Castration of Iraqi local bucks by bilateral spermatic cord torsion compared with double ligation of spermatic cord.

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Abstract

This study aimed to investigate the efficacy of using spermatic cord torsion as one of the easy castration techniques in Iraqi local black goat, and compared with double ligation of spermatic cord also to be acquainted if the age of animals has an effect on spermatic cord torsion technique. This present study was done in the animals farm of the college of the veterinary medicine of Al-Qadissiya university, 30 local male black bucks (15 kids of 2.5 - 3 months) (15 adult bucks of 13 - 15 months) with body weight (13.4 ± 2.21) and (31.9 ± 3.25) Kg respectively, were supplied for two symmetrical experiments, each one included division the animals randomly to three groups, first group (G1) left as control , Second group (G2) had spermatic cord ligation of both testes and third group (G3) had bilateral spermatic cord torsion and after two months orchiectomy of all testes were done to study the dimensions, the weight, histopathology of the testes and the level of serum testosterone hormone. The results revealed that the castration lead significance ($P<0.01$) to increase the body weight of both kids and bucks as compared with control, the maximum weight gained was in the bilateral spermatic cord torsion, while in the kids was the ligation group. Weights, lengths and circumferences of the both testes of all animals showed a significant decrease ($P<0.01$) as compared with control animals. Testosterone hormone analysis revealed a significant decrease ($P<0.01$) in its level in all castrated groups when compared with control group. Seminal analysis showed a significant decrease ($P<0.01$) (seminal plasma only) for the volume, concentration, viability, individual and mass motility of the sperms of the all castrated animals as compared with control. The histopathological study of all treated testes corroborated there were a severe degeneration and fibrosis in the testicular tissue as well as in the sertoli and leydig cells and complete suppression of spermatogenesis in all treated groups. The conclusion that spermatic cord torsion caused damage to the testes as ligation did with no effect of age of animals on this technique.

Introduction

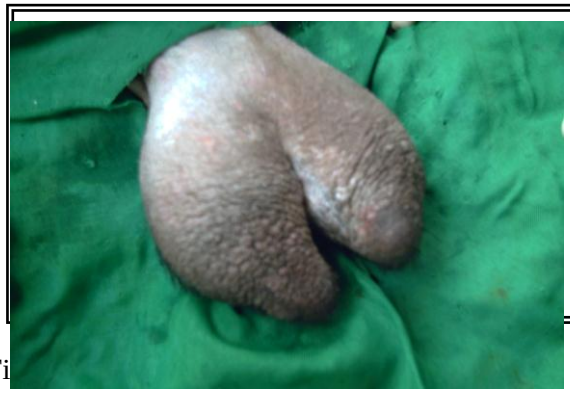
Goats are species of animals characterized by many unique biological features such as high fertility, ability to produce twins, triplet and even quadrant pregnancies, and have a resistance to different types of diseases. The gynecological problems are very few and eating simple food. (1). they were regarded as a useful model to study the urogenital abnormalities (2,3). Castration means a process which cause stop the function of the testes leading to sterilization (4). The indication of castration are different according to reasons of castration such as stop the production of male hormones and sperms, prevent mating after age of puberty, produce animal to be easier to handle with less aggressiveness, avoid unwanted pregnancies and mating of young females before they are of adequate size and age for pregnancy and parturition and reduce goaty smell in males (5). The common techniques which used for castration are Burdizzo, elastration, ligation of spermatic cord and chemical castration (6,7). Torsion of the spermatic cord causes strangulation of gonadal blood supply with subsequent testicular necrosis and atrophy, and results in diminished fertility in experimental animals (8,9,10,11,12). Spermatic cord torsion regarded as an emergency case with few data related with ipsilateral and contralateral changes in the testes especially of small ruminants, so this technique was used as a new manual one for castration.

Materials and Methods

The study were conducted on 30 local male black bucks (15 kids of 2.5-3 months) and (15 adult bucks of 13-15 months) weighing (13.4 ± 2.21) and (31.9 ± 3.25) respectively, which were managed under uniform housing condition and the adults were separated from kids. Animals divided into two main groups depending on the age, the adult and kid groups, each group subdivided into three subgroups (G1 control, G2 castration by ligation of spermatic cord and G3 torsion of spermatic cord) the animals in G2 is restrained in lateral recumbency under help of Xylazine at dose (0.1-0.3 mg/kg) intramuscularly, the neck of scrotum were prepared for aseptic surgery (figure 1) and anesthetized locally by ring block using lidocaine Hcl 2% (13).Longitudinal skin incision about 2.5 cm was made over the spermatic cord till reach the tunica vaginalis which remains intact , curved hemostat was inserted under the cord to separate it from the surroundings , spermatic cord was ligated by double rows of transfixation technique (one centimeter down to the first one) (figure 2) , ligation was performed via non-absorbable silk suture No. 2 in bucks and No. 1 in kids, the skin and other health tissues that incised were re-stitched back in a routine manner, the same technique was repeated on the other side (14,15,16).The G3 instead of ligation both spermatic cords were twisting (720º) along its longitudinal axis by rotating the cord using tissue forceps, torsion was maintained in position by fixing the cord to the subcutaneous tissue with one stitch of silk suture (figure 4). (11,17) . Five bucks and five male kids in G3 were left entire (untreated) as control group.Semen was collected using artificial vagina from all adult bucks before castration (in December) and two months after castration (in March). Semen assessment was done within approximately 20 min, The evaluation of semen include; the sperm motility (mass and individual), sperm concentration and sperm viability.Serum testosterone levels of all animals were determined by the using of Radio-immuno assay method using active testosterone RIA DSL-4000 Kit (18) before treatment, after two months of castration and two weeks later after orchiectomy (figure 5).All testes of bucks and male kids were removed surgically, clinical examination and testicular changes were evaluated which represented by testicular dimensions (length and circumference) by scale tape in addition to testicular weight were estimated using electrical balance. Testicular biopsies from the transected testes of each animals were collected and stained with Hematoxylin – Eosin (H & E) stain and examined under light microscope (19).The structures of the seminiferous tubules and interstitial space in the testes were examined.

