

PELVIC ACTINOMYCOSIS. UROLOGIC PERSPECTIVE

VENKATA K. MARELLA, OMID HAKIMIAN, GILBERT J. WISE, DAVID A. SILVER

Section of Urology, Maimonides Medical Center, Brooklyn, New York, USA

ABSTRACT

Purpose: Actinomycosis is a chronic granulomatous infection caused by the gram-positive anaerobic bacteria, *Actinomyces israeli*. This paper reviews the etiology and clinical presentation associated with Actinomycosis that often presents as a pelvic mass that mimics a pelvic malignancy.

Materials and Methods: A combination of patients treated by the authors in the recent past and a literature review of patients with pelvic Actinomycosis were assessed for demographic, clinical and predisposing co-factors. An analysis is made of age distribution, gender, diagnostic methods and treatment concepts.

Results: Thirty-three patients were included in the study that included 2 current patients and 31 obtained from literature review. There were 27 females (age range 16 - 69 years, mean 38 years) and 6 males (16 - 55 years, mean 36 years). Presenting signs and symptoms were lower abdominal mass in 28 (85%); lower abdominal pain in 21 (63%); vaginal discharge or hematuria in 7 (22%). Two patients developed fistulae (entero-vesico 1; vesico-cutaneous 1). Nineteen (70%) of the 27 female patients had intra-uterine contraceptive devices (IUD). Four patients (12.5%) (3 males and 1 female) had urachus or urachal remnants. Cystoscopy in 12 patients noted an extrinsic mass effect, bullous edema and in one patient "vegetative proliferation" proven to be a chronic inflammatory change. Exploratory laparotomy was performed in 32 of the 33 patients who had excision of mass and involved organs. Diagnosis was established by histologic examination of removed tissue. Penicillin (6 weeks) therapy was utilized to control infections.

Conclusion: Pelvic actinomycosis mimics pelvic malignancy and may be associated with the long-term use of intra-uterine contraceptive devices, and persistent urachal remnants. Removal of infected mass and antibiotic therapy will eradicate the inflammatory process.

Key words: pelvis; Actinomycosis; infection; tumor

Int Braz J Urol. 2004; 30: 367-76

INTRODUCTION

Actinomycosis is a chronic granulomatous infection caused by the gram-positive anaerobic bacteria, *Actinomyces israeli*, which often occur in clusters of tangled filaments called sulfur granules. *Actinomyces* is a natural inhabitant of the gastrointestinal tract. Clinical actinomycosis includes cervicofacial (60%), thoracic (15%), abdominal/pelvic (25%) (1).

Actinomycosis is a chronic infection characterized by the presence of dense fibrous tissue and pus. This infection does not invade intact mucous membranes, and commonly requires tissue trauma or the presence of foreign body. Abdominal surgery, ruptured viscus, tubo-ovarian abscess and intra-uterine contraceptive devices (IUD) are recognized risk factors for abdominal/pelvic Actinomycosis (2). In females, actinomyces are thought to be induced by oro-genital contact (3).

The Actinomycetes have been considered as “transitional forms between bacteria and fungi” however, their metabolic and morphologic characteristics classify them as higher forms of monera (bacteria). Actinomycosis is a chronic suppurative infection, which rarely involves the genitourinary system. Only 2 cases of abdominal Actinomycosis were encountered in 5 major hospitals with 640,000 admissions during 1955 to 1964 (4).

Recent presentations of 2 patients with genito-urinary Actinomycosis and a review of literature indicate that pelvic infection may be more prevalent. This paper presents an assessment of patient with pelvic Actinomycosis, and the associated risk factors.

Diagnosis is essential to differentiate the inflammatory mass or pseudotumor from malignant process.

MATERIALS AND METHODS

A literature review of 31 patients and 2 recent patients were evaluated to determine demographics, etiologic and clinical patterns of patients with pelvic infection caused by Actinomycosis.

RESULTS

A total of 33 patients with pelvic Actinomycosis are cited (Table-1). Twenty-seven patients (81%) were female with age range of 16 - 69 years (mean 38 years) and 6 male (18%) with age range of 16 - 55 (men 36 years). Four patients (3 male and 1 female) had urachus or urachal remnants. Nineteen (70%) of the 27 females had intra-uterine contraception devices.

