

Behavioral Responses of Castrated Buck Kids at Different Ages By Using Different Methods of Castration**Souad A. Ahmed and Essam A. Ahmed**Department of Animal Hygiene, Behavior and Management, Faculty of Veterinary Medicine, Benha University.
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Abstract: To evaluate the behavioral responses of kids to castration by burdizzo (Bur), rubber ring (RR) or control handled, 90 buck kids were used. Behavioral responses of kids throughout the 180 minutes after castration or control handled were assessed by using a video camera. Castration of younger kids (7 and 21 days) took significantly shorter time than 42 days old. RR produced the highest values of active pain behavior, frequency of elimination, less frequently suck, teat seeking or nibble at feed. The scrotal sloughing was delayed in older kids. Results of questionnaire indicated that most castrations were done at the farm; castration failure was only in some of Burdizzo especially those older than 8 weeks. It was concluded that kids castration must be done as early as possible to reduce the total pain response and for achievement of animal welfare, and Burdizzo method is the preferable technique for castration of kids at all ages.

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Key words: kids age, castration, Bur, RR, behavior.

1. Introduction:

Under general husbandry procedures in animal rearing, Castration is carried out as routine animal husbandry procedures in lambs although it has been recommended that they should only be undertaken after careful consideration of their necessity by the farmer (Anon 2007). Castration of males those not wanted as replacement bucks should be done during the first days or weeks after birth for many reasons; to prevent disruption in the flock through sexual activity of young males, castrated males can remain with their dams and female flock mates for a much longer period of time than intact males, prevent unwanted pregnancies, indiscriminate breeding and reduce fighting and injury to animals as a result of sexually related behavior and dominance amongst males and there is a belief that castration improves conformation of the body thus producing a better quality product (Archer, 2004; and Farm Animal Welfare Council, 2008).

Castration also prevents physically or genetically inferior males from reproducing and prevents pregnancy in commingled pubescent groups (Stafford and Mellor 2005). Castrated males are easier to manage, especially as they mature thus maintain general control of stock. Beside this, castration of bucks is recommended to avoid the goaty odor which taints the doe's milk. Male lambs are preferably castrated in the first few days or weeks of life because animal handling is easier and postoperative complications are fewer (Baird and Wolfe, 1998).

However, management actions can also be a source of poor welfare in the neonatal lamb, particularly carrying out painful procedures without

the use of analgesics, and disruption of the ewe-lamb bond by permanent or temporary separation (Dwyer 2008). Studies investigating differences between pain responses of lambs at different ages have been undertaken using different methods of castration and tail docking (Johnson et al. 2009).

The most widely methods of castration being used are rubber ring, burdizzo and surgical or open methods. Rubber ring castration method via application of a tight rubber ring around the neck of the scrotum using an elastrator causes ischemia, leading to tissue death and sloughing. Other methods include the application of an emasculator (e.g. Burdizzo clamp) over the spermatic cord to crush and destroys a narrow segment of each spermatic cord, causing irreversible damage to the vessels supplying the scrotum, leading to ischemia and testicular atrophy, while the third is the open or surgical castration involves excising the scrotum and underlying tissues to reveal the testes which are then removed by tearing, cutting or twisting, with or without cautery, ligation or clamping. (Dinnis et al., 1997a). All three castration methods produced changes in the integrated scrotal pain scores which were significantly higher compared to control lambs (Thornton and Waterman-Pearson, 1999). Pain in animals is a complex experience, dependent not only on the severity of the insult to pain pathways and the degree of tissue or nerve damage, but also on previous pain experiences and on social position within a flock/herd. Pain associated with inflammatory diseases is probably the major source of pain in ruminant species (Fitzpatrick et al. 2006).

Melches et al. (2007) reported that long-term pain after rubber ring castration of calves can last for

at least 42 days. In addition, the prolonged wound healing and long term local pain compared to Burdizzo castration and the occurrences of local infections do not favor the rubber ring method. The Burdizzo method appears to be both effective and safe but can be difficult to apply and considerable variability in its effectiveness can occur (Hosie *et al.*, 1992). Zimmerman (1986) suggested that in animals a painful experience should result in learned avoidance and affect the animal's behavior including social behavior. Therefore we can use behavioral and physiological criteria to determine whether an experience is painful to an animal.