Statistical Analysis:

All presented data are mean ± SE, SPSS program were used to determine the difference between mean of control and treatment values of body weight, testes measurements, semen assessments and serum testosterone concentrations, as well as (LSD) test was used to compare the significant variances between mean($P<0.01$) and ($P<0.05$).(20,21).



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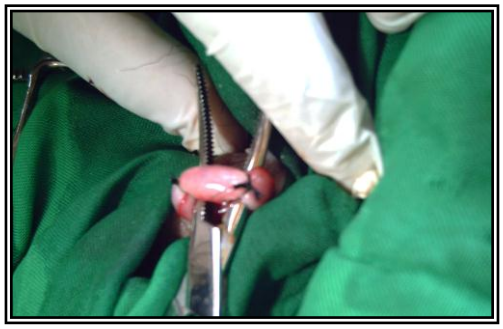


Fig 2 Double row of transfixation of spermatic cord.

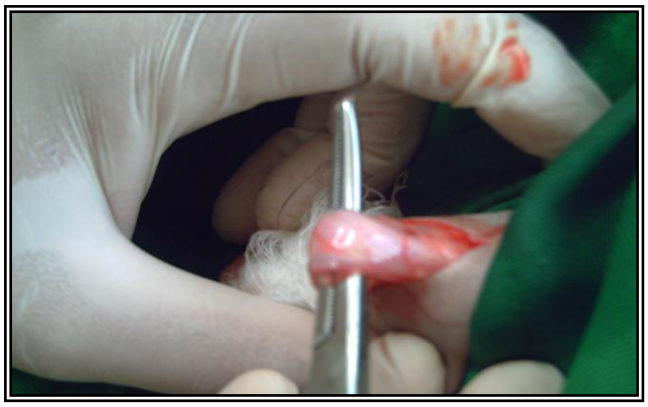


Fig 3 Separation of the spermatic cord.

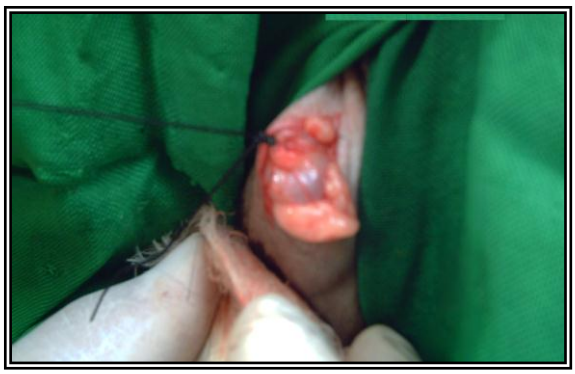


Fig. 4 Fixation rotating cord.

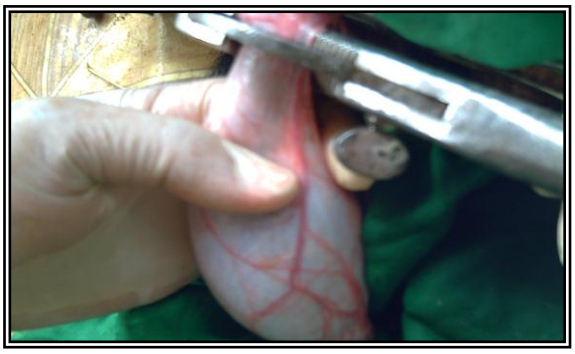


Fig. 5 Complete orchiectomy.

Results

1-Adult Animals:

A-Body weight:

There were increases in means of body weight of adult animals before and after castration.The body weight gained of control, ligation, and bitorsion were (3.48 ± 0.4283, 7.69 ± 0.26 and 8.02 ± 0.4663) kg respectively.There were a significance increase (P< 0.01) in body weight gain in both castrated groups than control group, while there were no significance differences (P>0.05) between them. (table 1).

Table (1) Body weight before and after treatment of adult animals.

Groups	Body Weight (kg)		Weight Gain (kg)
	Before Treatment	After Treatment	Total
Control	31.88±0.4236 aA	35.36±0.7061 aA	3.48 ± 0.4283 a
Ligation	31.78±0.6967 aA	39.74±0.5997bB	7.69 ± 0.26 b
B.Torsion	31.8±0.5385 a A	39.82±0.3137 bB	8.02 ± 0.4663 b

- Different small letters denote to a significance difference (P<0.01) in the one column.
- Different capital letters denote to a significance difference (P<0.01) in the one row.
- Different small letters in weight gain column denote to a significance difference (P<0.01).