Cystoscopy was performed in 12 patients. Findings included extrinsic mass effect, bullous edema and in one patient “vegetative proliferation” that revealed chronic inflammatory change. Exploratory laparotomy was performed in 32 of the 33 patients with excision of mass and involved organs (salpinx - 6; hysterectomy - 2; cystectomy or partial cystectomy - 10) Two patients required urinary diversion and 1 undiversion following determination that the mass was inflammatory.

The authors recently treated 2 patients with pelvic Actinomycosis. A 43-year old female presented with 2 months history of right lower quadrant abdominal pain associated with weight loss. Past history included 2 caesarian-sections and intrauterine device for 9 years, which was removed 1 month prior to admission.

Physical examination revealed a firm, tender right lower quadrant abdominal mass. No cervical motion tenderness was appreciated. Patient’s laboratory evaluation revealed no leukocytosis, and normal urinalysis. Computed tomography (CT) showed a predominantly right sided mass involving the anterior abdominal wall, small bowel and dome of the bladder (Figure-1).

Laparotomy confirmed a firm mass, extending from anterior abdominal wall to apex of bladder, adherent to right ovary, and ileum. En-bloc resection of bladder dome, right ovary, terminal ileum, appendix and cecum was performed. Histology revealed chronic inflammation with multiple abscesses and clusters of Actinomyces (Figure-2). This patient was treated with intravenous penicillin derivative. There was no recurrence.

Another patient a 39-year old woman had a 2 years history of lower abdominal pain associated with severe urinary frequency. The patient reported a 7-year use of IUD and history of penicillin allergy. Physical examination was unremarkable. Laboratory evaluation revealed no leukocytosis, pyuria, with sterile urine culture. CT showed a cystic mass anterior to bladder (Figure-3). Cystoscopy revealed intact bladder mucosa with edema and impression of extrinsic mass anterior to bladder. Transurethral biopsy was consistent with inflammatory process. Elective CT guided drainage of cystic mass disclosed purulent contents. Although drainage culture was sterile, cytology revealed inflammatory cells with aggregates of Actinomyces. Patient was treated with prolonged drainage of abscess cavity and 6 weeks of oral ciprofloxacin. Two months after removal of the percutaneous drain, patient had recurrence of the same previous symptoms, and the persistent cystic mass was seen on CT imaging. Patient underwent laparotomy, and enbloc excision of cystic mass including the bladder dome. The patient recovered completely after surgery.



Figure 1 – Computed tomography (CT) showing a predominantly right-sided mass involving the anterior abdominal wall, small bowel and dome of the bladder.

A review of 33 patients indicated that the diagnosis was established in 31 (94%) following surgical exploration and removal of tissue mass and affected organs that included portions of bladder, female reproductive organs uterus, salpinx and ovary. Three patients required urinary, bowel reconstruction or fecal diversions.

DISCUSSION

An actinomycotic lesion may present as hard mass with induration that extends to the adjacent organs, resulting in difficult differentiation from malignancy. Genitourinary symptoms are usually non-

specific, and may include abdominal pain, urinary frequency, and repetitive cystitis.

There is usually a long interval between the onset of symptoms and establishment of diagnosis. The diagnosis is primarily histological. Cultures are often unsuccessful in determining causative factors.

During the past 3 decades, the medical literature has cited a number of case reports of Actinomycosis of the genito-urinary system. Actinomycosis has caused primary infections of the kidney (5-7), including a horseshoe kidney (8), renal duodenal fistula (9), and reno-colic fistula (10).

Abdominal-pelvic forms of Actinomycosis have mimicked carcinomatosis with presentations of large pelvic mass and multiple peritoneal nodules (11). Other manifestations of Actinomycosis have included retroperitoneal and para-spinal masses (12,13).

Actinomycosis has been known to cause scrotal masses (14,15), infections of the prostate (16) and penile pilonidal sinus (17).

Bladder and pelvic infections have been well documented in the literature. Most patients were women who presented with lower abdominal mass and suprapubic pain (18-20). Pelvic mass was the presentation in most of female patients with actinomycosis, with the history of IUD use. (21-23).

