



Cystographic Evaluation Post Colocystoplasty in Two Nigerian Indigenous Dogs

Muhammad S. T.*¹, Awasum C. A.², Mohammed B.³ and Hassan A. Z.²

¹Veterinary Teaching Hospital, Ahmadu Bello University, Zaria, Nigeria. ²Department of Veterinary Surgery and Radiology, Ahmadu Bello University, Zaria, Nigeria. ³Department of Veterinary Pathology, Ahmadu Bello University, Zaria, Nigeria. *Corresponding author: Email: tmsaidu@abu.edu.ng; Tel No:+2348135989887.

SUMMARY

A study was conducted to evaluate “graft-take” in an experimentally reconstructed urinary bladder by colocystoplasty in two adult dogs. Predetermined 2x3 cm dimension of urinary bladder defect was created on the dorsum and the ventrum of the urinary bladder and was patched with harvested 3x6 cm colonic pedicle flap. All operations were humanely conducted. Urographic evaluation for graft-take was done on days 21 and 49 post colocystoplasty by infusing Urografin^(R)-76% (sodium amidotrizoate + meglumine amidotrizoate + Iodine) transurethrally. The urinary bladder architecture was preserved and maintained without obvious evidence of the grafted portion. The cystogram revealed an apparent dome-shaped with slight irregular mural thickness at day 21 which was not displayed cystographically on day 49 post-operative. This was evident of the textural difference of the colonic flap compared with the thicker urinary bladder. The healing pattern and the return to physiologic function of the reconstructed urinary bladder conclusively revealed that the colonic pedicle flaps are useful in repair of major urinary bladder defect. These flaps are suitable graft tissues.

Key words: Urinary bladder, Colocystoplasty, Cystography, Nigerian Indigenous dogs.

INTRODUCTION

The urinary bladder (UB) lies in the pelvic abdominal cavity and dorsal to the ventral abdominal wall in animals, associated with the large intestines (colon), the uterus in females and held in place by triangular cystic ligaments (Dyce *et al.*, 2003; Fossum *et al.*, 2002). Any aberration of the anatomic and physiologic endowment of the urinary bladder is diagnosed as a urinary bladder defect (Anon, 2012; Muhammad *et*

al., 2015) which include bladder hypoplasia and exstrophy of congenital origin, and most acquired bladder injuries such as complications of pelvic surgeries and vaginal operations (Cilento and Nguyen, 2001; Awasum, 2010; Muhammad *et al.*, 2015), bladder neoplasm and chronic tuberculosis, interstitial cystitis; and post-radiation bladder contracture, all require surgical reconstruction of the urinary

bladder (Nabi *et al.*, 2003). Enterocystoplasties are currently the best surgical procedures that bring about greater relief of symptoms associated with urinary bladder reconstruction, since it is a “salvage procedure”, life can be nearly normal as low morbidity and mortality is satisfactory (Muhammad *et al.*, 2014). To evaluate the integrity/morphology of most internal body organs or system(s) of an individual, contrast radiography have been utilized decades ago (Pechman, 2007). Cystography is a contrast radiographic study performed to aid in evaluating urinary bladder morphology, which cannot be defined by survey radiography (Stephanie, 2005). Numerous protocols for the contrast cystogram involving either positive or negative contrast media have been described (Park and Wrigley, 2007; Pechman, 2007). The application of retrograde cystographic procedure is adequate in regional urinary bladder geometry like size, shape, location, degree/extent of affliction (leakage or tear), surface character, number, or organ opacity (Feeney and Anderson, 2011). The negative contrast (carbon dioxide, or nitrous oxide) cystography is good for demonstrating the location and shape of the bladder (Sura, 2011). While positive contrast (formulations of organic iodine) cystography is excellent for determining the location of the bladder, evaluating bladder shape, detecting loss of bladder wall integrity and filling defect (Stephanie, 2005; Feeney and Anderson, 2011). Positive contrast cystography was employed in this study for morphologic evaluation of reconstructed urinary bladder with the aim of evaluating “graft take” post reconstruction of the urinary bladder with colonic pedicles (colocystoplasty) in Nigerian indigenous dogs.

MATERIALS AND METHODS

Ethical clearance was sort and obtained in accordance with the statutory regulations guiding animal care and use as approved by

Ahmadu Bello University Committee on Animal Use and Care (ABUCAUC) Ahmadu Bello University, Zaria (ABUCAUC/02/Vet. Med/14/01).