B-Testicular weight:

Grossly there was a noticeable decrease in size of the affected testicles when compared with control. There were a significant decrease (P<0.01) in weight of testes of ligation and B. torsion than the control group, whereas there was no significant difference (P>0.05) between them. (table 2).

Table (2) Testicular weight (gm) of adult bucks after two months from treatment (means ± SE) (n=5).

Groups	Testicular Weight (gm)	
	Left	Right
Control	134.22±1.7676 a	132.84±0.9368 a
Ligation	31.8±0.4940 b	31.1±0.3033 b
B.Torsion	31.34±0.3842 b	31.22±0.4994 b

- Different small letters denote a significance difference (P<0.01).

C-Testicular length:

There were a significant decrease (P<0.01) in length of the testes of ligation and B. torsion than the control group, with no significant difference (P>0.05) between them.(table 3).

Table (3) Testicular length (cm) of adult bucks after two months from treatment (means ± SE) (n=5).

Groups	Testicular Length (cm)	
	Left	Right
Control	12.34±0.2786 a	10.98±0.1068 a
Ligation	7.94±0.3444 b	7.74±0.3234 b
B.Torsion	8.1±0.2429 b	7.86±0.2421 b

Different small letters denote a significance difference (P<0.01).

D-Testicular circumference:

There were a significant decrease (P<0.01) of castrated group than control group, with no significant difference (P>0.05) between them. (table 4).

Table (4) Testicular circumference (cm) of adult bucks after two months from treatment (means ± SE) (n=5).

Groups	Testicular Circumference (cm)	
	Left	Right
Control	14.24±0.3203 a	13.96±0.3881 a
Ligation	9.32±0.4510 b	8.54±0.44 b
B.Torsion	9.42±0.3513 b	8.52±0.4283 b

Different small letters denote a significance difference (P<0.01).

E-Testosterone hormone:

The testosterone hormone levels in all animals before castration have no significant changes (P>0.05) among the readings.The level of this hormone after two months of castration showed a significant decrease (P<0.01) in both castrated groups than the control, the hormone level after two weeks of complete orchiectomy showed no significant difference (P>0.05) among all groups. (table 5).

Table (5) Testosterone hormone of adult bucks before treatment (Th.1), after treatment (Th.2) and two weeks later from orchiectomy (Th.3) (means ± SE) (n=5).

Groups	Testosterone Hormone (ng/ml)		
	Th. 1	Th. 2	Th. 3
Control	0.88±0.0247 aA	0.89±0.02025 aA	0.05±0.007071 aB
Ligation	0.8960±0.02293aA	0.06±0.004472 bB	0.05±0.003162 aB
B.Torsion	0.894±0.0186 aA	0.072±0.003742 bB	0.06±0.003162 aB

- Different small letters denote to a significance difference (P<0.01) in same row.
- Different capital letters denote to a significance difference (P<0.01) in same column.

F-Semen assessment:

The mean of the evaluation in all 15 adult animals of all groups (before any surgical intervention were recorded in table (6).

Table (6) Semen assessments of adult bucks before treatment of all groups (means ± SE) (n=15).

Groups	Volume (ml)	Concentration($x10^9$)	Viability(%)	Sperm motility (%)	
				Individual	Mass
Animals	0.592 ± 0.017612	1.868 ± 0.20248	68.48	67.38	66.92

The volume of semen, the concentration, the viability and sperm motility were seen decreased significantly (P<0.01) in both castrated groups than the control group, (table 7).

Table (7) means ± SE of semen assessments of adult bucks after treatments. (n=5)

Groups	Volume (ml)	Concentration($x10^9$)	Viability(%)	Sperm motility (%)	
				Individual	Mass
Control	0.588±0.02035 a	1.9±0.2121a	67 a	69.28a	69.98a
Ligation	0.154±0.005099bd	0.00±0.00 b	0.00 b	0.00 b	0.00 b
B.Torsion	0.142±0.003742d	0.00±0.00 b	0.00 b	0.00 b	0.00 b

- Different small letters denote to a significance difference (P<0.01) among control and treated groups.

Pathological changes in bucks and kids:

Macroscopical evidence:

The testes of both treated groups were atrophied and declined significantly (P<0.01) in measurements when compared with control group.

Histopathological findings:

Control group: All seminiferous tubules are normal, active spermatogenesis and high numbers of spermatozoa as well as there were no multinucleated giant cells with no vaculaion of spermatogonea, presence of leydig cells in the interstitium and normal sertoli cells (figure 6).

Treated groups: Both treated groups suffered from degeneration changes and coagulative necrosis with severe suppression of spermatogenesis, vaculation of spermatogonea and reduced numbers of spermatozoa also there were a degeneration of leydig cells in the interstitium and degeneration of sertoli cells within seminiferous tubules, severe fibrosis enclosed the seminiferous tubules caused more constriction of their lumen as well as necrosis, desquamation and sloughing of the epithelial lining of seminiferous tubules, obviously several changes can be seen in these groups as necrosis of sertoli cells, thickening of connective tissue and peritubular tissue, absence of tubular ducts and edema and destruction of spermatogonium , spermatocytes and spermatides. (figures 7-8 in buck and figures 9-10 in kid).

