Use of partial prostatectomy for treatment of prostatic abscesses and cysts in dogs

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Objective—To determine whether dogs had prostatic disease, urinary incontinence, or urinary tract infection 1 year after partial prostatectomy to treat prostatic abscesses and cysts.

Design—Prospective study.

Animals—20 male dogs with prostatic abscesses or cysts. Fifteen dogs had evidence of urinary tract infection. Only 8 dogs urinated normally; the remainder dribbled, had obstructions, or required medical treatment.

Procedure—Partial prostatectomy was performed on each dog. Sexually intact dogs (n = 12) also were castrated.

Results—None of the dogs had return of prostatic cystic enlargement or clinical signs of prostatic disease during the first year after surgery. Two dogs were euthanatized within 1 year after surgery, with 1 dog having prostatic enlargement and adenocarcinoma and 1 dog having unrelated lymphosarcoma. Fifteen dogs were continent. The remaining 5 dogs urinated normally but had intermittent and minor incontinence. Eleven dogs had no signs of infection 1 year after surgery, 5 had pyuria or positive urine bacteriologic culture results, 2 did not have urinalysis performed, and 2 were euthanatized.

Clinical Implications—Dogs with severe prostatic abscesses or cysts and infections can be successfully treated by partial prostatectomy with an ultrasonic surgical aspirator and castration, resulting in long-term disease resolution. Although most dogs with severe prostatic disease do not urinate normally before surgery, nearly all dogs resume normal micturition after partial prostatectomy. Postoperative results of partial prostatectomy appear to be better than those of previous drainage techniques for treatment of prostatic cavitary disease. (*J Am Vet Med Assoc* 1997;211:868–871)

Prostatic disease resulting from prostatic abscesses and cysts can be difficult to treat because of the tendency for disease to persist and its association with incontinence and acute sepsis.[1-5] Prostatic drainage procedures (marsupialization and drainage by suction or Penrose drains[6,7]) permit transient improvement, but infections tend to develop with resistant bacteria even in castrated dogs.[1] In a study[4] of 92 dogs with prostatic abscesses drained by use of multiple Penrose drains, early postoperative complications included sepsis in a third of the dogs and death in a fifth. Of the 57 dogs in that study for which follow-up information was obtained, prostatic abscesses recurred in a fifth of the dogs and incontinence developed in more than a fourth 6 months or longer after surgery.[4] To reduce the recurrence rate and total expenses, complete prostatectomy (removal of the entire prostate and prostatic urethra followed by urethral anastomoses) has been performed.[2,8-10] Prostatic disease does not recur after this type of prostatic surgery in clinically affected dogs, but most are incontinent after surgery.[10] Typical urodynamic findings after surgery in dogs with prostatic disease are decreased maximal urethral closure and plateau pressures.[3,10,11]

A partial prostatectomy technique has been developed by use of an intracapsular surgical approach. An ultrasonic surgical aspirator[a] is used to remove glandular tissue while preserving nerves, vessels, and the prostatic portion of the urethra. When this technique was used on 7 clinically normal dogs, all dogs remained continent and had normal urethral pressures and electromyographic findings after surgery.[12] The purpose of the study reported here was to determine whether prostatic disease and infection recurred during the first year after partial prostatectomy by use of an ultrasonic surgical aspirator.

Materials and Methods

Dogs—Twenty client-owned male dogs with signs of prostatic disease, prostatomegaly, and ultrasonographic evidence of cavitary disease were included in this study. Dogs were evaluated by physical examination (including rectal examination), CBC, urinalysis, bacteriologic culture (of urine, prostatic fluid, and prostatic tissue), serum biochemical analysis, urethral pressure profilometry, and imaging techniques such as abdominal radiography, ultrasonography, and urethrography. Using a previously described technique,[13] urethral pressure profiles were measured[b] in conscious dogs. Measurements included maximal urethral closure pressure (greatest difference between urethral and bladder pressure) and plateau pressure (urethral pressure contributed by connective tissue, smooth muscle, and vascular components located distal to the maximal urethral closure pressure). Diagnostic tests, especially profilometry, were not performed in dogs when surgery was indicated as an emergency treatment for peritonitis or sepsis. Dogs were excluded from the study if neoplasia was diagnosed before or during surgery.