Pre-operatively, two, 1.5-year old and 2-year old Nigerian indigenous dogs of weights 17 and 19 kg respectively, were acquired and acclimatised in the kennels of Veterinary Teaching Hospital, Ahmadu Bello University Zaria, for two weeks prior to the commencement of the operation. The dogs were physically and laboratorily examined and found apparently healthy. The procedures were carried out under general anaesthesia using atropine sulphate 0.05 mg/Kg and chlorpromazine hydrochloride 4 mg/Kg as premedication, and thiopentone sodium 15 mg/Kg as final anesthetic agent all administered through a cannulated cephalic venopuncture. They were aseptically prepared and urinary bladder defects (2 x 4 cm dimension) were created on dorsum in one and ventrum on the other dog, and each reconstructed with 3 x 6 cm colonic flaps. The defects created were to mimic conditions that can result in loss (due to disease or surgery) of significant portion of the UB.

The abdominal cavity was accessed via caudal mid-ventral 15 cm abdominal incision extending from the umbilicus to the pelvic brim (Desch and Wagner, 1986; Hassan and Hassan, 2003) to view the urinary bladder and colon. By gentle manipulation, the colonic segment adjacent to the bladder was selected, isolated and 3 x 6 cm bowel segment was harvested and prepared by detubularization at the antimessenteric border, washed clean of faecal materials and preserved under saline-soaked gauze in order to patch urinary bladder defect of 2 x 4 cm as described by Muhammad *et al* (2014). Bowel continuity was re-established by end-to-end anastomosis. The preserved pedicle flap was immediately grafted with the 4 ends of the rectangular flap attached first by placement

TABLE I: Mean (\pm Standard Deviation) pre- (week 0) and post (week 1 to 7)-surgery vital parameters of a dog that underwent ventral colocolostomy

Weeks	Temperature ($^{\circ}$ C)	Pulse rate (beats/minute)	Respiratory rate (cycles/minute)
0	38.50 \pm 0.12	90.14 \pm 4.21	18.06 \pm 2.02
1	38.78 \pm 0.31	94.71 \pm 10.69	20.57 \pm 1.19
2	38.49 \pm 0.22	89.43 \pm 3.95	19.43 \pm 3.21
3	38.73 \pm 0.20	87.29 \pm 2.87	18.57 \pm 1.52
4	38.40 \pm 0.10	90.00 \pm 0.00	20.40 \pm 4.34
5	38.50 \pm 0.00	89.00 \pm 1.41	17.40 \pm 1.95
6	38.40 \pm 0.00	92.00 \pm 5.06	17.80 \pm 2.68
7	38.27 \pm 0.31	86.67 \pm 4.62	19.71 \pm 2.69

of simple interrupted stitches and followed by simple continuous suture pattern to complete the colocolostomy. A transabdominal Foley catheter (10Fr) was lodged laterally into the UB by means of cystostomy to evacuate urine and rest the urinary bladder. The catheter was removed a week post-operative for patient to store and void urine normally. The dogs were observed until recovery and vital parameters (temperature, pulse and respiratory rates) were recorded over an 8 week period. Elizabethan collar was applied to prevent the dogs from interfering with the wound sites. Both dogs were administered ciprofloxacin lactate with some dextrose saline 100ml all intravenously, at 12 hourly for 7 days and maintained on bland diet (a low viscous mixture of water, grounded millet and guinea corn, sugar and fried fish). Analgesia utilised pentazocine injection 2 mg/kg administered intramuscular for 5 days. Cystography was performed at 3rd and 7th weeks post-operative, as described by Stephanie (2005) and Park and Wrigley (2007). Each dog was fasted for 24 hours and cleansing enema was performed 3 hours before commencement of the contrast study. Plain radiography was undertaken and the contrast radiography followed immediately with each dog in a dorsal and right lateral recumbencies with the hind stretched out. Diazepam injection 0.5 mg/kg IM was administered and the dogs were restrained in