Ureteric obstruction related to pelvic infection has been reported (24). Brown et al. reported a 34-year old female, with ureteric obstruction secondary to IUD-associated actinomycosis, which

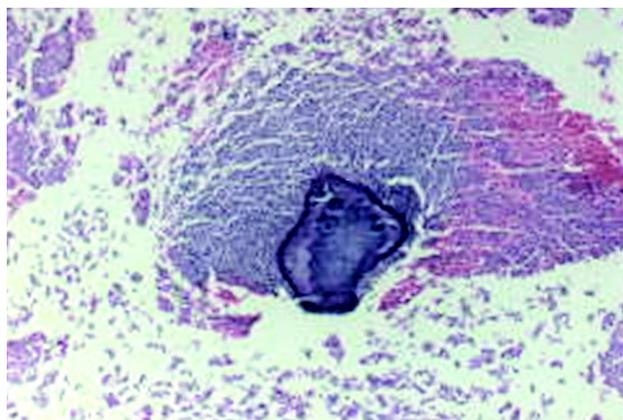


Figure 2 – Photomicrograph of chronic inflammation with multiple abscesses and clusters of Actinomyces (X400).



Figure 3 – Computed tomography (CT) showing a cystic mass anterior to the bladder.

Table 1 – Review of abdomino-pelvic actinomycosis and associated risk factors.

Study	No	Age (years)	Sex	Presentation	Risk Factors	Cystoscopy	Treatment & Findings
Current study	1	43	F	2 mo., right lower quadrant pain, with weight loss and firm tender right lower quadrant abdominal mass, CT scan showed 5 cm right sided pelvic mass, involving the anterior abdominal wall, small bowel and the dome of the bladder	IUD	N/A	Laparotomy, with excision of the mass with en-bloc resection of the bladder dome, right ovary, and terminal ileum
Current study	1	39	F	2 yr., lower abdominal pain with severe urinary frequency and unremarkable physical exam, 6 cm cystic mass anterior to the bladder (CT scan)	IUD	Edema and signs of extrinsic compression at dome, biopsy confirms inflammatory process	CT guided drainage and ciprofloxacin for 6 weeks, recurrence of mass after 2 months, required laparotomy with excision of cystic mass and bladder dome
Beedham et al.	4	29,19, 44,24	F	Pelvic mass, vaginal discharge, menorrhagia or amenorrhea	IUD	None	Exploratory laparotomy, penicillin therapy
Brown et al.	1	34	F	Weight loss and constitutional symptoms, CT and IVP findings of bilateral hydronephrosis and a mass in the pelvis displacing the bladder anteriorly, and a mass in right ischio-rectal fossa	IUD	None	Laparotomy and excision of a friable mass in the pelvis, which displaced the bladder anteriorly, with bilateral pyosalpinges
Deshmukh et al.	1	57	F	Vesico-cutaneous fistula	Appendectomy, cholecystectomy	Edema at dome	Penicillin

PELVIC ACTINOMYCOSIS. UROLOGIC PERSPECTIVE

Study	No	Age (years)	Sex	Presentation	Risk Factors	Cystoscopy	Treatment & Findings
Ellis et al.	4	16	M	Voiding symptoms and lower abdominal fullness	No	Extrinsic compression on bladder dome	Drainage and marsupialization of the abscess to the abdominal wall
		24	F	Lower abdominal discomfort, dyspareunia, and vaginal bleeding	Previous appendectomy	N/A	Right salpingo-oophrectomy, for a mass originating from right ovary
		29	F	Recurrent PID	IUD	N/A	Hysterectomy for atypical dysplastic cervix, and tubo-ovarian abscess
		22	F	Tender Left lower quadrant abdominal mass	Abortion	N/A	Laparotomy and excision of 5 x 10 cm abdominal wall mass, with no continuity with abdominal structures
Fulton et al.	2	31	F	Right lower quadrant pain, pelvic mass	IUD	N/A	Laparotomy and hysterectomy
	1	32	F	Lower abdominal pain, left sided pelvic mass	IUD	N/A	Antibiotic therapy, laparotomy
Gotoh et al.	1	55	M	Lower abdominal pain and dysuria, CT finding 4 x 8 cm mass from anterior bladder wall to rectus muscle	Urachal remnant	Stretched edematous dome	Laparotomy and excision of the mass and urachal cord with part of bladder and peritoneum
Grierson et al.	1	68	F	Large, hard, irregular lower abdominal mass left to midline (urachus)	Urachus Appendectomy	N/A	Partial cystectomy and hard, fibrotic mass involving the dome of the bladder
Henderson et al.	1	38	F	Lower abdominal pain, vaginal discharge and pelvic mass	IUD	None	Laparotomy – tubo-ovarian abscess