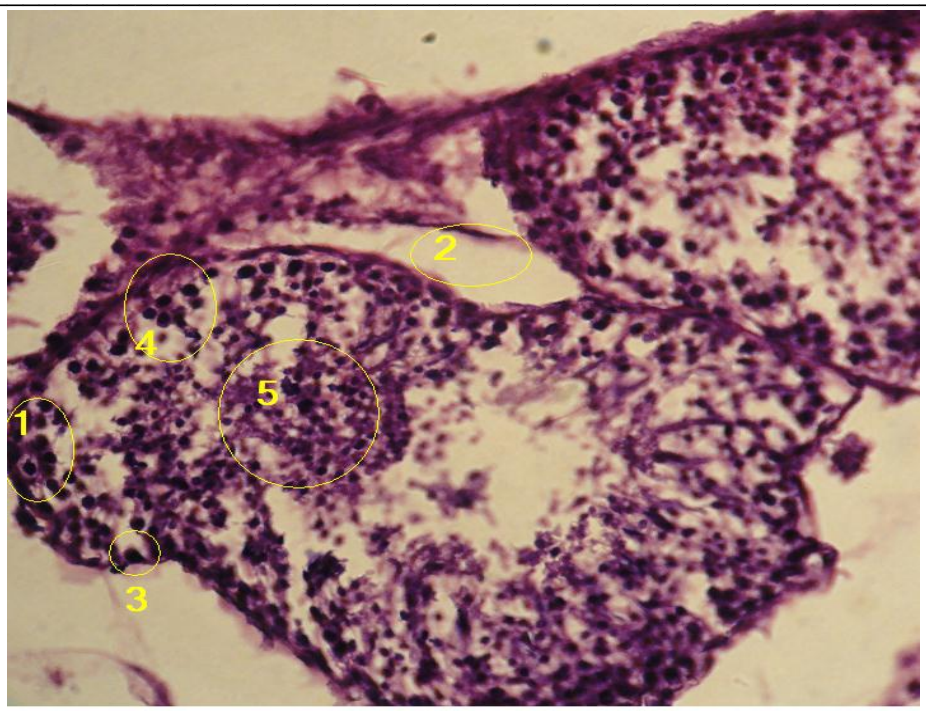
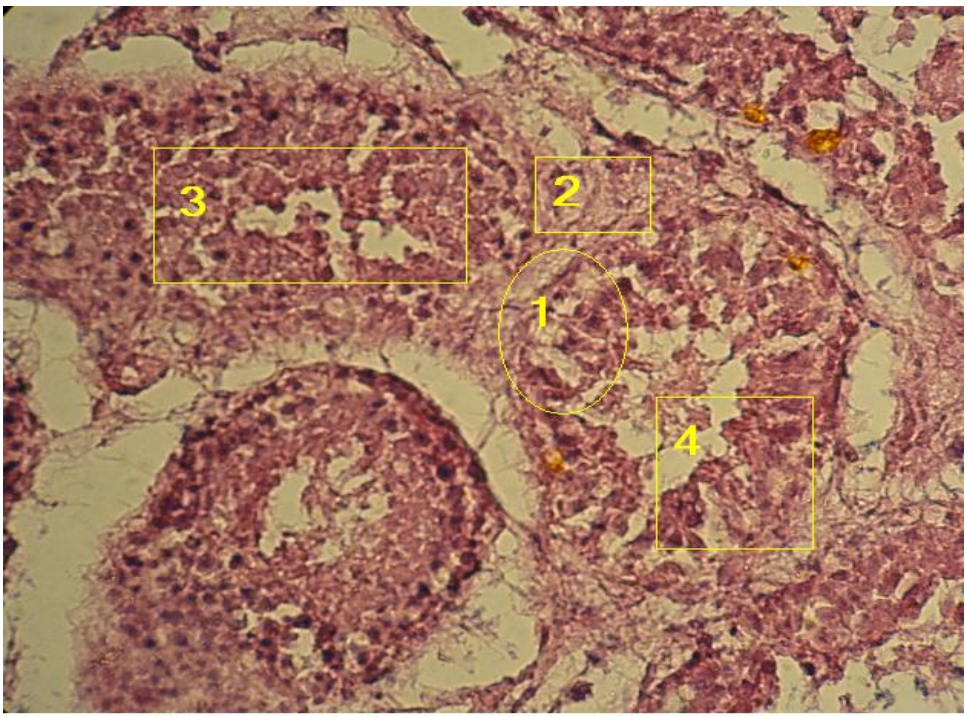
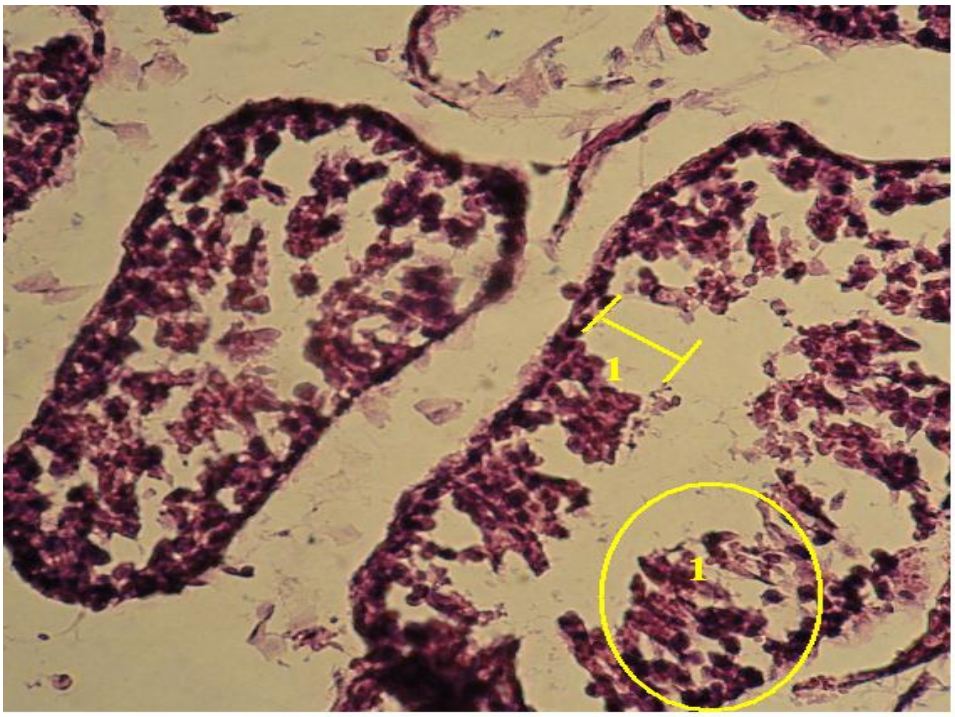