Surgical techniques—The anesthetic regimen was selected on the basis of the dog's clinical condition. Ventral midline laparotomy was performed to approach the prostate. Prostatic samples (tissue or fluid) were submitted for bacteriologic culture. Biopsy specimens were taken from the prostate and medial iliac lymph nodes. Prior to prostatic

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surgery, a temporary tourniquet was placed around the aorta just cranial to its bifurcation into the external iliac arteries. The intracapsular partial prostatectomy procedure has been described in detail.[12] Briefly, it was performed by use of electrocautery to ventrally incise both poles of the prostate. The ultrasonic surgical aspirator was used to fragment, irrigate, emulsify, and aspirate approximately 85% of the glandular tissue. The ultrasonic aspirator provided discrimination of nerves, blood vessels, and collagenous connective tissue from glandular tissue.[14-16] A catheter was placed within the urethra to identify and avoid damaging it. Urethral fistulae were identified by inflating the urethra with fluid. When fistulae were identified, they were closed with an interrupted or continuous pattern of 4-0 monofilament synthetic absorbable sutures. After glandular resection and excision of the ventral hemisphere of the capsule, the dorsal portion of the prostatic capsule was sutured with an interrupted pattern of 3-0 synthetic monofilament absorbable sutures on the ventral midline to form a cuff around the prostatic portion of the urethra. The urethral catheter was secured in place for decompression of the urinary bladder during the initial 18 hours after surgery. Sexually intact dogs were castrated. Postoperative treatment included intravenous administration of lactated Ringer's solution (or other appropriate fluids) given at greater than maintenance rates (2.2 ml/kg of body weight/h [1 ml/lb/h]), pain-relieving medications, antibiotics, and intensive care monitoring.

Postoperative evaluation—Follow-up information was obtained for all dogs for 1 year after surgery, except 2 that were euthanatized. Attempts were made to evaluate dogs 1, 3, and 6 months after surgery. Repeat evaluations included history, physical examination (including rectal examination), CBC, urinalysis, bacteriologic culture of urine, abdominal radiography and ultrasonography, and urethral pressure profilometry.

Statistical analysis—Descriptive statistics were calculated. A *t*-test of independent sample means was used to compare incontinent with continent dogs. Measurements before surgery were compared with those 1 year after surgery, using a paired *t*-test. A value of $P < 0.05$ was considered significant.

Results

Twenty male dogs with clinical signs of prostatic disease or prostatomegaly (abscesses and cysts) were treated. Mean age was 8.4 years (range, 4 to 12 years). The 3 youngest dogs were 4, 5, and 6 years old; others were more than 7 years old. Eight dogs had been castrated, 6 of which were castrated more than 6 months prior to admission. Seven of these 8 dogs had been castrated previously as part of the treatment of prostatic disease. These 7 castrated dogs had also received prolonged administration of antibiotics, with 1 being treated by marsupialization and 1 by drainage, using Penrose drains. A single breed was not represented more than twice, except that 6 were mixed-breed dogs. Eighteen of the 20 dogs survived for at least 1 year after surgery. Two dogs were euthanatized; 1 had an unrelated lymphosarcoma 10 months after surgery and 1 had a prostatic adenocarcinoma 9 months after surgery. The diagnosis of prostatic adenocarcinoma had not been made at the time of initial surgery.

