ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 08, pp.55752-55756, August, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

ASSESSMENT OF SINGLE LAYER INVERTING VS DOUBLE LAYER INVERTING SUTURING TECHNIQUE FOR CYSTOTOMYCLOSURE IN DOGS

[1]Faisal Hayat, [*,2]Allah Bux Kachiwal, [1]Ahmed Nawaz Tunio, [3]Muhammad Ghiasuddin Shah and [4]Abdullah Sether

[1]Department of Surgery and Obstetrics, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University Tandojam

[2]Department of Physiology and Biochemistry, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University Tandojam

[3]Department of Anatomy and Histology, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University Tandojam

[4]Department of Livestock and Fisheries, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University Tandojam

ARTICLE INFO

Article History:
Received 18th May, 2017
Received in revised form
10th June, 2017
Accepted 16th July, 2017
Published online 31st August, 2017

Key Words:

Cystotomy,
Urolithiasis,
Post-operative complications,
Urinary bladder.

ABSTRACT

This study was conducted on dogs to determine the best suturing technique from single layer inverting and double layer inverting suture techniques for cystotomy. Total 12 dogs were used and were divided in two Groups (A and B) placing six animals in each at random. In group-A the cystotomy incision was closed with single layer inverting suturing technique, while in group-B the bladder wound was closed with double layer inverting suturing technique in which a simple continuous pattern was followed by cushing suturing pattern. Both techniques were evaluated by physical examination, ultrasonography, post-operative complications, leakage, and post-mortem examination. Results showed that more number of stitches and more time taken for the closure of cystotomy wound in double layer inverting suturing technique. No any leakage from operated urinary bladder in both groups. Adhesion were seen more in group A as compared to group B, while bursting pressure was greater in group-B as compared to group-A. It was concluded that double layer inverting suture technique was the better suturing technique as compared to single layer inverting suturing technique for cystotomy in dogs

Citation: Faisal Hayat, Allah Bux Kachiwal, Ahmed Nawaz Tunio, Muhammad Ghiasuddin Shah and Abdullah Sether, 2017. "Assessment of single layer inverting vs double layer inverting suturing technique for cystotomyclosure in dogs", *International Journal of Current Research*, 9, (08), 55752-55756.

INTRODUCTION

The formation of urinary calculi in the urinary bladder is said to be urolithiasis (Fossum, 2007) which is a very frequent clinical problem in small dogs. Cystotomy is the surgical opening of the urinary bladder (Fossum, 2007). Complete obstruction of the urinary tract due to urinary bladder stone is a life-threatening problem in dogs in which cystotomy is the easiest, cheapest and best option to remove the urolithiasis and save the animal life (Fortier *et al*., 2004). Urethral obstruction must be treated to save the life of the animal by cystotomy procedure (Ewoldt *et al.,* 2006). Therefore, cystotomy procedure is also performed for the management of several other problems affecting on the lower urinary tract (Ewoldt *et al*., 2006; Franz *et al*., 2009; Defarges *et al*., 2013) and urethral injuries (Rakestraw *et al*., 1995). Cystotomy is also referred for neurogenic bladder atony (Boothe, 2000), biopsy, urethral catheterization, surgical correction of ectopic ureters and transitional cell carcinoma (Smith *et al.,* 1995; Henry, 2003). It was reported that 171 male dogs were found with urinary calculi (Escolar *et al.,* 1991). Furthermore, cystotomy procedure is indicated for the surgical removal of urinary calculi and repair of ruptured urinary bladder (Brown, 2011). Additionally, this is an important technique used to remove urinary stones in dogs and cats (Waldron, 1993; Dória *et al.,* 2007). Cystotomy, wound is closed by different suturing patterns, such as simple continuous (Stephen *et al.,* 2009) and simple interrupted suturing pattern (Mehl *et al.,* 2005) or it may be closed with double layer which may include simple