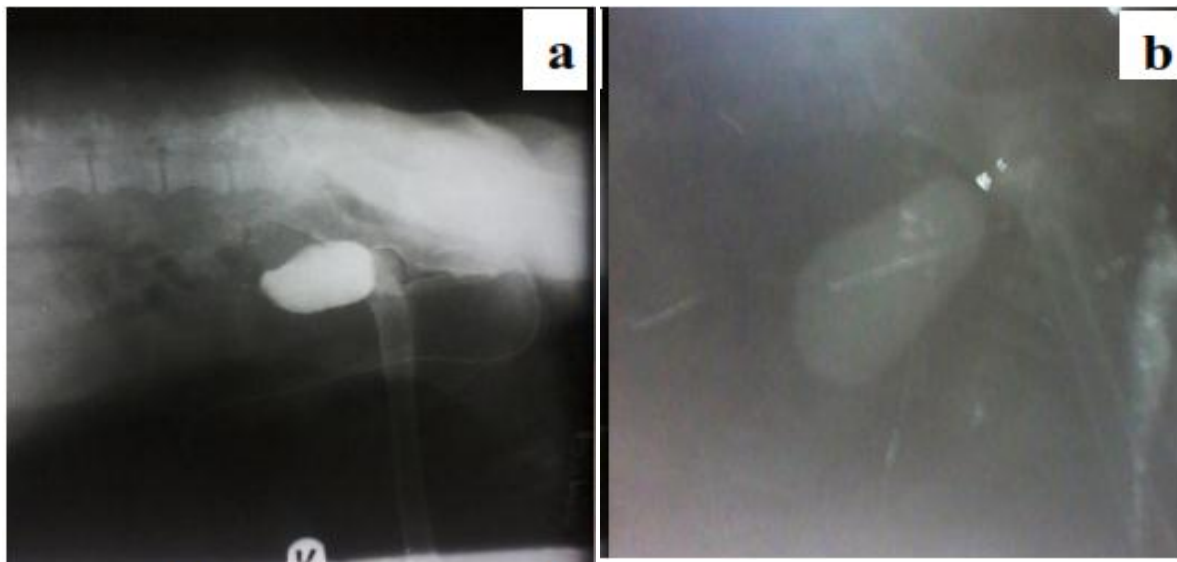
a lateral recumbent position to expose the pelvic region and later in a dorsal recumbency. The preputial area was aseptically cleaned with chlorhexidine gluconate 4% solution. The prepuce was retracted caudally to expose the penis. Sterile Foley catheter (10 Fr) filled with lidocaine Hcl 2% solution was lubricated with the K-Y jelly was inserted transurethraly and gradually into the urinary bladder. A reconstituted Urografin^(R) 76% to 20% solution was infused at 5 ml/kg into the urinary bladder and radiographed at 70 kV and 6 mA using mobile X-ray machine (MDX-100 model by Recorders and Medicare System LTD, Chandigarh, India). For the two views obtained (lateral and ventro-dorsal), the radiographs were developed and viewed for interpretation.

RESULTS AND DISCUSSION

The cystogram revealed an intact and engorged UB. Apart from revelation of the cystogram at day 21 post-operation which indicated regular UB outline, the cystogram at day 49 revealed near perfectly preserved and delineated UB (plates 1 and 2) devoid of leaks and indicative of advanced healing. The apparently smooth topography of the UB at day 21 in both dogs were evident of adaptation between the neocystic and the transitional tissues of the UB. The mean weekly vital parameters (temperature, pulse and respiratory rates) of both dogs (obtained

TABLE II: Mean (\pm Standard Deviation) pre (week 0) - and post (week 1 to 7)-surgery vital parameters of a dog that underwent dorsal colocystoplasty

Weeks	Temperature	Pulse rate	Respiratory rate
0	38.8 \pm 0.22	90.03 \pm 1.41	30.12 \pm 1.09
1	39.23 \pm 0.20	104.00 \pm 6.83	29.14 \pm 6.07
2	38.71 \pm 0.22	94.00 \pm 5.10	23.29 \pm 2.06
3	38.63 \pm 0.25	93.29 \pm 3.99	23.71 \pm 3.73
4	38.70 \pm 0.26	90.02 \pm 5.60	21.33 \pm 2.42
5	38.74 \pm 0.24	89.50 \pm 3.95	24.00 \pm 2.83
6	38.61 \pm 0.30	92.00 \pm 6.20	22.57 \pm 1.95
7	38.56 \pm 0.15	87.67 \pm 3.22	23.43 \pm 0.38

**Plate 1:** Right lateral view urograms indicating a clear delineation of the urinary bladder architecture taken at 21 days (a) and 49 days (b) post-operative on the bladder dorsum

from single daily measurements) were within the normal limits and showed no marked difference (TABLES I and II) even at 72 hours post-operative when compared with preoperative values. Both dogs resume normal urine voidance after the Foley catheter was dislodged and resumed feeding and defecation as early as day 5 post-operative.