Castration-related responses indicating pain and distress in lambs include changes in behavior and serum cortisol concentration, and the occurrence of abnormal postures. This has been well established by several authors investigating post castration-distress over the first few hours after castration (Molony *et al.*, 2002). After castration individual lambs expressed pain in different ways; some rolled; some wagged their tails while others head turned, stamped their feet or vocalized (Molony *et al.*, 2002). This experiment aimed to study the behavior of castrated buck kids at three different ages after castration by RR or Bur, and to assess the suitable method for each age class depending on the response of buck kids to castration method that was less painful to the animal. Also to assess the preference of owners to any method through the results of questionnaire.

2. Materials and Methods:

Animals:

Three different ages and three methods of castration (including control handled) were used in this study to see the effect of age and method of castration on the behavior and welfare of kids. This study was conducted on ninety buck kids aged 7, 21, and 42 days were used, in this study. For each age group, ten kids were castrated by rubber ring, ten by Burdizzo, and ten kids were control handled and used as control for both. Animals were allowed to acclimatize for a minimum of 24 hours in the pens where the castration was done prior to commencement of the study. Does were housed with their kids in straw bedded pens for the duration of the experiment (Molony *et al.*, 2002). Green fodder and water were provided *ad libitum* and concentrates fed as required.

Experimental design:

Before castration, all kids received a tetanus prophylaxis of 1500 IU of Tetanus-Serum, the castrations or control handlings were performed between 0700 and 0800 A.M. Three methods were studied (control handling, rubber ring, and Burdizzo), each kid experienced only one castration method.

1- Control handling: The operator manipulated the testes for 1–2 min in order to simulate the handling associated with castration.

2- Rubber ring castration (RR): A constricting latex rubber ring was applied to the neck of the scrotum, using an elastrator after ensuring that both testes were situated distal and the teats proximal to the ring. One person held the kid while a second person applied the treatment.

3- Burdizzo castration (Bur): Each spermatic cord and associated scrotal tissue was crushed each with a Burdizzo clamp. The second application of the clamp lay distal to the first. Care was taken to ensure that the clamp crush lines did not overlap. castration and control handled were done according to (Melches *et al.*, 2007).

Recording of behavioral responses:

Behavioral observations of kids during control handled and castration and the immediate behavioral responses of each buck kid throughout the 180 minutes following castration or control handling were assessed by using of a video camera (Hitachi) situated at a slightly elevated angle to record all activities within the pen; video taping enabled the experimental area to remain free from human presence and activity, thus lessening the risk of altering the kid's normal behavior. The video tapes were reviewed at a later date and the behavioral responses were recorded. The 180 min experimental period (post castration) was divided into 10 min observation periods and the occurrence or count of each behavior or pasture was recorded for each 1 min period (Grant 2004).

Description of behaviors was based on what reported by (Molony *et al.* 2002 and Grant 2004), as follows:

Foot stamp and kicking: one action was recorded when either a front or hind limbs was lifted and forcefully placed on the ground while standing or lying.

Statue standing: standing immobile for more than 10 s usually with the hind limbs slightly apart and positioned further back than normal, the back was arched, the tail tucked between the hind legs and the kid was trembling, with an obvious withdrawal from interaction with other pen members and outside stimuli.

Lateral lying with head up, or down: lateral recumbency with one shoulder on the ground, with extension of the hind limb and with the head up or down.

Abnormal ventral lying: ventral recumbency with the hind limbs partially or fully extended, or with the kid keeping the scrotal region off the ground.

Abnormal standing/walking: Standing or walking unsteadily sometimes with tail wagging; walking on knees; moving forward with bunny hoops; circling; leaning on a support or falling, swaying.

Normal standing/ walking: standing, walking and playing, eating or investigating with no apparent abnormality.

Active pain behaviors:-

Head turning: (movement of the head beyond the shoulder), include both looking and touching at the source of pain and grooming.

Tail wagging : a single side to side tail wagging was recorded as one action. Tail wags while teat seeking was not counted.

Rolling: kid rolled from lying on one side to the other without getting up, half rolls on the back were included.

Easing quarters: one action was recorded each time a front or hind limb, including the shoulder and hind quarters was moved in a less forceful manner than stamping or kicking or the whole body was shifted or eased without moving from the place of rest, tensing of leg muscles was also included.

Licking scrotum and inside of the hind leg: during standing or lying down, the kid turns its head toward the inside of hind leg and scrotum with elevation one of hind legs with vigorous licking.

Restlessness, the number of times the kid stood up and lay down; each unit scored included both the act of rising and lying down, instances of the kid rising as far as its knees were included in the count.