Mean weight of dogs was 25.5 kg (56.1 lb) before surgery. Many appeared to be anorectic, and 9 had neutrophilic leukocytosis with a left shift and other clinical signs and laboratory findings of sepsis. Mean (± SD) body weight of 15 dogs that were weighed before and 1 year after surgery increased significantly from 27.3 ± 14.0 to 31.7 ± 18.0 kg (60.1 ± 30.8 to 69.7 ± 39.6 lb), respectively. Several dogs became overweight after surgery, and it was recommended that dietary intake be decreased. Eleven of the 12 dogs that were castrated at the time of partial prostatectomy were weighed before surgery and 1 year later. Weight of these dogs increased significantly from 30.8 ± 12.6 to 36.1 ± 16.9 kg (67.8 ± 27.7 to 79.4 ± 37.2 lb). Because of the small number (4) of previously castrated dogs weighed before and after partial prostatectomy, it was not possible to differentiate the effect of castration from that of partial prostatectomy on body weight. Mean body weight before surgery (17.7 ± 15.0 kg [38.9 ± 33.0 lb]) was not significantly different than that after surgery (19.6 ± 17.0 kg [43.1 ± 37.4 lb]) in previously castrated dogs.

All prostates were determined to be at least twice the normal size and to have cavitary lesions on the basis of rectal examination and radiographic, ultrasonographic, and surgical findings. Eight dogs had prostatic abscesses defined as septic, purulent exudate within fluid-filled spaces of the prostate. Five dogs had intraprostatic cysts and evidence of infection on the basis of findings on histologic examination and bacteriologic culture results. Another had prostatic hyperplasia with cysts but no infection. Three had periprostatic cysts without growth on bacteriologic culture. One of these dogs had a periprostatic abscess, 1 had an infected periprostatic cyst containing more than 7.5 L of fluid, and 1 had a large periprostatic hematoma (12 × 8 cm in area, with a prostate that was 11 cm in diameter). All 6 dogs with periprostatic disease also had intraprostatic disease.

All owners were interviewed 1 year after partial prostatectomy. Fifteen dogs also had a complete examination 1 year after surgery. Three dogs without clinical signs of prostatic disease and 2 dogs that were euthanatized less than 1 year after surgery were not examined. All of the 15 dogs that were reexamined had prostates that were small and difficult to identify by means of abdominal and rectal palpation, radiography, and ultrasonography. Two dogs were suspected of having a small cyst on ultrasonographic examination. Although none of the dogs had evidence of prostatic disease during the initial year after surgery, 1 dog had recurrence of a prostatic abscess 18 months after partial prostatectomy. This dog had a normal-sized prostate and urinalysis results were within reference ranges when examined 6 weeks previously. After a second partial prostatectomy, prostatic disease did not recur. Another dog had a cyst recur twice within 1 month of initial surgery while it was still hospitalized. At the time of the second and third surgeries, bacteriologic culture results of urine and cystic fluid were negative and positive, respectively. The cause of repeated prostatic disease in this dog was persistence or recurrence of a fistula between the urethra and a prostatic cyst that had not remained closed after simple suture apposition.

Mean duration of surgery for all dogs was 2.25 hours (median, 2 hours). Mean and median times spent in the intensive care unit were 3.13 and 1.25 days,

respectively. Time spent in intensive care was primarily a reflection of the severity of prostatic disease and duration of urethral catheterization. Mean and median duration of indwelling catheterization were 2.8 and 1.5 days, respectively. Mean and median duration of hospitalization after surgery were 10.1 and 5.0 days, respectively. When 4 dogs that were hospitalized more than 10 days were excluded, mean duration of hospitalization decreased to 5.4 days.

Before surgery, 8 dogs were considered to urinate normally and another urinated normally when being treated with bethanechol chloride. Eight dogs leaked urine constantly while awake, and 3 of these dogs also had dysuria. Two dogs had only dysuria. One of the dysuric dogs had a perineal hernia with a retroflexed bladder and 1 had a urethral stricture just caudal to the os penis. One dog urinated often by squirting small volumes of urine.

