Intravesical Foreign Bodies
Review and Current Management Strategies

Muhammad Rafique

Introduction: The aim of this study was to evaluate the cause, diagnosis, and management of intravesical foreign bodies in patients treated at our hospital and to review and update management of intravesical foreign bodies reported in the current literature.

Materials and Methods: Sixteen patients had been treated for intravesical foreign bodies at Nishtar Medical College Hospital, Multan, Pakistan during a 5-year period. Records of these patients were analyzed retrospectively for etiology, presentation, diagnosis, and management.

Results: The age of the patients ranged from 14 to 70 years and 10 of them were men. Seven patients (43.8%) had iatrogenic intravesical foreign bodies, 5 (31.3%) had migrated foreign bodies from the adjacent organs, and 4 (25.0%) had self-introduced foreign bodies into the bladder. The objects included copper wire, carrot, lead pencil, intrauterine device, surgical gauze, pieces of Foley catheter, and teflon beak of resectoscope sheath. The most common presenting symptoms were urinary frequency and dysuria. Endoscopic retrieval was possible in 8 (50.0%) patients, and the remaining underwent open cystostomy.

Conclusion: Intravesical foreign bodies should be included in the differential diagnosis of patients with chronic lower urinary tract problems. Radiological evaluation is necessary to determine the exact size, number, and nature of them. The most suitable method for removal of intravesical foreign bodies depends on the nature of the foreign body, age of the patient, and available expertise and equipment. Most intravesical foreign bodies can be retrieved with minimally invasive techniques.

Keywords: foreign bodies, bladder, foreign-body migration, urinary tract infections, hematuria, intrauterine devices, cystoscopy

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INTRODUCTION

During the past few decades, reports of intravesical foreign bodies have increased in the literature. A review of the literature on this subject reveals that almost any conceivable object has been introduced in to the urinary bladder. Introduction into the bladder may be self-insertion (through the urethra), iatrogenic, migration from adjacent organs, or a results of penetrating trauma.[1-4]

Patients present with either acute or chronic symptoms due to complications. Each foreign body poses a challenge to the urologist and treatment has to be individualized according to the size and nature of the foreign body and age of the patient.[5] Previously, endoscopic extraction with or without perineal urethrotomy or open cystotomy were the only treatment options, but with the advent of newer minimally invasive

Department of Urology, Nishtar Medical College, Multan, Pakistan

Corresponding Author:
Muhammad Rafique, FRCS, FRCS, Dip Urol, FEBU
No 5, Altaf Town, Tariq Rd, Multan, Pakistan
Tel: +92 61 457 1544
E-mail: rafiqanju@hotmail.com

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techniques, most intravesical foreign bodies can be removed endoscopically without resorting to open surgery.[6-9]

This paper presents our experience of diagnosis and management of various intravesical foreign bodies at our hospital. In addition, the discussion focuses on reviewing and updating the knowledge on management of intravesical foreign bodies reported in the current literature.

MATERIALS AND METHODS

Hospital records of patients who had received treatment for intravesical foreign bodies during a period from January 2001 to December 2005 at the department of urology, Nishtar Medical College Hospital, Multan, Pakistan, were retrospectively analyzed. The patients' age and sex, clinical presentation, diagnosis, and offered treatment were reviewed. The study was approved by the hospital's ethics committee.

RESULTS

There were 16 patients who had received treatment of intravesical foreign bodies at our hospital during the studied period. Their age ranged from 14 to 70 years (median age, 33 years). Ten patients were men and 6 were women (male-female ratio, 1.7:1). They had presented with variable urinary symptoms (Table 1). The most common symptoms were urinary frequency and dysuria. Hematuria, difficulty with micturition, and urinary retention were the other complaints at presentation. Seven patients (43.8%) had iatrogenic foreign bodies including retained surgical gauze (namely *gossypiboma*) in 5, a piece of a Foley balloon catheter in 1, and Teflon beak of a resectoscope sheath in 1 patient. All of the patients with surgical gauze had undergone open transvesical prostatectomy at peripheral hospitals and presented at variable intervals after the primary surgical operation. A piece of the Foley catheter in 1 patient had probably been left in the bladder when the balloon of his "stuck" catheter was suprapubically punctured. One patient had transurethral resection of the prostate carried out 6 weeks before presentation, when the Teflon beak of the resectoscope sheath became detached and was incidentally left in the bladder. He presented with hematuria.