Vocalizations; occurrence of each vocal sound was recorded.

Backward movements: the kid move few steps backward while leaning on object.

Elimination: number of defecations and urinations.

Teat seeking: kid seeks the teats with or without sucking was recorded.

Feeding: when the kid nibbles or eats feed.

Also the effect of age on time needed for castration and scrotal sloughing were recorded. The time for castration or manipulation was measured, including the time for fixation and disinfection (Melches et al., 2007).

Beside this there was a survey on kids' castration through a questionnaire to owners and veterinarians (according to Hosie et al., 1996) as follows:-

1-Why do you castrate your kid?

2- At what age do you castrate your kid?

3-Which technique have you used? And who do it ?

4- At what age do you use (Surgical removal, Burdizzo castrator, Rubber ring).

5- In case of surgical removal do you use tetanus prophylaxis? Yes or No

6-Where do you normally carry out this task?

7- Are you aware of any injuries or deaths associated with these techniques? Yes or No.

8- Do you use anesthetics when castrating? Yes or No.

9- Are you aware of any failure with any of these techniques? Yes or No. if yes how many?

Statistical analysis: Analysis of variance (ANOVA) was performed on the behavioral data, gathered during the 180 minutes to compare differences in behavioral activities and time spent in various postures, between treatments. Data were analyzed using SPSS (SPSS 2003, SPSS Inc.), and ($P < 0.05$) was consider as statistically significant. Data are presented as means \pm SE.

3. Results:

As shown in table (1); the time needed for castration of buck kids was significantly affected both by age of kids and method of castration. Castration of older kids (21 and 42 days) took significantly longer time ($P < 0.05$) in both methods of castration. Bur method took significantly ($P < 0.05$) longer time than RR at all ages.

As shown in table (2); age of castrated kids significantly ($P < 0.05$) affected the behaviors (vocalization, tail wagging and kicking) during castration process. The incidence of these behaviors during castration was greater in older kids (42 days).

Table (1) Effect of method of castration and age of buck kids on the time needed for castration each kid (min.), and scrotal sloughing in RR method

Age	7 days	21 days	42 days
Method of castration			
Rubber ring	0.57 \pm 0.01 ^b	2.09 \pm 0.04 ^a	2.15 \pm 0.25 ^a
Burdizzo	1.08 \pm 0.03 ^b	3.32 \pm 0.22 ^{*a}	4.56 \pm 0.53 ^{*a}
scrotal sloughing (days)	14.60 \pm 0.11 ^c	22.16 \pm 2.18 ^b	41.56 \pm 6.18 ^a

Values are shown as means \pm S.E. M

^{a,b,c} means with different letters in the same raw are significantly different at $P < 0.05$

means with stars^{*} in the same column are significantly different at $P < 0.05$

Table (2) Incidence of kicking, vocalization, and tail wagging of kids during castration and handled control at different ages:

Age	Behavior	Control	Rubber ring	Burdizzo
7 days	Kicking	0.33 ± 0.11 ^c	1.33 ± 0.88 ^b	3.67 ± 0.43 ^a
	Vocalization	0.50 ± 0.08 ^c	1.40 ± 0.05 ^b	4.98 ± 0.24 ^a
	Tail wagging	0.50 ± 0.01 ^c	3.12 ± 0.02 ^b	5.20 ± 0.54 ^a
21 days	Kicking	0.67 ± 0.33 ^c	2.57 ± 0.67 ^b	5.47 ± 1.02 ^a
	Vocalization	0.33 ± 0.04 ^c	2.64 ± 0.11 ^b	6.67 ± 0.43 ^a
	Tail wagging	0.60 ± 0.25 ^c	3.20 ± 0.21 ^{b*}	6.61 ± 0.51 ^a
42 days	Kicking	1.33 ± 0.21 ^c	2.89 ± 0.07 ^b	5.82 ± 0.53 ^a
	Vocalization	0.54 ± 0.21 ^c	4.14 ± 1.00 ^b	9.67 ± 0.88 ^a
	Tail wagging	1.20 ± 0.04 ^c	5.35 ± 0.58 ^{b*}	8.80 ± 0.53 ^{a*}

Values are shown as means ± S.E. M

^{a,b,c} means with different letters in the same row are significantly different at $P < 0.05$

means with stars* in the same column are significantly different at $P < 0.05$

The abnormal postures were virtually absent in control kids and present in those castrated at all ages used in this study for up to 180 minutes following castration (Tables 3-5). RR kids had significant ($P < 0.05$) increase in statue standing and immobile periods, abnormal lying with full extension of hind

limb, while lateral lying with head up or down, and normal standing/ walking were more in case of Bur castration technique. By age advancement of castrated kids there was significant ($P < 0.05$) increase in the time spent doing abnormal pastures in both RR and Bur kids.