Postoperative urinary continence was evaluated by obtaining a postoperative history for all dogs, including the 2 dogs that had been euthanatized 9 and 10 months after surgery. All 20 dogs were initially reported to be clinically normal by their owners, but intermittent and infrequent urinary incontinence were reported for 5 dogs when questioning was more directed. Fifteen of the 20 dogs were considered to urinate normally. Three dogs were considered to urinate normally but sometimes had postmicturition incontinence when excited. Dogs with postmicturition incontinence dribbled without conscious awareness after complete voluntary urination. One dog had nocturnal enuresis, leaking a few drops of urine while sleeping. During the day, the dog remained continent. The fifth dog urinated normally but would have urge incontinence, which is defined as dribbling of urine when the bladder is full and the dog is anticipating going outside, as often as once a week. In all 5 dogs with urinary incontinence, owners felt that this degree of inappropriate voiding was acceptable.

Urethral pressure profiles were obtained in 17 dogs before surgery. Mean maximal urethral pressure before surgery of 7 incontinent dogs (95.2 ± 48.3 cm of water) was not significantly different from that of 8 clinically normal dogs (90 ± 47 cm of water). Mean plateau pressure before surgery of 7 incontinent dogs (58.1 ± 52.6 cm of water) was also not significantly different from that of clinically normal dogs (52.6 ± 24.7 cm of water). Two dogs with preoperative dysuria had a mean maximal urethral closure pressure of 50.3 cm of water and a mean plateau pressure of 37.4 cm of water. Maximal urethral closure pressure in 14 dogs measured before surgery (93.3 ± 48.0 cm of water) was not significantly different from that 1 year after surgery (79.3 ± 36.2 cm of water), but plateau pressure in 13 dogs was significantly decreased 1 year after surgery (42.6 ± 15.4 cm of water), compared with that before surgery (55.8 ± 22.7 cm of water).

Fifteen of the 20 dogs had urinary tract infections before surgery. Twelve had positive bacteriologic culture results, and 3 had pyuria with negative bacteriologic culture results. One year after surgery, 11 dogs had no signs of urinary tract infection, but 5 had pyuria or positive bacteriologic culture results. Of the 3 surviving dogs that were not examined 1 year after surgery, 2 did not have urinalysis performed and 1 had urinalysis performed by the referring veterinarian.

Discussion

Results from this study indicate that intracapsular partial prostatectomy produces long-term resolution of prostatic abscesses and cysts. In terms of long-term results, prostatic drainage procedures in dogs managed in the 1980s often resulted in redevelopment of prostatic disease within 1 year.[1,10] Whether current clinical management would have improved long-term results is debatable. White and Williams[17] evaluated 20 dogs 4 weeks after intracapsular prostatic omentalization for prostatic abscesses and then contacted all clients 1 year after surgery. Nineteen of the 20 dogs were reported to be clinically normal by their owners. Prostatic omentalization is performed by digitally exploring the prostate through bilateral capsulectomy wounds and then packing omentum through the wounds into abscess cavities. Prostatic omentalization, therefore, appears to have advantages over earlier drainage procedures. In addition to favorable long-term results, partial prostatectomy in dogs of our study did not cause death, and most dogs were active and able to void urine the day after surgery. This is in contrast to results obtained by use of a laser for extracapsular partial prostatectomy[3] and drainage procedures[4] that resulted in some perioperative mortality. However, direct comparisons of results between various surgical techniques must be tempered with potential inconsistency of preoperative disease severity and postoperative monitoring intensity and duration. On the basis of results of earlier studies and the 1 dog in our study with recurrent problems 18 months after surgery, results of a detailed postoperative history, physical examination, urinalysis, bacteriologic cultures, and abdominal radiography and ultrasonography are necessary at a minimum of 1 year after surgery to evaluate long-term effects of prostatic surgery techniques.