PELVIC ACTINOMYCOSIS. UROLOGIC PERSPECTIVE

Study	No	Age (years)	Sex	Presentation	Risk Factors	Cystoscopy	Treatment & Findings
Isaacson et al.	1	51	M	Hypogastric mass and bilateral ureteric obstruction	None	None	Laparotomy and ureterolysis – Ileocecal mass
Jackson et al.	1	45	F	Epigastric and back pain, pelvic mass, bilateral ureteric obstruction	IUD	Right ureteric stenosis	Laparotomy and resection of pelvic mass
King et al.	1	36	F	Right lower quadrant pain, voiding symptoms and RLQ mass	IUD	Bullous edema of right lateral wall	Laparotomy and partial cystectomy
Lomax et al.	4	16,28, 40,25	F	Pelvic mass, weight loss	IUD (2 patients)	None	Exploratory laparotomy- tubo-ovarian abscesses
Maeda et al.	1	43	F	Lower abdominal pain and abdominal distension, CT and IVP findings of a pelvic mass causing right hydronephrosis and intestinal obstruction	IUD	N/A	Emergency laparotomy, and incomplete tumorectomy and colostomy and cutaneous ureterostomies due to positive frozen sections for adenocarcinoma, but final pathology revealed actinomycosis, and then underwent urinary undiversion.
Makar et al.	1	35	F	Lower abdominal pain and urgency, CT findings of mass from anterior portion of bladder with infiltration into rectus abdominis muscle	IUD	Vegetative proliferation at dome	Partial cystectomy, with a 4 cm central exophytic tumor, which was adherent to pubis and omentum

PELVIC ACTINOMYCOSIS. UROLOGIC PERSPECTIVE

Study	No	Age (years)	Sex	Presentation	Risk Factors	Cystoscopy	Treatment & Findings
Marco Perez et al.		55	M	Right flank pain – Right sided bladder mass, right hydronephrosis, CT – thick bladder wall on right side and right. hydronephrosis	H/o Bilroth II	Mass effect on right lateral wall with intact mucosa	Exploratory laparotomy and finding of mass with infiltration at bladder, sacrum and posterior bladder with encompassing both ureters. Cystectomy and ileal conduit
Micheli et al.	1	22	M	Hard, fixed, median umbilical-pubic mass (urachus)	No	Normal	Excision by laparotomy and mass reaching from umbilicus to bladder dome
Nagy et al.	1	16	M	Palpable, painless umbilical-pubic mass and voiding symptoms (patent urachus)	No	Evidence of external compression up to 3 cm, at dome of bladder	Excision by laparotomy and mass reaching from umbilicus to bladder vertex with terminal ileum involvement
Ozyurt et al.	1	31	F	Palpable suprapubic mass, with hematuria and CT finding of a 5 cm mass originating from anterior bladder wall.	IUD	Edematous bladder mucosa	Partial cystectomy and right salpingo-oophrectomy, for a firm mass extending from the anterior wall to the apex of the bladder.
Piper et al.	1	69	F	7 weeks h/o voiding symptoms, and pneumaturia, suggesting entero-vesical fistula	None	Cysto - 4 cm mass effect on right lateral wall IVP - filling defect in bladder, right hydronephrosis	Exploratory laparotomy – mass in right iliac fossa involving a loop of small bowel, bladder, and ovary
Spagnuolo et al.	1	43	F	Pelvic mass and lower abdominal pain	IUD	None	Exploratory laparotomy-dense fibrous adhesions involving pelvic organs
Willscher et al.	1	49	F	Right lower quadrant pain, pelvic mass	Ca Cervix	None	Exploratory laparotomy - Pelvic mass, and retroperitoneal fibrosis