In 5 patients (31.3%), the foreign bodies had migrated into the urinary bladder from the

Table 1. Patients Presented With Intravesical Foreign Bodies*

Patient	Age	Sex	Foreign Body	Cause	Presentation	Time to Presentation	Treatment
1	60	M	Surgical gauze	Iatrogenic	Acute urinary retention	3 months	Cystoscopy
2	70	M	Surgical gauze	Iatrogenic	Frequency, dysuria, difficulty with micturition	6 years	Open cystotomy
3	70	M	Surgical gauze	Iatrogenic	Difficulty with micturition, recurrent UTI	3 years	Open cystotomy
4	67	M	Surgical gauze	Iatrogenic	Difficulty with micturition	3 weeks	Cystoscopy
5	65	M	Surgical gauze	Iatrogenic	Urinary retention	4 months	Open cystotomy
6	30	M	Piece of Foley balloon catheter	Iatrogenic	Recurrent UTI	6 months	Cystoscopy
7	60	M	Teflon beak of TUR sheath	Iatrogenic	Hematuria, difficulty with micturition	6 weeks	Cystoscopy
8	28	F	Calculus on IUD	Migration	Recurrent UTI	5 years	Cystoscopy and litholopaxy
9	32	F	Calculus on IUD	Migration	Hematuria	5 years	Open cystotomy
10	35	F	Calculus on IUD	Migration	Frequency, dysuria	3 years	Open cystotomy
11	40	F	Calculus on IUD	Migration	Hematuria, dysuria	2 years	Cystoscopy and litholopaxy
12	14	F	Metal wire	Migration	Hematuria, dysuria	3 weeks	Open cystotomy
13	25	M	Copper wire	Self-insertion	Hematuria	3 weeks	Open cystotomy
14	28	F	Carrot	Self-insertion	Hematuria	2 weeks	Cystoscopy and TUR resection
15	18	F	Lead pencil	Self-insertion	Hematuria, dysuria	4 weeks	Cystoscopy
16	16	F	Ball pen	Self-insertion	Recurrent UTI	6 months	Open cystotomy

*M indicates male; F, female; UTI, urinary tract infection; TUR, transurethral resection; and IUD, intrauterine device.

surrounding structures. In 4 of them, intrauterine device (IUD) had migrated into the bladder, and these patients presented between 2 and 5 years after insertion of the device when calculi had been formed over the IUDs (Figure 1). A mentally disabled boy who had swallowed a 3-in long metal wire 6 weeks earlier presented with hematuria and dysuria, and the metal wire was found to be lying in the bladder.

In 4 patients (25.0%), the foreign bodies had been self-introduced into the bladder for sexual pleasure. These included a copper wire (Figure 2), a carrot, a lead pencil (Figure 3), and a ball pen. These patients were rather young with the ages ranged between 14 and 28 years.

All of the patients had undergone ultrasonography of the urinary tract and plain abdominal radiography of the kidney, ureters, and bladder (KUB) at the time of admission to our hospital. In 15 patients (93.8%), ultrasonography had detected the presence of an echogenic object in the bladder; however, only in 6 (37.5%), the presence of vesical foreign bodies had been correctly reported by the radiologist. Nine of the cases (52.3%) had been erroneously reported to be bladder calculi. In 1 patient ultrasonography had failed to diagnose the presence of a piece of Foley balloon catheter. Plain KUB had revealed the presence of a foreign body in 7 patients (43.8%), while in 2 patients (12.5%), who had a surgical gauze in the bladder, a faint radio-opaque shadow in the bladder area had been reported. In 2 patients who had transvesical prostatectomy, cystography had been performed that had strongly suggested the presence of a foreign body in the bladder by showing contrast material in some areas of filling defect.

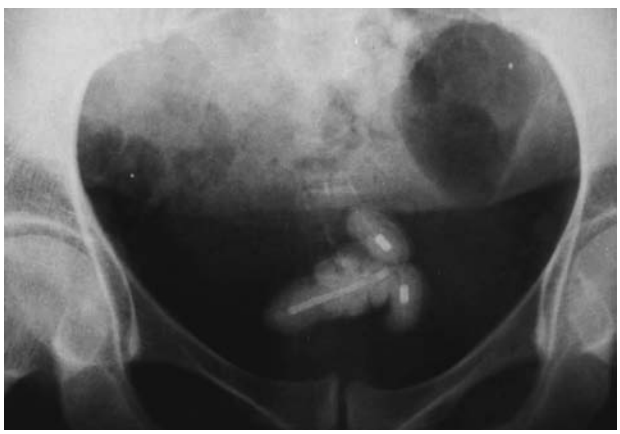

Figure 1. Pelvis radiography shows calculus formation on an intra-uterine device.