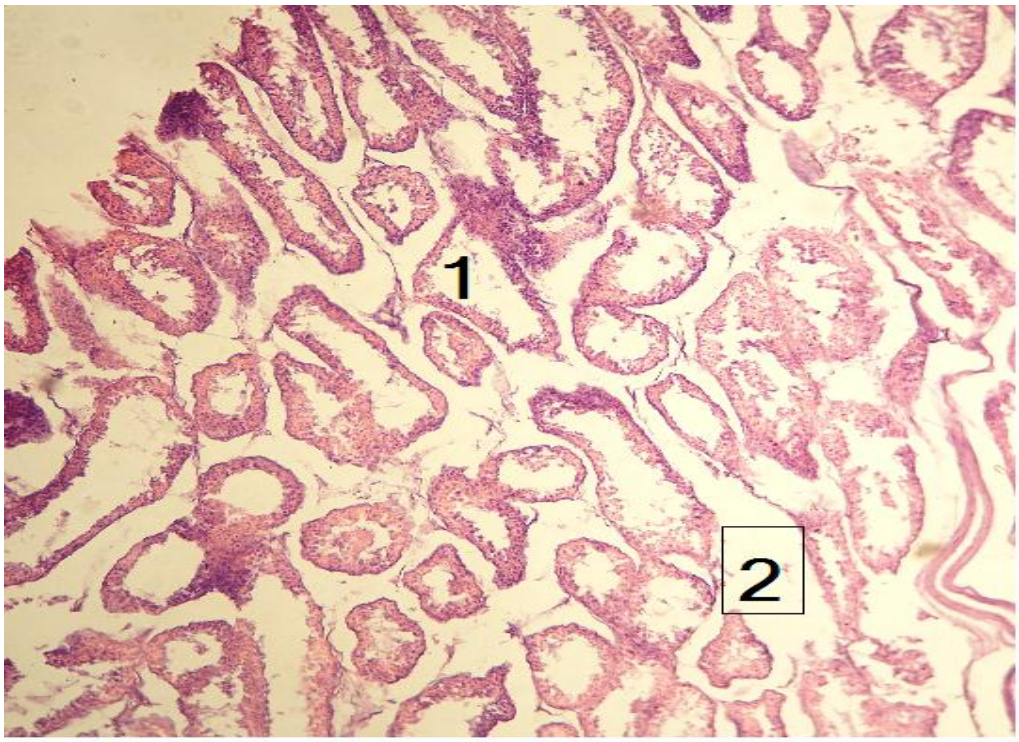
Figure (6): normal seminiferous tubule tissue , sertoli cell (1), Peritubular tissue(2), spermatogonium(3), spermatocytes(4) and spermatides(5). H&E, 400X.