responded well to tetracycline therapy alone (25). Another 45-year old female, with IUD use for more than 13 years, presented with bilateral ureteric obstruction secondary to a large pelvic mass involving the uterus, tubes, ovaries, and rectum (26). Fulton et al. reported 2 cases with ureteric obstruction, secondary to IUD-associated Pelvic actinomycosis (27). Tubo-ovarian abscess was reported by *Actinomyces bovis*, was reported in a 38-year old female with IUD use (28).

One patient's (20) cystoscopy demonstrated edematous mucosal however this patient presented with a supra-pubic mass that was similar in presentation as the 2 case reports. King et al. reported a bladder mass limited to serosa, associated with IUD use for more than 13 years (29). Other presentations of pelvic actinomycosis with bladder involvement are vesico-cutaneous fistula (30), anterior pelvic masses involving bladder dome (31), and lateral pelvic masses causing ureteral compression (32). Actinomycosis involving the urachus or urachal remnant has been reported. One patient was a 68 year-old woman while the other cases involved men aged 16, 22 and 55 years (18,33-36).

A 16 year-old male developed an urachal Actinomycosis that penetrated into the ileum (37). Ureteric obstruction secondary to retroperitoneal and pelvic Actinomycosis was reported (38,39). Ileo-vesical fistula was reported in a 69 year-old woman due to Actinomycosis (40). All patients presented with suprapubic masses thought to be either an urachal abscess of malignancy. Diagnosis was established following histologic examination of the resected tissue. All patients responded to antibiotic therapy. In most cases of female infection the presence of a long standing (> 6 years) intra-uterine contraceptive device was incriminated as the putative cause of pelvic infection. A number of cases have been related to the use of intra-uterine devices.

In only one patient was the diagnosis of supra vesical Actinomycosis established prior to surgical exploration. This was achieved by CT guided aspiration of supra-vesical abscess. Although the patient had 6 weeks of ciprofloxacin therapy, the mass persisted and the patient subsequently required surgical exploration with excision of supra-vesical

mass and partial cystectomy. The literature cites another patient in whom diagnosis was established by drainage from a vesico-cutaneous fistula.

These case reports indicate the potential for Actinomycosis to develop in women with IUD's. *Actinomyces* is usually found in gastrointestinal tract. The access to the genital tract is likely to be by oral contact or via blood stream. The disease may become established in the presence of chronic tissue injury from an IUD, and some copper containing IUD's may have a differential effect on bacterial colonization by anaerobic flora. Luff et al. demonstrated *Actinomyces* in 40% of hysterectomy specimens removed from IUD wearers for various reasons (41). Thus, with chronic inflammation and mucosal breakdown associated with IUDs appears to favor colonization, and subsequent development of suppuration. Urachus or urachal remnants also appear to be a co-factor. Intestinal perforation with ileo-cecal involvement is also a potential risk factor for pelvic actinomycosis. Awareness of these contributing factors may interdict the need for aggressive surgery utilized in the treatment of malignant processes.

The treatment is a combination of extensive surgical debridement and/or long-term antibiotic therapy. Penicillin is the drug of choice. If diagnosed pre-operatively, should start with 10 to 20 million units of intravenous penicillin per day for 4 to 6 weeks.

Then wide excision of the infected tissues and exposure of any sinus tracts should be performed. After surgery, the patient should receive 1 to 2 million units of oral penicillin continued for 12 to 18 months. If the diagnosis is made at the time of surgery, 10 to 20 million units of intravenous penicillin, and then long-term oral penicillin therapy is needed. Tetracycline, erythromycin, clindamycin and ciprofloxacin are the alternative antibiotics in the management of patients with penicillin allergy.

CONCLUSIONS

The presentation of 2 recent case reports and review of 31 cases cited in the literature reiterate the importance of this diagnostic entity when the urologist encounters a patient with an unusual pelvic mass. The presence of long -standing contraceptive intra-uterine

device is the most significant contributing factor in the female patient. An urachus or urachal remnant is also an associated risk factor.