Figure 2. Pelvis radiography shows a coiled-up metal wire in the bladder area.

Figure 3. Ultrasonography shows a straight echogenic foreign body (lead pencil; arrow) and balloon of a Foley catheter in the bladder.

Eight intravesical foreign bodies (50.0%) had been removed endoscopically, and the remaining, by open surgery. The operation had been carried out by different surgeons and surgeons in training. The number of the foreign bodies removed endoscopically could have been higher had the required endoscopic equipment and

expertise be available at the time of treatment of all cases. Postoperatively, 2 patients had fever with rigors that settled with appropriate intravenous antibiotic therapy. One patient who had open surgical removal of a surgical gauze developed superficial wound infection. No other complications were recorded.

DISCUSSION

Intravesical foreign bodies are an important consideration in the differential diagnosis of lower urinary tract problems. Usually, foreign bodies are self-introduced, result of medical errors, migrated from the surrounding organs, or result of a penetrating injury. The variety of foreign bodies inserted in to bladder defies imagination and includes any types of objects. The most common motive associated with intravesical insertion of foreign bodies is sexual gratification. In some cases, it may be a consequence of a psychiatric illness. It is therefore surprising that objects as diverse as light bulbs, electric wire, glass rod, thermometer, battery, and blue tack have been self-introduced by patients.[2,9-12] Occasionally, a foreign body is inadvertently inserted into the female urethra in an attempt to procure abortion or prevent conception.[13] Furthermore, thermometers are frequently reported to slip into the female bladder during the patient's attempts to determine the temperature in the vulva or urethra.[14,15] Rarely, living objects, leech for instance, may enter the urinary bladder through the urethra.[16]

A variety of objects have been reported to migrate into the urinary bladder from the surrounding pelvic organs, including IUD, vaginal pessary, artificial urinary sphincter, prosthetic slings, nonabsorbable sutures used in Stamey procedures, surgical gauze, etc.[17-22] Almost any foreign body placed in the vicinity of the bladder has a potential of migration into the urinary bladder. Calculus formation may develop on such foreign bodies.

Catheters and endoscopic instruments are the most common objects introduced into the bladder by urologists. Thus, fragments of these instruments are the most common iatrogenic foreign bodies remaining in the bladder. Catheter tips, parts of catheter balloon, bougies, and beak of resectoscope sheath are some of the reported iatrogenic foreign bodies recovered from bladder.[7,23-26] In addition, urethral stents used in reconstructive urological procedures such as hypospadias repair may migrate into the bladder.[27] Retained suture material or staples used in bladder surgeries are of other iatrogenic objects, which may subsequently present as bladder calculi.[28] Occasionally, surgical gauze or sponge (*gossypiboma*) may be left in the bladder.[29,30] Recently, transvaginal tape has become one of the common procedures performed for the treatment of female stress incontinence. Perforations of the bladder during the placement of transvaginal tape are relatively common, but are usually noted on cystoscopy and corrected intraoperatively. Undetected bladder perforation may result in several complications including recurrent urinary tract infections, bladder calculus formation, and pelvic pain.[31,32]

Symptoms of intravesical foreign bodies are usually those of acute cystitis including urinary frequency, dysuria, hematuria, and strangury. Some patients may present with swelling of the external genitalia, poor urinary stream, and urinary retention. More importantly, patients occasionally present with no symptoms or complaint of minimal discomfort.[23] However, signs that should raise the physician's suspicion include undue anxiety during sexual history taking or attempts to avoid genital or rectal examination. Previous bladder surgery or surgery on the adjacent organs may well be relevant.[1]