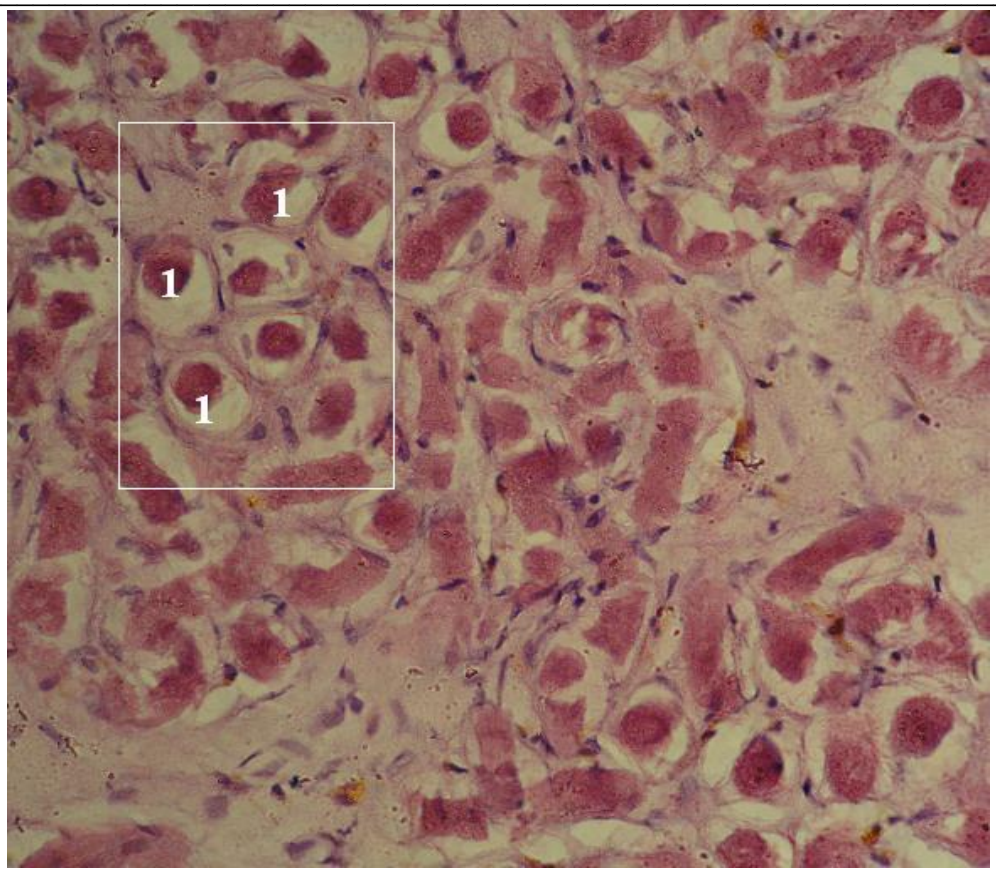
Figure(7):(ligation group) seminiferous tubules, necrosis of sertoli cells(1), thickening of connective tissue and peritubular tissue(2), absence of tubular ducts(3) and edema and destruction of spermatogonium, spermatocytes and spermatides(4).H&E stain, 100X.



Figure(8): (torsion group) seminiferous tubules, diminishing of the germinal epithelium(1) and absence of sertoli and leydig cells. H&E stain. 400X.



Figure(9) (ligation kid) Low magnification of the testis, complete atrophy of seminiferous tubules(1) and increased interstitial space(2). H&E, 100X.



Figure(10): (torsion kid) testis, sloughing of germinal epithelium of seminiferous tubules(1). H&E, 100X.

2-Kids:

A-Body weight:

The body weight gained of animals in control, ligation and B. torsion were (2 ± 0.1517, 4.8 ± 0.4722 and 4.32 ± 0.3121) kg respectively.There were an increase in body weight of kid animals before and after castration.

In body weight there were no significant difference (P>0.05) between control group before and after treatment, while there were a significant difference (P<0.01) between both treated groups before and after treatments.There were a significance increase (P< 0.01) in body weight gain in both castrated groups than control group, while there were no significance differences (P>0.05) between treated groups (table 8).

Table (8) Body weight and weight gained before and after treatment of kids (means ± SE) (n=5)

Groups	Body Weight (kg)		Weight Gain (kg)
	Before Treatment	After Treatment	Total
Control	13.52 ± 0.5607aA	15.52 ± 0.5064aA	2 ± 0.1517 a
Ligation	13.14 ± 0.5297aA	17.94 ± 0.3982bB	4.8 ± 0.4722 b
B.Torsion	13.6 ± 0.5329aA	17.92 ± 0.3089bB	4.32 ± 0.3121 b

- Significance difference (P<0.01) between control group and other treatments, and there was no significance difference (P>0.05) among treated groups.
- Different small letters denote to a significance difference (P<0.01) in the one column.
- Different capital letters denote to a significance difference (P<0.01) in the one row.
- Different small letters in weight gain column denote to a significance difference (P<0.01).

B-Testicular weight:

There were a significant decrease (P<0.01) in weight of testes of ligation, B. torsion than the control group, with no significant between them (table 9).

Table (9) Testicular weight (gm) of kids after two months from treatment (means ± SE) (n=5).

Groups	Testicular Weight (gm)	
	Left	Right
Control	19.48 ± 0.5352a	18.56 ± 0.6063a
Ligation	4.98 ± 0.2478 b	4.72 ± 0.2596b
B.Torsion	4.56 ± 0.1691b	4.28 ± 0.1828b

- Different small letters denote to a significance difference (P<0.01).

C-Testicular length:

There were a significant decrease (P<0.01) in length of the testes of ligation and B. torsion than control group, with no significant difference (P>0.05) between them (table 10).

Table (10) Testicular length (cm) of kids after two months from treatment (means ± SE) (n=5).

Groups	Testicular Length (cm)	
	Left	Right
Control	4.46 ± 0.2482a	4.24 ± 0.2441a
Ligation	2.74 ± 0.1965b	2.52 ± 0.2332b
B.Torsion	2.62 ± 0.1463b	2.4 ± 0.1581b

- Different small letters denote to a significance difference (P<0.01).

D-Testicular circumference:

There were a significant decrease (P<0.01) of castrated group than control group, with no significant difference (P>0.05) between them. (table 11).

Table (11) Testicular circumference (cm) of kids after two months from treatment (means ± SE) (n=5).