Surgical resection combined with penicillin therapy was proven to be successful. In most patients, the diagnosis was established after exploratory surgery following extensive resection of infected tissue. Awareness of this diagnostic entity may enable the urologist to implement antibiotic therapy and minimize the need for major organ resection.

REFERENCES

1. Cope, Z.: Actinomycosis. London, Oxford University Press, 1938.
2. Schiffer MA, Elguezabal A, Sultana M, Allen AC: Actinomycosis infections associated with intrauterine contraceptive devices. *Obstet Gynecol.* 1975; 45: 67-72.
3. McCormick JF, Scorgie RD: Unilateral tubo-ovarian actinomycosis in the presence of an intrauterine device. *Am J Clin Pathol.* 1977; 68: 622-6.
4. Weese, W.C., Smith, IM: A study of 57 cases of Actinomycosis over 36 year period. A diagnostic "failure" with good prognosis and treatment. *Arch Int Med.* 1975; 135: 1562-8.
5. Patel BJ, Moskowitz H, Hashmat A: Unilateral renal actinomycosis. *Urology.* 1983; 21: 172-4.
6. Crosse JE, Soderdahl DW, Schamber DT: Renal actinomycosis. *Urology.* 1976; 7: 309-11.
7. Khalaff H, Srigley JR, Klotz LH: Recognition of renal actinomycosis: nephrectomy can be avoided. Report of a case. *Can J Surg.* 1995; 38: 77-9.
8. McGibney D, Clarke PB: Primary renal actinomycosis in the presence of horseshoe kidney. *Br J Urol.* 1986; 58: 566.
9. Cvetkov MC, Elenkov C, Georgiev M, Topov U, Stefanova G: Renal actinomycosis complicated by renoduodenal fistula and diabetes mellitus. *Br J Urol.* 1995; 75: 104-5.
10. Yu HH, Yim CM, Leong CH: Primary actinomycosis of kidney presenting with reno-colic fistula. *Br J Urol.* 1978; 50: 140.
11. Cameron AE, Menon GG, Wyatt AP: Abdominal actinomycosis mimicking carcinomatosis. *J R Soc Med.* 1988; 81: 231-2.
12. Schlech WF 3rd, Gelfand M, Alper B, Kaiser AB: Medical management of visceral actinomycosis. *South Med J.* 1983; 76: 921-2.
13. Levine LA, Doyle CJ: Retroperitoneal actinomycosis: a case report and review of the literature. *J Urol.* 1988; 140: 367-9.
14. Sarosdy MF, Brock WA, Parsons CL: Scrotal actinomycosis. *J Urol.* 1979; 121: 256-7.
15. Jani AN, Casibang V, Mufarrij WA: Disseminated actinomycosis presenting as a testicular mass: a case report. *J Urol.* 1990; 143: 1012-4.
16. de Souza E, Katz DA, Dworzack DL, Longo G: Actinomycosis of the prostate. *J Urol.* 1985; 133: 290-1.
17. Rashid AM, Williams RM, Parry D, Malone PR: Actinomycosis associated with pilonidal sinus of the penis. *J Urol.* 1992; 148 (2 Pt 1): 405-6.
18. Ellis LR, Kenny GM, Nellans RE: Urogenital aspects of actinomycosis. *J Urol.* 1979; 122: 132-3.
19. Makar AP, Michielsen JP, Boeckx GJ, Van Marck EA: Primary actinomycosis of the urinary bladder. *Br J Urol.* 1992; 70: 205-6.
20. Ozyurt C, Yurtseven O, Kocak I, Kandiloglu G, Elmas N: Actinomycosis simulating bladder tumour. *Br J Urol.* 1995; 76: 263-4.
21. Beedham T, Ellice R, Smith H, Usherwood MM: Female genital actinomycosis. *Eur J Obstet Gynecol Reprod Biol.* 1979; 9: 341-5.
22. Spagnuolo PJ, Fransioli M: Intrauterine device-associated actinomycosis simulating pelvic malignancy. *Am J Gastroenterol.* 1981; 75: 144-7.
23. Lomax CW, Harbert GM Jr, Thornton WN Jr: Actinomycosis of the female genital tract. *Obstet Gynecol.* 1976; 48: 341-6.
24. Maeda H, Shichiri Y, Kinoshita H, Okubo K, Okada T, Aoki Y, et al.: Urinary undiversion for pelvic actinomycosis: a long-term follow up. *Int J Urol.* 1999; 6: 111-3.
25. Brown R, Bancewicz J: Ureteric obstruction due to pelvic actinomycosis. *Br J Surg.* 1982; 69: 156.
26. Jackson AE, Parry JR, Shah PJ: Ureteric obstruction secondary to pelvic actinomycosis. *Br J Urol.* 1988; 62: 85-7.
27. Fulton IC, Paterson WG, Crucioli V: Pelvic actinomycosis causing ureteric obstruction. Case reports. *Br J Obstet Gynaecol.* 1981; 88: 1044-50.
28. Henderson SR: Pelvic actinomycosis associated with an intrauterine device. *Obstet Gynecol.* 1973; 41: 726-32.
29. King DT, Lam M: Actinomycosis of the urinary bladder. Association with an intrauterine contraceptive device. *JAMA.* 1978; 240: 1512-3.