The slight dent on the urinary bladder wall was suggestive of the portion of the colonic graft which is less elastic compared to the transitional epithelium of the UB (Mahaffey, 1989; Park and Wrigley 2007). Urinary bladder (UB) cavity was well filled with Urografin76 %^(R), for assessment has been

pointed by other researchers such as Stephanie (2005); Feeney and Anderson (2011); and Muhammad *et al* (2014) and the contrast was distinct and illustrative enough to delineate the UB borders. These cystograms were similar to those illustrated by Muhammad *et al* (2014) where retrograde contrast cystography (using 20 % solution of Urografin) was employed in the evaluation of the UB following ileocystoplasty. The Urografin76%^(R) used in this study was adequate as was used by Awasum (2010) and no evidence of toxicity was seen clinically and, at high dilution of 20% proved a positive identification of shape and integrity of the urinary bladder as was

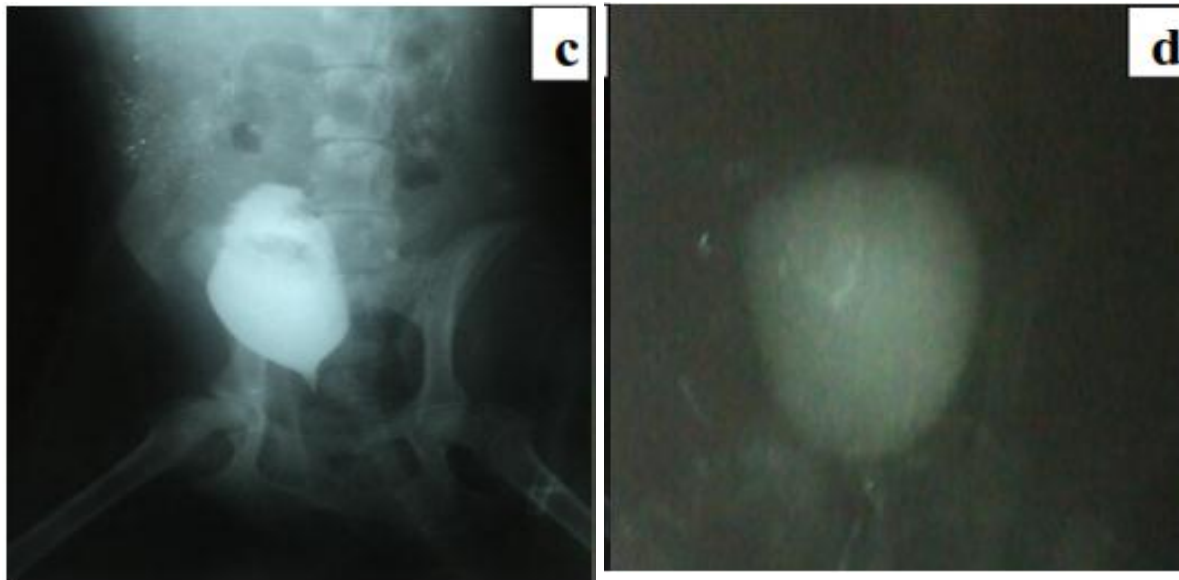


Plate 2: Ventro-dorsal view urographs with clear delineation of the urinary bladder margins taken at 21 days (c) and 49 days (d) post-operative on the bladder ventrum

suggested by Feeney and Anderson (2011). The cystographs revealed no evidence of pathology and this is not unusual as this has been reported by Probst *et al.* (1997 and 2000) and Muhammad *et al.* (2014).

The normal mean weekly vital parameters observed were similar to what was reported by Awasum (2010) in ureteroplasty in dogs. In conclusion, cystography used to evaluate architecture of the UB post colocystoplasty proved adequate. The 3 x 6 cm flap used to repair the urinary bladder was preserved and was impregnated adequately. The technique as described was humane and the dogs showed no adverse reactions. At high dilution of 20% Urografin^(R), the contrast was distinct. Long-term effect of the use of colonic flaps for defective urinary bladder repair should be evaluated.

ACKNOWLEDGEMENTS

The authors wish to thank the technical staff of the Department of Veterinary Surgery and Radiology, Ahmadu Bello University, Zaria, Nigeria for their kind support in carrying out this study.