Groups	Testicular Circumference (cm)	
	Left	Right
Control	5.38 ± 0.2131a	5.16 ± 0.2159a
Ligation	3.48 ± 0.1356b	3.22 ± 0.1428b
B.Torsion	3.4 ± 0.1140b	3.18 ± 0.08b

- Different small letters denote a significance difference (P<0.01).

E-Testosterone hormone:

The testosterone hormone level in all kid animals before castration were ranged between (0.16 ± 0.02449 to 0.186 ± 0.008718 ng/ml) and there were no significant changes (P>0.05) among the readings.

The level of this hormone after two months of castration showed a significant decrease (P<0.01) in both castrated groups than the control, the hormone level after two weeks of complete orchiectomy ranged between (0.0274 ± 0.0006782 to 0.032 ± 0.004411 ng/ml) and showed no significant difference (P>0.05) among all groups (table 12).

Table (12) Testosterone hormone levels in kids before treatment (Th.1), after treatment (Th.2) and two weeks later from orchiectomy (Th.3) (means ± SE) (n=5)

Groups	Testosterone Hormone (ng/ml)		
	Th. 1	Th. 2	Th. 3
Control	0.18±0.03742aA	0.18±0.03742aA	0.0292±0.0005831aB
Ligation	0.16±0.02449aA	0.029±0.0007071bB	0.0274±0.0006782aB
B.Torsion	0.186±0.008718aA	0.029±0.0007071bB	0.0324±0.004411aB

- Different small letters denote to a significance difference (P<0.01) in the same column.
- Different capital letters denote to a significance difference (P<0.01) in the same row.

3-Complication of castration:

After completing the treatment operations several parameters were recorded to indicate the complications appear on the animals as followings:

Table (13) some complications were faced the castration techniques.

Operations	Age of animals	Parameters			
		Lameness	Testicular swelling	Infection	Hydrocele
Ligation	Buck	1	2	1	1
	Kid	1	3	2	0
B. torsion	Buck	3	2	1	3
	Kid	2	2	2	3

Lameness was noticeable signs in almost treated groups after ending action of the analgesia, and this can be treated by pain killer (metalgen) in a dose of 5 mg/kg IM for three days as a single dose.Testicular swellings were obvious in the treated groups especially in the ligation, and B. tortion and these swellings were decreased gradually in as long as 8^{th} day after torsion.Wound infection was presented in all surgical techniques and this represented by discharching pus, this treated by aseptic technique to the edges of wound with refreshing by scarification and flushing with diluted povidin solution, the wound was re-stitched and potent antibiotic was lasting 4 days. Hydrocele was noticed clearly in case of spermatic cord torsion and treated by aseptic aspiration of these fluids repeatedly for three days.

Discussion

Castrated adult and kid animals in the present study scored a significant increment in weight gain than the control group , this may be resulted from the castration which is important for better fat deposition in carcass and for body weight gain improvement. This accord with 22 whom found that castration in goats can cause increment in body weight gain.Testicular mensuration revealed that the weight, length, and diameter of the testes subjected to the treatments (ligation, torsion) recorded a significant decrease (P<0.01) than the control group. These changes resulted from atrophy and small size of testes due to the decrease of blood flow to the testes. This was compatible with (23,15) whom found significant atrophied changes in testes after ligation of spermatic cord.The weight, length, and diameter of the testes of kids subjected to the treatments (ligation, and torsion) recorded a significant decrease (P<0.01) than the control group, similar result has been demonstrated in adult bucks.The decline in the value of testosterone hormone in the sera of adult bucks before castration ranged from 0.88-0.92 ng/ml in all animals of the study were related to the time of the study. This result uphold by (24), postulated that the period of study may done out of breeding season.The values of testosterone hormone in the sera of studied kids before treatments were

ranged from 0.16-0.186 ng/ml in all animals of all groups. These reading were near the normal values registered by (24) and consider normal reading because the animals were immature.The result revealed that the value of testosterone hormone in the treatment groups (ligation, and torsion of spermatic cord) (bucks and kids) recorded a significant decrease ($P<0.01$) from control and this can be explained by the damage of the testicular cells including the leydig cells who responsible for secretion of The testosterone hormone caused by the impairment of testicular blood supply created by spermatic cord ligation, torsion and crushing, and this concur with (25,26), whom found that testosterone hormone secreted from leydig cells of farm animals and the values of this hormone can affected by any damage to the testicular cells.From the other hand the low levels of testosterone hormone in the sera of all orchiected animals (bucks and kids) credited to the cortex of adrenal gland which secretes testosterone hormone and this corroborated with (27) and (28) whom declare that testosterone hormone secreted from testes as well as the cortex of adrenal gland.In ligation group, all treated bucks and kids have serum testosterone concentration that were significantly declined ($P<0.01$) than control group, this observation may due to the ligation of spermatic cord which seems to harm leydig cells function in terms of ability to respond to ICSH and produce testosterone, the lack of response to gonadotropin in treated bucks and kids suggests that leydig cells in these animals were atrophied or unable to respond, this result is in accordance with the study achieved by (29,15).The spermatic cord torsion can cause testicular ischemia this also lead to testicular damage. (30,31,32,33).Semen evaluation values in adult bucks including the volume, the concentration, the viability the individual and mass motility were similar to what conducted by (34,35,36,37).There was a direct relationship between serum testosterone level and the total sperms count, viability and motility.The low levels of testosterone associated with low values of semen characteristics and this what was found in the present study which agreed with what reached by (38) whom substantiated that ram semen parameters affected by testosterone hormone.Semen parameters post treatments (ligation and torsion) were declined significantly ($P<0.01$) than control group due to the complete occlusion of the blood supply which cause degeneration of the seminiferous tubules who produce sperms and this confirmed by (39,40) whom found that any physical damage or radiation treatment of the testicle can effect viability of sperms.All treated testes were observed grossly as smaller in parameters than control groups and this due to the complete occlusion of blood and nerve supply to the testes as well as congestion of blood vessels of spermatic cord which lead to noticeable atrophy of the testes and similar results have been demonstrated by (15).Severe suppression of spermatogenesis, reduced numbers of spermatozoa, no sperms in the seminiferous tubules and no spermatids with depletion of germ cells and degeneration of leydig and sertoli cells were seen microscopically, these results were attributed to obstruction of the blood and nerve supply to the testes by occlusion of spermatic cord and this consistent with (41) who found that obstruction of the spermatic cord lead to pathological changes in the testes including degeneration leydig and sertoli cells and affection of seminiferous tubules leading to seminal plasma only without sperms. Many complications after completion of castration by all techniques were seen like a noticeable change in the behavior of the animals represented by increase restlessness time, lying on the ground, rolling and kicking of belly or flank especially in the adult bucks all these concurrent with (42) who declare that castration can cause signs of pain to affected animals. The common complication for most surgical operation is wound infection and this came from attack the wound by pyogenic bacteria from the environment of the affected animals and