Table (3) Effect of method of castration on time (min) spent in abnormal postures by kids in 180 minutes after RR and Bur castration (7 days of age):

Behavior	Control	RR	Bur
Statue standing	0 ± 0 ^c	37.18 ± 0.19 ^a	9.53 ± 1.21 ^b
Lateral lying , head up	0 ± 0 ^c	5.37 ± 0.14 ^b	10.52 ± 0.12 ^a
Lateral lying , head down	0 ± 0 ^c	6.2 ± 0.15 ^b	14.33 ± 0.23 ^a
Abnormal ventral lying, full leg extension	0 ± 0 ^c	36.40 ± 3.05 ^a	27.36 ± 0.16 ^b
Abnormal ventral lying, partial leg extension	0 ± 0 ^c	20.53 ± 1.17 ^b	30.2 ± 0.15 ^a
Abnormal standing\ walking	0.21 ± 0.05 ^c	53.32 ± 0.11 ^a	36.22 ± 0.23 ^b
Normal standing\walking	95.11 ± 2.7 ^a	7.30 ± 0.23 ^c	18.18 ± 0.49 ^b

Values are shown as means ± S.E. M

^{a,b,c} means with different letters in the same row are significantly different at $P < 0.05$

Table (4) Effect of method of castration on time (min) spent in abnormal postures by kids in 180 minutes after RR and Bur castration (21 days of age):

Behavior	Control	RR	Bur
Statue standing	0 ± 0 ^c	39.51 ± 3.05 ^a	20.42 ± 0.13 ^b
Lateral lying , head up	0 ± 0 ^c	18.53 ± 1.17 ^b	33.40 ± 3.05 ^a
Lateral lying , head down	0 ± 0 ^c	2.48 ± 0.15 ^b	10.41 ± 3.17 ^a
Abnormal ventral lying, full leg extension	0 ± 0 ^c	39.36 ± 0.32 ^a	29.21 ± 1.14 ^b
Abnormal ventral lying, partial leg extension	0 ± 0 ^b	8.33 ± 0.09 ^a	9.13 ± 0.27 ^a
Abnormal standing\ walking	0.18 ± 0.03 ^c	55.49 ± 0.18 ^a	36.53 ± 0.35 ^b
Normal standing\walking	107.11 ± 1.19 ^a	3.18 ± 0.12 ^c	11.52 ± 3.17 ^b

Values are shown as means ± S.E. M

^{a,b,c} means with different superscripts in the same row significantly differ ($p < 0.05$)

Table (5) Effect of method of castration on time (min) spent in abnormal postures by kids in 180 minutes after RR and Bur castration (42 days of age):

Behavior	Control	RR	Bur
Statue standing	0 ± 0 ^c	42.29 ± 0.28 ^a	30.8 ± 3.17 ^b
Lateral lying , head up	0 ± 0 ^c	22.35 ± 0.37 ^b	36.18 ± 0.23 ^a
Lateral lying , head down	0 ± 0 ^b	1.21 ± 0.18 ^b	8.31 ± 1.12 ^a
Abnormal ventral lying, full leg extension	0 ± 0 ^b	39.28 ± 0.12 ^a	33.50 ± 1.09 ^a
Abnormal ventral lying, partial leg extension	0 ± 0 ^b	8.07 ± 0.47 ^a	7.21 ± 0.33 ^a
Abnormal standing\ walking	0.19 ± 0.01 ^c	57.47 ± 0.18 ^a	46.51 ± 0.15 ^b
Normal standing\walking	109.41 ± 2.29 ^a	1.11 ± 0.06 ^c	6.28 ± 0.19 ^b

Values are shown as means ± S.E. M

a,b,c means with different superscripts in the same row significantly differ ($p < 0.05$)

The incidence of active pain behaviors (tail wagging, rolling, easing quarters, licking scrotum and inside of the hind leg, restlessness, vocalizations, and backward movements) were significantly higher in

case of RR kids than Bur kids and handled control at the same ages, while the incidence of head turning increased in case of Bur kids (Tables 6 & 7).