Urinary control improved after partial prostatectomy in the dogs of our report. All dogs urinated normally after surgery, but 5 had subtle urinary incontinence. These results are more favorable than those of complete prostatectomy (removal of the entire prostate and prostatic urethra followed by urethral anastomoses) in clinically affected dogs, after which most become incontinent[1,3,10] usually as the result of decreased urethral pressure or, less often, detrusor muscle instability. In contrast, results of a retrospective study[18] of 11 dogs that had complete prostatectomy during a 14-year period revealed that only 3 of 9 dogs were incontinent, and results of a study by Pettit[8] indicated that only 1 of 5 dogs developed incontinence after this type of prostatic surgery. A high percentage of dogs with prostatic disease in this and previous studies[3,10] had low urethral pressures before surgery, even though some of these dogs were clinically continent. Excision of the entire prostate and prostatic urethra followed by urethral anastomoses in clinically normal dogs does not produce incontinence but does reduce urethral pressure.[13] We believe that surgery plus prostatic disease, especially progressing disease, can produce inconti-

nence. Another major disadvantage of complete prostatectomy, compared with partial prostatectomy, is the need to maintain cystostomy and urethral catheters for approximately 1 week after surgery.[2,18] Prolonged catheterization is thought to reduce complications of urethral anastomoses[2,18] but also markedly increases intensive care and hospitalization costs.

Maximal urethral closure pressure in dogs of our study was lower than in clinically normal dogs, but this finding did not correlate with clinical observations of micturition and incontinence before and after partial prostatectomy. Maximal urethral closure and plateau pressures have been reported in small groups of clinically normal dogs. In 1 of our earlier studies,[12] preoperative maximal urethral closure pressure in a group of 7 male dogs was 170.0 ± 28.1 cm of water (mean ± SD) and plateau pressure was 57.4 ± 30.1 cm of water. In another study,[13] maximal urethral closure pressure in clinically normal dogs was approximately 200 cm of water and plateau pressure was 50 cm of water. Urethral pressure profilometry has disadvantages as a diagnostic tool for patients in which incontinence is produced by an urethral outflow resistance that is lower than cystic pressure. The procedure of withdrawal of a pressure-sensing catheter through the urethra does not duplicate clinical signs of dribbling of urine. Profilometry also measures static pressure and does not reflect the dynamic changes that develop with altered body positions and sudden increases in abdominal pressure.[19] In addition, instability of the detrusor muscle of the bladder develops in dogs with prostatic disease, especially after surgery.[10] Any study designed to characterize incontinence also can be criticized because of potential biases in recording clients' observations about subjective signs of urinary control. This is particularly true when the recorder is a clinician managing these dogs and is trying to determine whether there is improvement after treatment. We attempted to ensure that the same questions and criteria were used before and after surgery.

On the basis of urinalysis, 11 of 16 dogs that had urinalysis performed in our study did not have evidence of urinary tract infection 1 year after surgery. These results are more favorable than those obtained using drainage procedures.[1] However, 5 dogs in our study did have pyuria or positive bacteriologic urine culture results at 1 year after surgery. These results indicate that these dogs are susceptible to reinfection and need to be reevaluated often. The owners of the dogs in our study had not noticed problems, reinforcing the necessity to repeat urinalysis and bacteriologic culture to evaluate long-term outcome. Castration appears to be beneficial in the resolution of chronic bacterial prostatitis, because castrated dogs have shorter experimental infection times with lower bacterial colony forming units/ml of urine than sexually intact dogs.[20] A purported benefit of castration to treat prostatic disease is to produce glandular atrophy.[2,21] However, at least 7 of the previously castrated dogs in our study had persistence of prostatic disease despite treatment with antibiotics and prostatic drainage procedures.

[a]Cavitron ultrasonic surgical aspirator system 200 macro-dissector, Valleylab Inc, Pfizer Hospital Products Group, Boulder, Colo.
[b]7810 versatile uromonitor, AMS, Minneapolis, Minn.

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