this agreed with (43).Castration which include incision in the affected animals showed signs of restlessness for short period and this referred by (23) and this may because of the surgical castration induces a greater plasma cortisol response and the administration of local anesthesia reduces the cortisol response of surgical castrates. (44).

Conclusions

Castration cause increment in weight gain in kids and adult bucks. Castration method by torsion of spermatic cord caused decline in the testes parameters, semen evaluations and testosterone hormone values in all treated animals as ligation of spermatic cord did, there were no effect of age of animals on this technique in goats.

References

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عملية خصي الماعز العراقي المحلي بطريقة التواء الحبل النطفي ومقارنتها مع عملية ربط الحبل النطفي

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الخلاصة

هدفت هذه الدراسة الى التحري عن كفاءة استخدام التواء الحبل النطفي كواحدة من طرق الخصي السهلة في المعز العراقي المحلي الأسود ومقارنتها مع عملية الخصي باستخدام الربط المضاعف للحبل النطفي وأيضاً الاطلاع على كون عمر الحيوان المخصي له أي تأثير على هذه التقنية. اجريت هذه الدراسة في الحقل الحيواني التابع لكلية الطب البيطري جامعة القادسية حيث تم تجهيز 30 معز محلي ذكر (15 جدي وبعمر 2.5 - 3 شهر) و (15 معز بالغ وبعمر 13-15شهر) وبوزن جسم بلغ (2.21 ±13.4) و (3.25 ± 31.9) كغم وحسب الترتيب المذكور ، اجريت تجربتين متناظرتين على كل من الجداء الصغيرة والمعز البالغة بحيث تضمنت كل تجربة تقسيم الحيوانات عشوائيا الى ثلاثة مجاميع ، المجموعه الاولى تركت كمجموعة سيطرة اما المجموعة الثانية اجريت لها عملية الاخصاء بوساطة ربط الحبل النطفي ولكلا الخصيتين ، اما الثالثة فاجريت لها عملية التواء الحبل النطفي لكلا الخصيتين وبعد مرور شهرين تم

استاصال جميع الخصى لمعرفة الابعاد والوزن والتغيرات النسجية ومستوى هرمون الشحمون الخصوي في مصل الدم. وقد اظهرت النتائج بان عملية الخصي ادت الى زيادة اوزان كل من الجداء والحيوانات البالغة حيث كانت الزيادات متفوقة معنوياً ($P<0.01$)عن مجموعة السيطرة وبلغ اعلى مستوى للزيادة الوزنية بعد شهرين من المعاملة في المعز البالغة في مجموعة الثالثة اما في الجداء الصغيرة فكانت في مجموعة الثانية. اوزان واطوال ومحيط الخصى ولجميع حيوانات التجربة اظهرت انخفاضاً معنوياً($P<0.01$) عن مجموعة السيطرة. أظهر التحليل لهرمون الشحمون الخصوي وجود انخفاض معنوي($P<0.01$) بعد شهرين من اجراء عمليات الاخصاء في مستواه في جميع حيوانات التجربة مقارنة بمجموعة السيطرة. بين تحليل السائل المنوي ان هناك انخفاضاً معنوياً ($P<0.01$) (وجود البلازما المنوية فقط) للحجم والتركيز والحيوية والحركة الفردية والجماعية للنطف ولجميع حيوانات التجربة مقارنة مع مجموعة السيطرة. أظهر التقطيع النسجي لجميع الخصى المعاملة بان هناك تنكس حاد وتليف في النسيج الخصوي وكذلك هو الحال في خلايا سرتولي ولايدك مع توقف كامل لعملية تكوين النطف في كل المجاميع المعاملة. الاستنتاج يظهر بان التواء الحبل النطفي سبب تلفاً للخصية كالذي احدثه الربط وان عمر الحيوان ليس له تاثيراً على هذه التقنية.