***Corresponding author:* Allah Bux Kachiwal**
Department of Physiology and Biochemistry, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University Tandojam

continues suturing pattern followed by cushing suturing pattern (Stone *et al.,* 1996), cushing suture pattern followed by lembert suture (Beard, 2004). Although, double layer closure pattern is most commonly used method for urinary bladder suturing in dogs and there is a current idea that a final inverting layer is essential to ensure a complete water tight seal (Abbas *et al.,* 2011). The one layer appositional closure technique is also recommended for the cystotomy closure (Waldron, 2003). But the inverted suturing technique is a successful and safe technique to close the hallow organ (Fossum*,* 2007). Many techniques were developed during previous years to cope with that problem. Each one has its own advantages and disadvantages, which in turn, raise the need for developing and modifying new techniques to overcome those complications. Surgical treatment of urine retention due to urethral obstruction was expanded to include both short and long-term procedures in dogs. Success rate varied and depend on several factors (Hastings, 1965). Present investigation designed to evaluate which of suturing techniques for cystostomy could be a reliable technique.

MATERIALS AND METHODS

Total 12 healthy mongrel dogs of both sexes were used which were divided into two groups placing six dogs in each group. All animals were kept at the Indoor-patient ward in the Department of Surgery and Obstetrics, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University Tandojam. Adult dogs of varying ages between 12 to 18 months old and an average body weight of 12 to 18 kg were used. All dogs were thoroughly examined physically and dewormed with the Vermox (Janssen-Cilag, Pakistan). One dog was housed in one cage and given free access to food and water. Animal care facilities were maintained throughout experimental study. All animals were maintained at room temperature 22°C, humidity 60% and maintained on a 12-hour light-dark cycle.

Pre-operative Preparations for anesthesia

Feeding was with held for overnight (12 hours) and water for 6 hours. Xylazine 0.5 mg/kg (Farvet, Netherland) was introduced as pre-anesthetic, intramuscularly through 1-ml disposable syringe in the left thigh muscles (Muir *et al*., 2000). While general anesthesia was achieved by administering thiopental sodium 10mg/kg (Abbot, Pak) in the right cephalic vein using 5ml disposable syringe (Muir *et al*., 2000).

Surgical Procedure

A caudal ventral midline laparotomy was performed and 3-inch long incision was made on the skin and then step incision was given at the linea alba and extended in order to expose the urinary bladder. The urinary bladder was identified and exteriorized manually from the body to the externa (Fossum, 2007). Two stay sutures were applied 4-cm apart at the dorsum of the urinary bladder for holding it. A 3-cm long cystotomy wound was created with the help of scalpel (No. 03 and blade No. 10) in between the two stay sutures on the urinary bladder (Plate-1). Then cystotomy wound was closed with a Vicryl 3-0 (Ethicon.INC., USA) suture material according to the following techniques (Barbolt, 2002).

Group A

In group-A cystotomy incision was closed by single layer (simple interrupted suture technique) appositional pattern (Plate-2). Sutures were applied on neuromuscular layer penetrating the mucosa of urinary bladder (Fossum, 2007).

Group B

In group-B cystotomy wound was closed in two layers by inversion type of suturing pattern (Plate-3). In the first layer mucosa was sutured by simple continues suturing pattern. The 2nd layer was closed by continues Cushing suturing pattern (Fossum, 2007).

Suturing Time

Suturing time was recorded from the placement of first suture over cystotomy wound to the placement of the last suture.

Number of stitches

Total numbers of stitches placed for closing of cystotomy wound were recorded in both groups.

Total time taken for laparotomy

Total time taken for laparotomy was recorded from the first incision on the skin to the closure of the skin wound.

Assessment of Suturing Techniques

Dogs were kept for a period of three weeks post surgery. Suturing techniques used in this study were evaluated during post operative period by physical examination, Ultrasonography, post operative complications and postmortem examination

Assessment through physical examination

Physical examination was performed twice a day for 7 days after surgery. Physical parameters included *i.e.* hematuria, dysuria, abdominal pain and vomiting. Abdominal cavity was regularly palpated for the presence of any fluid filled distention.

Assessment through ultrasonography

Ultrasonography was performed before the experimental surgery and then with the interval of three days, one week and two weeks post-surgery. Ultrasonography was performed using ultrasound machine (HONDA, Japan) with the help of abdominal transducer with frequency of 7.5MHz in each dog.

Assessment through Post-Mortem

Six dogs were sacrificed using thiopental sodium (100 mg/kg) intravenously (Muir *et al.,* 2000) on day 10^{th} and six dogs were sacrificed on 21^{st} days post surgery.