Table (6) Effect of method of castration on incidence of active pain behavior by kids in 180 minutes after Burdizzo (Bur) castration:

Age Behavior	7 days	21 days	42 days
Head turning	3.40 ± 0.74 ^b	8.12 ± 1.84 ^a	8.46 ± 1.33 ^a
Tail wagging	2.60 ± 0.51 ^b	5.81 ± 0.52 ^a	6.11 ± 0.61 ^a
Rolling	13.40 ± 2.29 ^b	18.63 ± 1.83 ^a	20.89 ± 4.12 ^a
Foot stamp\ kick	2.41 ± 0.50 ^b	2.83 ± 0.61 ^b	7.65 ± 0.41 ^a
Easing quarter	5.60 ± 0.31 ^b	9.12 ± 0.09 ^a	11.30 ± 0.18 ^a
Licking scrotum and inside of hind leg	3.18 ± 0.55 ^b	8.42 ± 0.23 ^a	9.40 ± 0.93 ^a
Restless	36.5 ± 0.44 ^c	49.82 ± 0.95 ^b	85.32 ± 0.91 ^a
Vocalization	2.21 ± 0.11 ^b	3.98 ± 0.52 ^b	7.31 ± 0.39 ^a
Backward movements	2.20 ± 0.05 ^b	3.51 ± 1.13 ^b	9.28 ± 4.88 ^a

Values are shown as means ± S.E. M

a,b,c means with different letters in the same row are significantly different at $P < 0.05$

Table (7) Effect of method of castration on incidence of active pain behavior by kids in 180 minutes after Rubber ring (RR) castration:

Age Behavior	7 days	21 days	42 days
Head turning	2.40 ± 0.51 ^b	2.80 ± 0.73 ^b	4.42 ± 0.93 ^a
Tail wagging	8.20 ± 0.85 ^b	10.21 ± 0.73 ^a	12 ± 2.95 ^a
Rolling	18.81 ± 1.85 ^b	24.40 ± 2.09 ^a	28.01 ± 3.91 ^a
Foot stamp\kick	4.20 ± 1.28 ^b	5.11 ± 2.86 ^b	10.04 ± 1.03 ^a
Easing quarter	9.08 ± 0.71 ^b	11.39 ± 1.57 ^b	18.62 ± 1.30 ^a
Licking scrotum and inside of hind leg	9.80 ± 2.51 ^b	13.11 ± 3.08 ^b	18.08 ± 1.32 ^a
Restless	50.5 ± 0.13 ^b	58.2 ± 0.45 ^a	108.45 ± 0.68 ^c
Vocalization	4.11 ± 1.39 ^b	13.62 ± 0.81 ^b	18.21 ± 1.50 ^a
Backward movements	7.17 ± 1.45 ^c	26.12 ± 4.93 ^b	48.71 ± 6.95 ^a

Values are shown as means ± S.E. M

a,b,c means with different letters in the same row are significantly different at $P < 0.05$

As shown in table (8); there was significant ($P<0.05$) increased in the frequency of urination and defecation behaviors and significantly ($P<0.05$) reduction in ingestive behavior in case of RR and in older age.

Table (9); revealed that most of buck kids were castrated between one and 10 weeks of age, Burdizzo was used between 2 and over 8 weeks with % of 2 and 16 respectively, while rubber ring was between one day and 8 weeks of age with % of 17 and 2

respectively. Most farmers still do surgical castration between ages of 7 days to over 8 weeks by themselves in the farm (seventy seven percent), and small percentage (twenty three percent) of castrations were done at the clinic. Castration failure was not recorded either for surgical or rubber ring castration methods, but were noted only in 7 out of 30 kids where the Burdizzo was used especially older than 8 weeks.

Table (8) effect of method of castration on the incidence of elimination, suckling and teat seeking, and feeding behavior by kids in 180 minutes after castration and handled control:

Behavior	Age	7 days	21 days	42 days
	Handled control	Urination	2.12 ± 0.01^b	2.36 ± 0.33^b
	Defecation	0.50 ± 0.02^b	3.11 ± 0.11^a	3.21 ± 0.30^a
	Suckling and teat seeking	$3.16 \pm 0.11^{b*}$	$6.44 \pm 0.28^{a*}$	$4.57 \pm 0.38^{b*}$
	Feeding	$0.23 \pm 2.20^{c*}$	2.64 ± 0.63^b	$6.63 \pm 2.92^{a*}$
Rubber ring (RR)	Urination	$7.80 \pm 0.21^{b*}$	$10.28 \pm 0.81^{a**}$	$15.21 \pm 0.36^{a**}$
	Defecation	$3.40 \pm 0.60^{b*}$	4.81 ± 0.92^b	$7.21 \pm 0.11^{a*}$
	Suckling and teat seeking	1.86 ± 0.03^a	1.6 ± 0.01^a	0.03 ± 0.01^b
	Feeding	0 ± 0^p	0 ± 0^b	0.21 ± 0.03^a
Burdizzo (Bur)	Urination	$6.87 \pm 3.07^{b*}$	$6.91 \pm 5.21^{b*}$	$11.61 \pm 0.12^{a*}$
	Defecation	3.26 ± 0.75^b	3.61 ± 0.81^b	$5.40 \pm 0.91^{a*}$
	Suckling and teat seeking	1.7 ± 0.01^a	0.12 ± 0.05^b	0.03 ± 0.11^b
	Feeding	0 ± 0^b	0 ± 0^b	0.58 ± 0.01^a

Values are shown as means \pm S.E. M

^{a,b,c} means with different letters in the same row are significantly different at $P<0.05$

means with stars* in the same column are significantly different at $P<0.05$

Table (9) Results of questionnaire on buck kids' castration survey:

Method of castration		Burdizzo	Rubber ring	surgical
Age (weeks)	1-2	-	17	83
	2-4	2	12	86
	4-8	2	2	96
	Over 8	16	-	84
Place of Castration	At clinic	23		
	At the farm	77		
Using of anesthesia		For older kids more than 8 weeks in case of surgical castration only		
Using of tetanus prophylaxis		in case of surgical castration only (40 %) especially over 4 weeks)		
Failure or recurrence		7	-	-
Injuries or deaths		2	2	3
Reason of castration	Prevent unwanted pregnancy	20		
	Avoid behavioral problems	27		
	Fattening	48		
	Avoid goatly odor	5		

4. Discussion:

The purpose of this study was to examine the behavioral responses of kids castrated by RR or Bur at different ages (7, 21 and 42 days of age), and to compare these responses to those seen in handled control of the same ages to those castrated. As pain is associated with suffering and distress, thus it is important to be estimated as it interferes with most behavioral patterns of animals. During castration kids did struggling behavior which increased with age of kids, as castration of younger kids (7 days of age) took significantly shorter time than older kids. The time of castration was significantly affected by age of castrated kids and age of castration. Older kids (21 and 42 days) took significantly longer time in both methods of castration. Bur method took significantly longer time than RR at all ages because the instrument had to be applied for each testicle. These results confirmed the findings of (Hosie *et al.*, 1993 and Melches *et al.*, 2007) as they stated that castration of lambs of the Burdizzo group, took significantly longer time than the castration of lambs of the rubber ring groups.

In case of RR castration, there was significant effect of age of kids at castration on the average time taken for the scrotum to drop off; it sloughed earlier in case of younger kids than in older kids because in the later there was more tissue and innervations by blood vessels and nerves, so it took longer time to slough. Kent *et al* (2000) recorded that 80% of castrated lambs still had scrotum present after 28 days of castration by RR. In castrated lambs, Mellema *et al.* (2006) found that after rubber ring castration, the scrotal tissue and its contents began to dry up and fell off after an average of 24.7 ± 4.4 days. Also Melches *et al.* (2007) reported that in case of rubber ring castration, the testes dropped off after a (35 ± 6.9) days in lambs.

The incidence of vocalization, tail wagging and kicking, behaviors during castration were greater in older kids, (42 days) indicating the severity of pain due to more tissue damage in those kids. This result agree with (Molony *et al.*, 1993) who found that in lambs all methods of castration at all ages produced changes in behavior that were interpreted as indicative of considerable pain. The expression of pain during castration was significantly influenced by the castration method (Molony *et al.*, 2007). The incidence of kicking, tail wagging, and vocalization during application of Bur was greater than RR at all ages used in this study as application of Bur need sometime to apply (grasping the scrotum and manipulate the testes down into the scrotum by hand, manipulation of spermatic cord and squeezing the Bur totally closed, clamping it on the kid's scrotum to crush the cord for each testicle and to the difficulties

of its application. Foot stamping and kicking or restlessness made up the main part of the total active behavior after rubber ring castration (Mellema *et al.* 2006). In piglets, (Weary *et al.*, 1998) recorded vocalization when castrated and demonstrated that piglets call at a higher frequency during the procedure especially during the severing of the spermatic cord. Studies investigating differences between pain responses of lambs at different ages have been undertaken using different methods of castration and tail docking (Johnson *et al.* 2009). In our study it was clear that all castration methods produced changes in behavior which were significantly higher compared to handle control kids and in older kids more than younger. Johnson *et al.* (2009) demonstrated that very young lambs have a reduced cerebrocortical response to castration than their older counterparts and it has been assumed that they perceive less pain.

