime performance advantage to waiting to castrate calves until weaning, but there is a risk of negatively impacting carcass quality by delaying castration and a high probability of receiving lower prices when marketing intact calves through conventional channels. When considering how age at castration affects animal welfare, the consensus is that the younger the calf is at time of castration, the less impact castration has on its welfare and performance.

DEVELOPING TECHNOLOGY

In the future, castration may be possible through vaccination (immunocastration). Studies conducted in California, Canada, and Brazil found that vaccinating cattle against gonadotropin-releasing hormone (GnRH) produces effects similar to traditional castration methods. This method is effective because GnRH regulates the production of sex hormones, and once immunized against GnRH, the production of sex hormones is reduced to the point that the testes actually degenerate. Immunocastrated calves have testosterone levels similar to calves castrated by traditional means. However, there is currently no vaccine of this nature commercially available. The risk of harmful side effects in the event of a human receiving an accidental injection may make acquiring FDA approval difficult.

CONCLUSIONS

Calves should be castrated as young as possible utilizing a method that causes the least chronic (long-term) pain. Surgical castration or using an emasculatome is preferable to banding, unless calves can be banded within a week of birth. On western cattle operations, cattle are often managed so extensively that castration within days of birth is not practical. In such cases, surgical castration as early as possible (i.e., at branding) may be the best approach. In situations where calves are handled at birth, banding during the calves' first week of life may be the best option. The use of an emasculatome may be preferable when environmental conditions increase the risk of complications related to other castration methods. Regardless of castration age or method, proper surgical techniques and tool sanitation are imperative to minimize infection.

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