RESULTS

Mean number of stitches in urinary bladder 5.66± 0.49 and 11.50± 0.42, mean time taken for urinary bladder closure 5.15 ±1.47 and 11.71±0.64 minutes, and mean time taken for laparotomy 30.65± 1.01 and 38.27± 1.29 minutes in group-A and group-B respectively (Table-1).

Table 1. Parameters recorded during cystotomy in dogs

Parameters	Group-A	Group-B
No of stitches in urinary bladder	5.66±0.49	11.50±0.50
Time taken for urinary bladder closure (min)	5.15±0.07	11.71±0.64
Total time taken for laparotomy (min)	30.65±1.01	38.27±1.29

Table 2. Mean±S.E percentage (%) of adhesion with visceral omentum and sutured site

Days after cystotomy	Adhesion % seen during necropsy examination	
	Group-A	Group-B
10th day	68.66±1.33 %	64.43±26.21 %
21st day	100±0.00 %	63.66±24.90 %

Table 3. Mean±S.E bursting pressure of urinary bladder during post-mortem

Days after cystotomy	Bursting pressure (mmHg)	
	Group-A	Group-B
10th day	141.00±0.57	150.33±0.88
21st day	162.67±4.37	212.67±8.19

Physical parameters

Observation of physical parameters after surgery showed that dysuria was observed in all dogs in group-A and group-B. Hematuria was observed in two dogs in group-B only. Vomiting was found in only one dog of group-A and two dogs of group-B. No abdominal fluid was observed in any of dogs of either group. While abdominal pain was observed to be present in all dogs of group-A and group-B.

Sonographic Findings

Ultrasound examination showed that there was no leakage seen from any part of the operated urinary bladder in all (n=12) dogs. Furthermore, there were adhesions seen between visceral organs and sutured site on the dorsum of the urinary bladder. Ultrasonographic examination of the urinary bladder showed urinary bladder was an echoic circular black area with well demarcated wall (Plate-4).