Pain is typically estimated to be mild or moderate based on abnormal postures and behaviors indicating discomfort (Molony *et al.*, 2002).

There was significant difference in abnormal postures (statue standing, lateral lying with head up, lateral lying with head down, , abnormal ventral lying with partial leg extension, and abnormal standing\walking) between RR and Bur kids in all kids at all ages used in this study ranged from (7-42 days). RR kids had significant increase in statue standing and immobile periods, and abnormal lying with full extension of hind limbs, by reducing total movements; this may be an attempt by the kid to decrease painful sensation, as pain might increase as a result of moving. Pain can lead to a period of hyperalgesia, which is a change in the relationship between pain perception and stimulus intensity, resulting in a decreased stimulus threshold and increased pain in response to a suprathreshold stimulus (Raja *et al.* 2000 and McCracken *et al.* 2010).

(Grant 2004) found that statue standing was highly indicative of Mulesing treatments. Lying postures and abnormal walking/standing based upon the degree of limb extension, as the increase full extension depends on testicular tissue pain. This agrees with what reported in lambs by (Molony *et al.*, 2002), that lying with full extension of the hind limbs is associated with lambs ranked higher in the pain scale. These abnormal postures values were higher in RR kids than Bur kids at all ages, the high level of these behaviors following RR castration reflects direct pressure on the spermatic cord and scrotal skin exerted by the tight rubber ring followed by ischemic scrotal and testicular pain and due to the inflammatory response of RR produced increase sensitivity at this site. Also may be as a result of RR kids displayed agitated behavior such as incessant pacing along the pen perimeter and ischemic pain

from RR prevented kids from adopting a similar strategy as observed in castrated lambs by (Grant, 2004). In castrated lambs, Mellema et al. (2006) stated that the proportion of recorded postures that were abnormal was significantly greater after RR castration, than Bur during the first 2 h. they added that from days 1 to 6 after treatment, lambs castrated without local anaesthesia (Bur and RR) exhibited a significantly higher rate of total active behavior than control lambs.

Lateral lying with head up or down, and normal standing/ walking were more in case of Bur castration technique which produced a short burst of intense pressure but not ischemic pain from the scrotum and its contents. Molony et al., (1993) postulated that this is because some afferent nociceptive signals are abolished by the crushing action of the clamp on the neuron serving these structures.

Pain is related to the amount of tissue damage (Lester et al., 1996 and Molony et al., 2002 ; and Fitzpatrick et al. 2006). Castration of older kids (42 days) displayed more active pain behavior than younger ages (7& 21 days), this is because of by increasing age of kid, there was an increase in pain sensation due to more innervations by nerves and blood vessels and more tissue damage, so those kids try to alleviate pain by doing these behaviors.

Many authors (Mololny et al., 1993; Kent et al., 1995 and Goodwin et al., 2007) have favored using active pain behaviors as a mean of assessing pain following castration. In both methods of castration, it was found that the abnormal lying with full leg extension and abnormal standing\ walking were significantly increased with age as with increasing age there was more tissue damage and more pain sensation, while lateral lying with head down, and abnormal lying with partial leg extension, were significantly decreased by age. Due to the tension of the rubber ring, RR kids spent significantly more time doing abnormal postures than Bur kids which spent greater time in lying postures at the same ages. These results agree with Melches et al. (2007), who observed that rubber ring lambs exhibited more often abnormal postures than the Burdizzo lambs: a tendency towards this difference was found during the time period 20 min to 2 h after castration, and significant differences were found during the time period 2.5–9 h after castration. Age significantly affected both the abnormal postures and the time spent in lying postures (all lying postures). Normal standing behavior was very short during the observational period in castrated animals, and this have been interpreted as indicators of post-castration pain and/or distress as reported by (Mellor et al., 1991; Wood et al., 1991; Kent et al., 1995, and Lester et al., 1996).