REFERENCES

- ANON (2012): Urinary bladder defect. (www.thefreemedicaldictionary.com) Retrieved on 18/01/2012.
- AWASUM, C.A. (2010): Response to Experimentally Reated Ureteral Injuries and the use of Intestinal Segments (Grafts) to Bridge Ureteral Defects in Dogs. A published PhD thesis. Ahmadu Bello University Zaria, Nigeria.
- CILENTO, B.G. and NGUYEN, H.T. (2001): Bladder Diverticula, Urachal Anomalies, and other Uncommon Anomalies of the Bladder. In: Gearhart JP, Rink RC and Mouriquand P, eds. Pediatric Urology. Philadelphia, Pa: WB Saunders.
- DESCH, J.P. and WAGNER, S.D. (1986): Urinary bladder incisions in dogs. Comparison of ventral and dorsal. *Veterinary Surgery*, 15: 153-155.
- DYCE, K.M., SACK, W.O. and WENSING, C.J.G. (2003): A Textbook of Veterinary Anatomy 3rd ed. W. B. Saunders, Philadelphia, PA: 172-182.

- FEENEY, D.A. and ANDERSON, K.L. (2011): Radiographic Imaging in Urinary Tract Disease. In: Textbook of Nephrology and Urology of Small Animals (Bartges, J. and Polzin, D. J. editors). Blackwell Publishing Ltd., USA: 97-127.
- FOSSUM, T.W., HEDLUND, C.S., JOHNSON, A.L., SEIM, H.B., WILLARD, M.D. and CARROLL, G.L. (2002): Surgery of the Bladder and Urethra. In: Small Animal Surgery. Pp 549- 609.
- HASSAN, A.Z. and HASSAN, F.B. (2003): Soft Tissue Surgery. In: An Introduction to Veterinary Practice. Ahmadu Bello University Press: 263.
- MAHAFFEY, M.B. (1989): Cystography: effect of technique on diagnosis of cystitis in dogs. *Veterinary Radiology*, 30(6): 261-267.
- MUHAMMAD, S. T., HASSAN, A. Z., AWASUM, C.A. and MOHAMMED, B. (2014): Radiographic evaluation of "Graft take" following ileocystoplasty of extensive urinary bladder defects in dogs. *Journal of Veterinary Advances*, 4(7): 626-633 doi: 10.5455/jva.20140723040127
- MUHAMMAD, S.T., AWASUM, C.A., HASSAN, A.Z., USMAN, B. and JAHUN B.M (2015): Traumatic urinary bladder injuries in small animals. *Journal of Veterinary Medicine and Animal Health*, 7(1): 27-32.
DOI:10.5879/JVMAH2014.0295.
ISSN 2141-2529
www.academicjournals.org/JVMAH
- NABI, G., CODY, J.D., DUBLIN, N., MCCLINTON, S., N'DOW, J.M.O., NEAL, D.E., PICKARD, R. and YONG, S.M. (2003): Urinary diversion and bladder reconstruction replacement using intestinal segments for intractable incontinence or following cystectomy. *Cochrane Database of Systematic Reviews*. 1
- PARK, R.D. and WRIGLEY, R.H. (2007): The urinary bladder. In: Textbook of Veterinary Diagnostic Radiology, edited by D.E. Thrall. St. Louis, MO: Missouri, Saunders: 708-724.
- PECHMAN, R.D. (2007): The Urethra. In: Textbook of Veterinary Diagnostic Radiology. (Thrall, D.E. and St. Louis, M.O: editors): Saunders: 725-728.
- PROBST, M., DAHIYA, R., CARRIER, S. and TANAGHO, E. A. (1997): Reproduction of functional smooth muscle tissue and partial bladder replacement. *Br. J. Urol.*, 79: 505-515.
- PROBST, M., PIECHOTA, H.J., DAHIYA, R. and TANAGHO, E.A. (2000): Homologous bladder augmentation in dog with the bladder acellular matrix graft. *Br. J. Urol.*, 85(3): 362-371.
- STEPHANIE, C. E. (2005): Contrast cystography. *Clin. Tech. in Small Anim. Pract.*, 20(1):46-51.
- SURA, P. (2011): Lower Urinary Tract Trauma. In: Textbook of Nephrology and Urology of Small Animals (Bartges J, Polzin DJ. editors). Blackwell Publishing Ltd., USA: Pp 828-834.