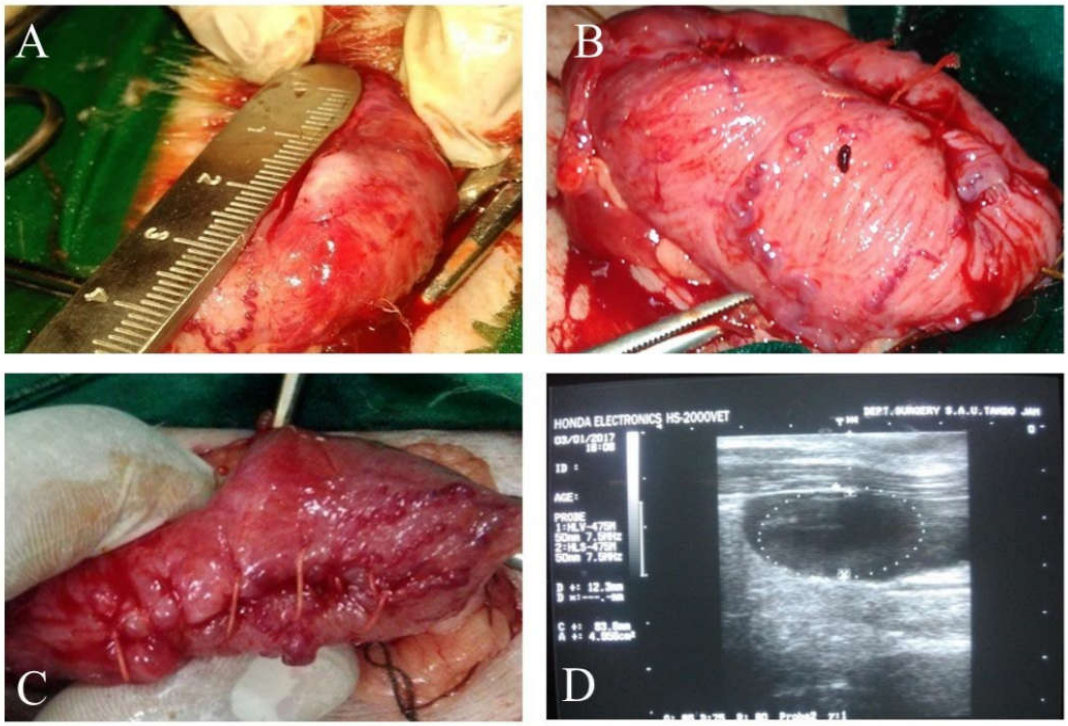

Figure 1. Parameters recorded during cystotomy (a) 3 inch long cystotomy wound created in urinary bladder, (b)Urinary bladder closed with single layer suture (interrupted) (c) urinary bladder closed with double layer inverting suture (simple continuous followed by cushing) method in dog. (d) An-echoic ultrasonographic image of operated urinary bladder in dog

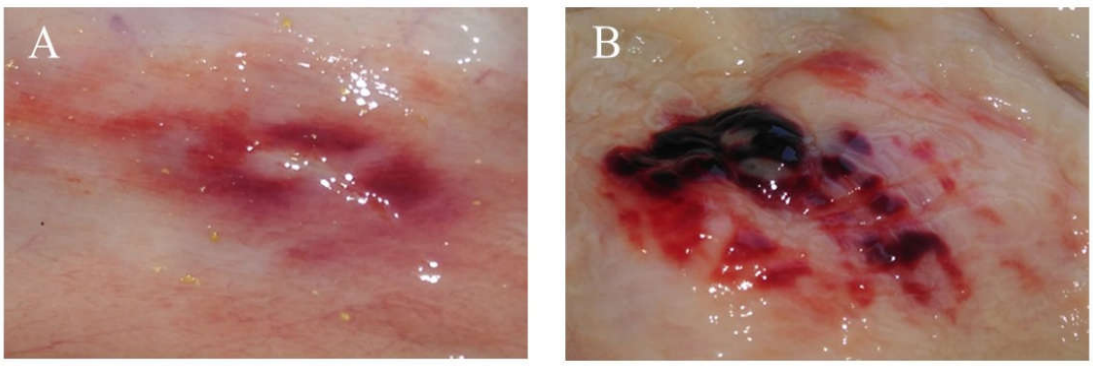

Figure 2. Post-mortem examination of Inner side of sutured site healing in both methods, (a) suture site healed with fine tiny scar, (b) sutured site healed with very distinct stricture

Post-Operative Complications

Evisceration was observed in two dogs (33.3%) of group-A and two dogs (33.3%) of group-B. Sinus formation was seen only in one dog in group-B (16%). Incisional hernia was observed in one dog of group-B (16%). One dog of group-A showed oedema at sutured site (16.6%). Inflammation was observed in two dogs of group-A (33%). Leakage from the sutured site was observed in one dog of group-A (16%) and one dog of group-B (16%). Dehiscence was observed in two dogs of group-A (33%) and two dogs of group-B (33%). Two dogs of group-A (33%) and two dogs of group-B (33%) had loss of suture material at the site of incision. Two dogs of group-A (33%) and one dog from group-B (16%) were observed tearing of tissues of skin, linea alba, muscularis and peritoneum due to self biting over sutured site on the skin. Only one dog of group-A (16%) was observed for wound infection. Peritonitis was observed in one dog of group-B (16%).

Post-mortem examination

Post-mortem examinations showed that adhesions were present in all animals in both groups (A&B) between the cystotomy site, intestine, mesentery and falciform ligaments. In group-A dogs, the quality of healing was better than group-A. In group-A dogs, the mucosa at cystotomy site was healed with a very thin and fine scar (Plate-5), but in case of group-B dogs a well demarcated stricture was seen at the cystotomy site (Plate-6). There were no calculi or crystals were found in the bladder lumen of all the dogs. Suture material was present at the site of suturing on urinary bladder in all operated dogs.

Adhesions

The mean percentage of adhesion recorded on 10 days after surgery in group-A and group-B were 68.66±1.33 and 64.43 ±26.21 % respectively. Mean percentage recorded on 20 days after cystotomy in group-A and group-B were 100±0.00 and 63.66±24.90 (Table-2).

Bursting pressure

The mean bursting pressure of group-A and group-B dogs sacrificed at day 10^{th} after cystotomy were 141.00 ± 0.57 and 150.33± 0.88 mmHg respectively. Bursting pressure was recorded in group-A and group-B dogs sacrificed 21 days after surgery were 162.67 ±4.37 and 212.67 ±8.19 mmHg respectively (Table-2).