Radio-opaque intravesical foreign bodies can usually be detected on KUB radiography. Intravenous urography or retrograde urethrography may provide additional information and occasionally reveal surprising findings and unexpected radiolucent objects.[1] The use of abdominal and transvesical ultrasonography has been reported for the detection of non-radio-opaque intravesical foreign bodies.[33-35] The degree of the echogenicity of a foreign body is dependent on the difference in acoustic impedance between the foreign body and surrounding tissues. Hence, the ultrasonographic appearance of intravesical foreign bodies will vary

depending on their nature.[36] To confirm the presence of intravesical foreign body cystoscopy is utilized. In addition, cystoscopy will identify the type and location of the foreign body, as well as being the most adequate method for treatment.[2]

Complications of intravesical foreign bodies consist of chronic and recurrent urinary tract infections, acute urinary retention, calcification, obstructive uropathy, scrotal gangrene, vesicovaginal fistula, squamous cell carcinoma, and even death of sepsis.[37-44]

Initial management of patients with intravesical foreign bodies should consists of providing pain relief and control of irritative voiding symptoms by prescribing analgesics and anticholinergic drugs, respectively. Antibiotics will be required for the control of urinary tract infection and prevention of sepsis in infected patients. Definitive management of intravesical foreign bodies is aimed at providing complete removal of the foreign body with minimal complications such as trauma to the bladder and urethra, peritonitis, urinary tract infection, hematuria, etc. On rare occasions, foreign bodies may be spontaneously expelled from the bladder during urination.[45] Most foreign bodies in the bladder may be removed either complete or after fragmentation via the endoscopic approach. However, the optimal technique is dictated by the patient's condition, associated urinary tract injuries and size, and shape and nature of the foreign body. Table 2 gives a brief summary of various authors' experiences of management of intravesical foreign bodies recorded in the current literature.[1,3,7-11,13,16-18,24,45-80] Conventionally, grasping forceps and retrieval baskets are used for removal of a foreign body. In some cases, grasping an object with an alligator or calculus forceps increases the effective diameter of that object and may make removal difficult and hazardous. In the past few decades, several modifications of endoscopic instruments and devices have been developed, especially for removing foreign bodies. Reportedly, cylindrical foreign bodies and thermometers have been removed via transurethral route using rigid and flexible cystoscopy, respectively.[46,47]

Wise and King[48] reported magnetic extraction of a metallic foreign body (hair pin) from the bladder by specially designed magnetic retriever. In recent years, because of their larger diameter and straight and strong design, the use of percutaneous instruments has been suggested for removing longer and stiff intravesical foreign bodies.[49] Younesi and colleagues[6] reported a similar technique for removal of a fragile glass foreign body (a lidocaine carpule) from the bladder. While Marshall and associates[50] reported the use of a specially constructed prolene snare intra-operatively to facilitate safe and rapid extraction of an intravesical metallic pipe by cystoscopy. Metal wires introduced into the bladder usually get curled up due to bladder contractions. In some cases, a wire can be removed endoscopically[12]; however, in most cases, open surgery is required to minimize urethral trauma during perurethral extraction. Ejstrud and Poulsen[51] reported the use of intravesical laparoscopy to untie a complete knot of an electric wire. The bladder was distended with 100 mL of saline during the procedure.

Paraffin objects such as candles and crayons are frequently introduced into the bladder. In the past, various solvents like xylol, benzene, and kerosene had been used for minimally invasive treatment of such objects. Since these solvents are known to be carcinogenic, their use is no longer suitable. Endoscopic removal of wax and paraffin objects is often complicated by their characteristic of floating on water. This problem may be solved by infusing gases such as carbon dioxide for cystoscopic examination and removal.[1] Wyatt and Hammontree[8] reported the use of holmium:yttrium-aluminum-garnet laser to cut a foreign body, ie, a weed trimmer line, to facilitate its perurethral removal. They also tested many reported intravesical foreign bodies *ex vivo* and reported that most foreign bodies except glass appeared to be cut by the laser. As the glass object would not absorb laser energy, it was not fragmented. During the procedure, potential safety concerns about burns and exposure to byproducts of combustion appear to be mitigated by irrigation fluid. The authors suggest that many commonly reported intravesical foreign bodies are amenable to

Table 2. Reported Intravesical Foreign Bodies in the Literature and Techniques Used for Their Removal*