30. Deshmukh AS, Kropp KA: Spontaneous vesicocutaneous fistula caused by actinomycosis: case report. *J Urol.* 1974; 112: 192-4.
31. Perez Garcia MD, Rodriguez Alonso A, Nunez Lopez A, Ojea Calvo A, Alonso Rodrigo A, Rodriguez Iglesias B, et al: Abdominal-pelvic actinomycosis with urinary tract involvement, secondary to gynecologic infection caused by intrauterine device. *Actas Urol Esp.* 2000; 24: 197-201.
32. Marco Perez LM, Lopez Costea MA, Trilla Herrera E, Condom Mundo E, Franco Miranda E, Serrallach Mila N: Primary bladder actinomycosis. *Actas Urol Esp.* 2000; 24: 573-5.
33. Grierson JM, Zelas P: Actinomycosis involving the urachal remnant. *Med. J. Aust.* 1977; 1: 849-52.
34. Micheli E, Hurle R, Losa A, Chinaglia D, Ranieri A, Lembo A: Primary actinomycosis of the urachus. *BJU Int.* 1999; 83: 144-5.
35. Gotoh S, Kura N, Nagahama K, Higashi Y, Fukui I, Takagi K: Actinomycosis of urachal remnants. *J Urol.* 1988; 140: 1534-5.
36. Asano S, Fujii Y, Inokuchi S: Actinomycosis of the bladder wall with transitional cell carcinoma of the bladder. *Nippon Hinyokika Gakkai Zasshi.* 1977; 68: 983-6.
37. Nagy V, Sokol L, Baca M, Valansky L, Zelenak P, Bodnar J: Actinomycosis of the urachus persists penetrating into the ileum. *Int Urol Nephrol.* 1997; 29: 627-31.
38. Isaacson, P, Jennings, M., Bilateral ureteric obstruction in a patient with ileocecal Crohn's disease complicated by actinomycosis. *Br J Urol.* 1977; 49: 410.
39. Willscher MK, Mozden PJ, Olsson CA: Retroperitoneal fibrosis with ureteral obstruction secondary to *Actinomyces israeli*. *Urology.* 1978; 12: 569-71.
40. Piper JV, Stoner BA, Mitra SK, Talerman A: Ileo-vesical fistula associated with pelvic actinomycosis. *Br J Clin Pract.* 1969; 23: 341-3.
41. Luff RD, Gupta PK, Spence MR, Frost JK: Pelvic actinomycosis and the intrauterine contraceptive device. A cyto-histomorphologic study. *Am J Clin Pathol.* 1978; 69: 581-6.

Received: June 28, 2004
Accepted: August 20, 2004

Correspondence address:

Dr. Venkata K. Marella
Section of Urology
Maimonides Medical Center
953, 49 st, # 301
Brooklyn, New York, 11219, USA
Fax: + 1 718 635-7093
E-mail: vkmarella@hotmail.com