DISCUSSION

Current findings support that cystotomy wound suturing time for continuous double layer closure was comparatively longer than single layer interrupted closure. Therefore, single layer cystotomy closure had advantages compared with double layer closure cystotomy because it provides good wound apposition in a comparatively short surgical time. Short surgical time is desirable because it reduces operative exposure of patient, minimize anesthesia time and on sequently reduce the patient morbidity and mortality. The current findings are agreed with the results of Lillich and De-Bowes. (1999) who also observed comparatively less time for single layer apposiotional suturing technique for the cystotomy over double layer inverting suturing pattern for cystotomy in dogs.

In present study findings of single layer versus double layers suturing technique showed hematuria in two dogs (Dog No-7 and 11) in group-A. Results showed that two layers suturing technique was effective compared to single layer suturing technique for urinary bladder wound closure. Similar findings were observed by Jens and Bjorling (2011) in dogs. Therefore, two layer closure technique may be preferred to cause less hemorrhages because mucosa is sutured by separate layer and it can effectively control bleeding and the suturing time for two layer closure is comparatively less than single layer closure done with single interrupted technique. Moreover, two-layer cystotomy closure is also preferred to close electrosurgical cystotomy incision and to prevent vesico-vaginal fistula instead of single-layer cystotomy closure. The current findings are parallel to the Soko *et al.* (2004). Based upon the physical evaluation the hematuria was observed only in two dogs in group-B, while dysuria was present in all dogs of both the groups (A & B). Abdominal pain was seen in all the operated dogs for 3-5 days. There was no abdominal distention in both groups A &B while, vomiting observed in one dog of group-A and two dogs of group B during the course of the experimental period. These findings are agreement to the findings of Khan *et al.* (2014) where they also found hematuria in two dogs also in single layer suturing and abdominal pain in all dogs. Objectives for suturing the cystotomy wound were repositioning of tissue planes, preservation of lumen diameter and avoiding the functional mutilation of urinary bladder Seifman *et al.* (2002). While, postmortem findings revealed that the mucosal surface of the urinary bladder with the presence of hemorrhagic spots were found around the sutured operated site in both groups (A&B). Gross examination of urinary bladder during postmortem showed that the suture material was not completely absorbed and was present at the site of suturing. Physical examination showed that there were no crystals or stones formation in their bladder lumen. While, there were no encrusted sutures, tunnels, suture knot impressions and calcified suture materials found. In group-B dogs, the mucosal surface was completely healed with a very fine scar and no gross inflammation was found. The suture material (Vicryl) was seen at the sutured site of the cystotomy wound. The current findings showed agreement with the findings of Khan *et al.,* (2014), who found same results with gross examination during postmortem after cystotomy by using chromic catgut for the suturing of urinary bladder.

Conclusion

It was concluded that Double layer inverting suture technique was the better suturing technique for cystotomy in dogs on the basis of following findings. It had higher bursting wall tension, less percentage of adhesions and less bleeding and post-operative complications.

REFERENCES

Abbas. B. T., Amin, D. M. T. M. and Hassan, A. H. 2011. Cystotomy closure using a single-layer simple continuous versus continuous cushing suture patterns in dogs. *A. A. J. Vet. Sci*., 4(2): 58-66.

Barbolt, T. A. 2002. Chemistry and safety of triclosan, and its use as an antimicrobial coating on coated vicryl plus antibacterial suture (coated polyglactin 910 suture with triclosan). *Surg. Infec*., 3: 45-53.

Beard. W. 2004. Para inguinall a paro cystotomy for urolith removal in geldings. *Vet. Surg*., 33: 386–390.

Boothe. H. W. 2000. Managing traumatic urethral injuries. *Clin. Tech. S. Ani*., 15: 35-39.

Brown,C. 2011. Urolithiasis and cystotomy in the rabbit. Lab. Ani. N.Y. 40 (3): 73-74.

Defarges. A., Dunn, M. and Berent, A. 2013. New alternatives for minimally invasive management of uroliths: lower urinary tract uroliths. *Comp. Cont. Edu. Vet.,* 1: 35.

