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The Veterinary Journal 172 (2006) 274–283
The Veterinary Journal
www.elsevier.com/locate/tvjl

Influence of local anaesthesia on pain and distress induced by two bloodless castration methods in young lambs

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Abstract

To assess short- and long-term effects of bloodless castration methods with and without local anaesthesia, behavioural and cortisol responses of lambs were used as indicators of pain and distress. Seventy lambs, aged 2–7 days, were control-handled or castrated by Burdizzo or rubber ring methods with and without local anaesthesia. Either 5 mL of diluted lidocaine (4 mg/kg) or physiological sodium chloride solution was distributed in both spermatic cords and the scrotal neck. The serum cortisol response was monitored for 48 h, and behavioural and clinical traits were followed for three months. Local anaesthesia tended to reduce behavioural and cortisol responses after Burdizzo castration and provided a significant reduction after rubber ring castration. Prolonged pain after rubber ring castration with anaesthesia was not evident. If combined with local anaesthesia, both the rubber ring and the Burdizzo methods are acceptable methods for castration of lambs up to one week of age.

Keywords: Behaviour; Castration; Cortisol; Lamb; Local anaesthesia

1. Introduction

Hofmeyr (1987) described several methods for the castration of male ruminants, including surgical removal of the testes, bloodless techniques that interrupt the blood supply to the testes such as elastic rubber rings or Burdizzo castration, and chemical or immunological castration. The method combining rubber ring and Burdizzo castration was first described by Molony et al. (1993). Aside from immunological castration, these methods may induce considerable pain depending on the technique. For example, surgical removal of the testes is reported to be more painful than bloodless castration (Kent et al., 1993; Lester et al., 1996).

The terms "animal pain" and "distress" are often used in the context of castration. Molony and Kent (1997) defined "animal pain" as "an aversive sensory and emotional experience representing an awareness by the animal of damage or threat to the integrity of its tissues; it changes the animal's physiology and behaviour to reduce or avoid damage, to reduce the likelihood of recurrence and to promote recovery". Likewise Mellor and Stafford (1999) used the term "distress" to acknowledge that the experience induced by pain includes interacting emotional and physical facets. Consequently, the use of both terms is indicated when assessing the overall impact of different castration methods on lamb welfare.

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doi:10.1016/j.tvjl.2005.06.002

It is not possible to measure pain and distress directly, but indirect physiological and behavioural indices may be used as indicators. Activity in afferent nerves (Cottrell and Molony, 1995), activity of the sympathetic nervous system (Peers et al., 2002), activity of the hypothalamo-pituitary-adrenal axis (Mellor and Murray, 1989a,b; Shutt et al., 1988), as well as changes in posture, locomotor activity, and behaviour (Mellor and Murray, 1989b; Molony et al., 1993; Wood et al., 1991) are feasible ways to assess animal pain (Molony and Kent, 1997; Molony et al., 2002). Several authors have used analysis of plasma cortisol concentration and/or observation of behaviour and postures to assess castration pain and distress over the first few hours after castration (Kent et al., 1993; Lester et al., 1991; Mellor and Murray, 1989b; Molony et al., 1993; Molony et al., 2002; Thornton and Waterman-Pearson, 1999).

The consequences of painful practices over the longer term (days to weeks) have not been well investigated in lambs. These consequences might include chronic pain, hyperalgesia, phantom pain, neuropathic pain, or infections (Mellor and Stafford, 1999). Moreover, it is of interest to confirm the results of Kent et al. (2000), who found that local anaesthesia resulted in a reduction of castration associated pain and distress beyond the duration of analgesia.

To minimise pain and distress, sedation and/or local or general anaesthesia as well as nonsteroidal anti-inflammatory drugs (NSAIDs) may be used. Sedatives may be beneficial in reducing handling distress and blunting pain (Grant and Upton, 2001; Mellor and Stafford, 1999). However, sedation alone is not an appropriate anaesthesia for castration of lambs.

General anaesthesia may reduce acute pain and distress, but it is hazardous and does not prevent the occurrence of post-castration pain (Mellor and Stafford, 1999). When injected prior to castration, NSAIDs have significant beneficial effects on the overall cortisol response and on the time spent in abnormal postures caused by Burdizzo castration in lambs (Molony et al., 1997). However, the pre-treatment use of caprofen did not reduce the discomfort scores after rubber ring castration or tail docking (Price and Nolan, 2001; Steiner et al., 2003).

Local anaesthesia reduces physiological and behavioural changes by preventing the afferent impulses from reaching the brain (Cottrell and Molony, 1995; Molony et al., 1997). Depending on the local anaesthetic, volume, and injection site, however, local anaesthesias may vary in efficiency. For rubber ring castration in lambs, injection of local anaesthetic into the testes was less effective than its injection into the neck of the scrotum at the site of the ring (Kent et al., 1998).

Acknowledgement that castration of male lambs interferes with their welfare has led to changes in animal welfare legislation in some countries. For example, since 2001 in Switzerland, male ruminants may only be castrated under local or general anaesthesia. Therefore, the combined Burdizzo and rubber ring castration without additional anaesthesia is not allowed in Switzerland, regardless of its reported pain-reducing effect (Kent et al., 1993, 1995, 1998; Molony et al., 1993; Thornton and Waterman-Pearson, 1999) and reduced healing time (Kent et al., 2000; Sutherland et al., 2000).

The current study was designed to evaluate inexpensive and simple castration methods combined with an effective analgesia, to meet the interests of both farmers and lambs. In addition to control-handling, elastic rubber ring and Burdizzo castration were tested. These two bloodless castration techniques and control-handling were compared with and without local anaesthesia, allowing multiple comparisons. To assess both the short- and long-term consequences of castration and anaesthesia, serum cortisol levels were measured over 48 h, and posture, behaviour, and clinical signs were monitored for a three-month period.

2. Materials and methods

2.1. Animals and housing

Seventy male lambs were housed indoor in straw-bedded pens together with their dam and siblings. White Swiss Mountain and White Swiss Mountain × Charolais lambs were treated at 2–7 days of age. From the day before treatment (day −1) until blood sampling was finished on day 2 after treatment, the animals were kept in pens measuring 1 × 2 m. Later in the study, lambs and their mothers were kept in large pens in groups of 20 ewes and their offspring. Only lambs not exhibiting any signs of disease, as determined by clinical examination, were included. On day −1, the lambs were weighed, marked to allow identification, and an indwelling catheter (Venflon, 18 G, Becton Dickinson) was introduced into one of the jugular veins to facilitate blood sampling.

2.2. Study design and treatments

Treatment groups included rubber ring castration with (RR+) and without anaesthesia (RR−), Burdizzo castration with (B+) and without anaesthesia (B−), and control-handling with (H+) and without anaesthesia (H−).

The lambs were randomly allocated to one of these six treatment groups by a second person drawing lots from a pot. The pot included one lot for each group. Each time a lot was drawn, it was removed from the pot and not put back until a group of six lambs was assigned to the different treatment groups. No attempt was made to balance the groups for weight of lamb or single and multiple births.