In the same ages, it was found that RR kids had significantly more incidence of active pain behaviors (tail wagging, rolling, easing quarters, licking scrotum and inside of the hind leg, restlessness, and backward movements) than Bur kids and handled control this may be due to noxious mechanical stimulation of the skin and subcutaneous tissue by the ring (as recorded in lambs by (Molony et al., 2002; Mellema et al. 2006; and Goodwin et al., 2007). The same was reported in lambs by (Kent et al., 2001), who observed fewer incidences of tail wagging, easing quarter, rolling and limb movements where castrator was applied proximal to the RR. Watts and Stookey, (2000), reported that vocalization is obviously an important part of many animals normal communication and a form of commentary on their own sense of well-being. As tissue damage increased by age, These behaviors significantly increased by age, indicating that the severity of pain increased in older kids (21 and 42 days), they also did more vocalizations than those castrated at 7 days, also vocalization was affected by methods of castration, RR castrated kids did more vocalizations than Bur at all ages. These results disagree with what reported by Grant, (2004), who stated that vocalization of the lamb did not appear to correlate well with the severity of the treatment and its expression was highly variable amongst lambs.

The incidence of restlessness and walking backward increased by age and were significantly more in case of RR indicating the severity of pain due to more tissue damage. Those animals suffered more and couldn't still in a fixed position for long time, thus they move more frequently to alleviate the pain sensation.

The frequency of urination and defecation in castrated kids was significantly affected by age and method of castration; it increased significantly in case of RR and in older ages, this indicated that those kids suffered more stress which made the kids stripping urine and increase times of defecation especially during the first hour after castration. McCracken et al. (2010) found that after tail docking in lambs, some behaviors such as urination were infrequently displayed and there was not a significant difference between the pre and post docking measurements.

There was significantly reduction in ingestive behavior (suckling and teat seeking and nibbling at feed) at different ages in this study. This may be related to reduction in appetite due to pain sensation and distress. In lambs, Mellema et al. (2006) reported that castration pain and distress should affect animal behavior, they may also affect food intake with consequent differences in daily weight gain. Our results agree with (McGlone et al., 1993, and Weary et al. 1998), they recorded reduction in suckling,

standing and increased lying time in the behavior of young pigs compared with that of intact pigs at all ages tested. Also reduction in suckling in castrated kids may be related to loss of appetite as reported in castrated cattle by (Stilwell et al., 2008).

Results of questionnaire indicated that the age of castrated buck kids were between one and 10 weeks of age, Burdizzo was used between 2 and over 8 weeks, while rubber ring was used in younger kids between one day and 8 weeks of age. Surgical castration also done between ages of 7 days to over 8 weeks, and mostly done by farmers themselves in the farm, while small percentage of castrations were done at the clinic. Castration failure noted only in case of Burdizzo especially those older than 8 weeks. This might be failure to apply sufficient crushing pressure to the spermatic cord due to short time of application as reported in lambs by Hosie *et al.*, (1996) who stated that the highest failure rate was attributed to a faulty bloodless castrator which the flockmaster believed did not achieve an adequate crushing pressure. The results also showed that in case of surgical castration, only 40 % of castrations used anesthesia and tetanus prophylaxis, and it was limited to those kids over 8 weeks. There was no significant difference in the percentage of deaths between castration methods, from 100 castrated kids of different ages, only two deaths were attributed to both Burdizzo and rubber ring whereas there were three for surgical castration. Deaths did not occur immediately after castration, but due to injury from the technique and infection to the scrotal skin, or to swelling of one or both testicles due to hemorrhage as reported by Hosie *et al.*, (1992). The main reasons given for castration of kids mostly for fattening, to avoid behavioral problems and to prevent unwanted pregnancy, while the least percentage, was recorded for avoidance the goatly odor of milk.

Conclusion:

As some of buck kids have to be castrated for the previous reasons, thus from welfare point of view, it is important to choose the safest and less painful method to apply because the careful selection of procedures could reduce the total pain response. Despite rubber ring castration was the easier and faster, it led to long-term pain after castration and had adversely effect on behaviors as compared with Burdizzo castration.

The % of time spent doing behaviors that indicate painful sensation was increased with age which indicate that pain sensation in younger ages diminished earlier than older. The results of questionnaire revealed that using of Burdizzo and rubber ring castration still have some ignorance. The general recommendation is to castrate kids as early as possible as pain sensation diminished earlier in young

kids (7-21 days) than old (42 days) which results more tissue damage which probably increases the likelihood of post operative complications.

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