Doria. R. G. S., Canola, P. A. and Dias, D.P. 2007. Surgical technique of sputum obstructive urolithiasis in small ruminant case reports. *Arq. Bras. Med. Vet. Z. T.* 59: 1425-1432.

Escolar. E., J. Bellanato and M. Rodriquez. 1991. Study of cystine urinary calculi in dogs. *Can. J. Vet. Res*., 55: 67-70.

Ewoldt. J. M., Anderson, D. E. Miesner, M. D. and Saville, W. J. 2006. Short and long-term outcomes and factors predicting survival after surgical tube cystostomy after treatment of obstructive urolithiasis in small ruminants. *Vet. Surg*., 35 (6): 417-422.

Fortier. L. A., Gregg, A. J. Erb, H. N. and Fubini, S. L. 2004. Caprine obstructive urolithiasis: requirement for 2nd surgical intervention and mortality after percutaneous tube cystostomy, surgical tube cystostomy, or urinary bladder marsupialization. *Vet. Surg*., 33 (7): 661-667.

Fossum, T. W. 2007. Text book of small animals surgery. 2: 572-577.

Hastings, D.H. 1965. Retention catheters for treatment of steers with ruptured bladder. *J.Am.Vet.Med.Assoc*., 147: 1329-1330

Henry. C.J. 2003. Management of transitional cell carcinoma. *Vet Clin N. Am. S. Ani. Pract*., 33: 597-613.

Jens, B. and D.E. Bjorling 2001. Suture selection for lower urinary tract surgery in small animals. *Comp. Contin. Educ. Pract*., Vet. 23:524-530.

Khan. I. U., M. A. Khan, S. G. Bukhari, M. Shoaib and M. A. Khan. 2014. Evaluation of catgut as a suture material for cystotomy closure in canines. *Ann. Vet. Ani. Sci*., 118-121.

Mehl, M. L., E. K. Andrew, R. Pollar, A. J. Joshu, H. K Philip, M. G. Stephen and R. G. Clare 2005. Comparison of 3 techniques for ureteroneocystostomyin cats. *Vet. Surg*., 34:114–119.

Muir, W. W., J. A. E. Hubbell, R. T. Skarda and R. M. Bednarski. 2000. Euthanasia. Handbook of veterinary anesthesia. 3: 496-501.

Rakestraw, P.C., S. L. Fubini and R.O. Gilbert. 1995. Tube cystostomy for treatment of obstructive urolithiasis in small ruminants. *Vet. Surg*., 24:498-505.

Seifman, B.D., M. A. Rubin, A. L. Williams and J. F. wolf. 2002. Use of cyanoacrylate glue to repair an open cystotomy. *J. Urol.,* 167:1872-1875.

Smith . J. D., E. A. Stone and S. D. Gilson. 1995. Placement of a permanent cystostomy catheter to relieve urine outflow obstruction in dogs with transitional cell carcinoma. *J. Am. Vet. Med. Assoc*., 206: 496-499.

Soko, A. I., M. F. R. Paraiso, S. L. Cogan, M. A. Bedaiwy, P.F. Escobar and M. D. Barber, 2004. Prevention of vesicoveginal fistulas after laparoscopic hysterectomy with electrosurgical cystotomy in female mongrel dogs. *J. Am. Obst. Gynac*., 190:628-633.

Stephen, J.O., M. S. Harty, A. R. Hollis, Yeomans and Corley. 2009. A non-invasive technique for standing surgical repair of urinary bladder ruptures in a post-partum mare: a case report. *Iri. Vet J*., 62 (11): 734-736.

Stone, E. A., T. F. George, S. D. Gilson and R. L. Page. 1996. Partial cystectomy for urinary bladder neoplasia: surgical technique and outcome in 11 dogs. *J. S. Ani. Prac*. 37: 480-485.

Waldron. D. R., D. Slatter. Philadelphia and W.B. Saunders. 2003. Urinary bladder. *Txt. B.S. Ani. Surg*., 3 1629-1637.

Waldron. D. R., Philadelphia and W.B. Saunders, 1993. Urinary bladder. *Slatter*, *D. Txt. B.S.Ani. Surg*. 2: 1451-1473.

****