Reference	Foreign Body	Technique for Removal
55	IUD	Cystoscopy
56,57	IUD	Cystoscopy and suprapubic cystotomy
58	IUD	Cystoscopy and transcervical removal
59	Calculus on IUD	Cystoscopy/cystolithotripsy
16,60,61	Calculus on IUD	Suprapubic cystostomy
62	Calculus on IUD	Cystoscopy/electrohydraulic lithotripsy
63	Calculus on IUD	Laparotomy
49	Pencil	Percutaneous nephrolithotomy Sheath and forceps
13	Calculus on pencil cover	Cystoscopy
1	Wax candle	Cystoscopy, air insufflation, and endoscopic removal
22,64	Surgical gauze	Cystoscopy and removal with forceps
65	Polypropylene mesh after laparoscopic hernioplasty	Suprapubic cystostomy
66	Demobilization chain	Suprapubic cystostomy
13	Bamboo stick	Cystoscopy
67	Long plastic tube	Cystoscopy
3,68	Electric wire	Cystoscopy
51	Electric wire	Intravesical laparoscopic undoing of knots & removal
69	Calculus on copper wire	Suprapubic cystostomy
70	Calculus on metal wire	Open cystostomy
8	Weed trimmer line	Holmium:YAG laser
71	Stamey sutures	Cystoscopy
72	Suture and pledget of bladder neck suspension	Cystoscopy
31	Tension-free vaginal tape	Suprapubically assisted Operative cystoscopy for Removal of mesh
32	Bladder penetrating polyester suture of sling operation	Cystoscopy and holmium Laser removal
73,74	Polypropylene suture after anti-incontinence surgery	Cystoscopy/holmium laser excision
75	Tampon	Cystoscopy
76	Urethral incontinence plug	Cystoscopy
47	Thermometer	Flexible cystoscopy
77	Thermometer	Percutaneous removal with rigid nephroscope and forceps
78	Aluminum rod	Open cystostomy
48	Metallic hair pin	Magnetic extraction with Magnetriever
17	Migrated AMS 800 urinary sphincter	Transvesical removal
11	Battery	Suprapubic cystostomy
7	Detached tip of resectoscope sheath	Holmium laser fragmentation and cystoscopic removal
24	Calculus on a piece of Foley balloon catheter	Tranurethral cystolitholapaxy cystoscopy
54	Retained catheter tip with inflated Foley balloon	Cystoscopy, puncture of balloon with Sachse's urethrotome knife, and endoscopic removal
79	calculus on ruptured Foley balloon fragment	Cystoscopy
9	Blue tack	Carbon dioxide insufflation cytoscopy for visualization and laparoscopic removal
80	Retained silastic catheter	Cystoscopy for optical visualization and percutaneous removal with laparoscopic equipment
53	Toy frog	Cystoscopic visualization and small open cystostomy

*IUD indicates intrauterine device; YAG, yttrium-aluminum-garnet; and AMS, American medical systems.

treatment with laser. Habermacher and Nadler[7] reported the use of holmium laser to fragment a detached 26-F resectoscope sheath tip before its transurethral removal without any complications. Hong and colleagues[32] used holmium laser to remove bladder-penetrating polyester suture in an earlier sling surgery that could not be removed completely by conventional cystoscopic equipment. The use of laser for intravesical fragmentation and subsequent removal of large intravesical foreign bodies is a promising new technique for urological surgeons.

Szlyk and Jarrett[52] described the use of 20-F rigid hysteroscope in urological practice to remove deeply embedded foreign bodies from the lower

urinary tract of 3 patients in whom previous attempts with standard cystoscopic equipment had been unsuccessful. DeLair and coworkers[53] reported a technique for rapid extraction of a large foreign body from the bladder. In this technique, the intravesical foreign body was visualized by cystoscopy. Urinary bladder was entered through a small cystotomy using a *cut-to-the-light* approach, and the foreign body (a toy frog) was rapidly extracted under cystoscopic guidance. The authors claimed that combination of endoscopy and cystotomy is rapid, safe, and potentially applicable for the removal of large vesical calculi.

Removal of the retained catheter tip of an inflated Foley catheter's balloon is difficult and sometimes frustrating. The spherical latex rubber balloon with little amount of air makes it of lighter density than water. Therefore, it has tendency to float in the urinary bladder and rest near the dome, almost hiding itself. Hemal and colleagues[54] reported 2 techniques to tackle such a situation. In the first technique, the bladder was evacuated of excess water and the balloon was trapped in the small space to be punctured with Sachse's urethrotome knife before its removal. In the second technique, a fine hypodermic needle without its hub was mounted on the biopsy forceps to puncture the balloon.

The removal of intravesical foreign bodies in children poses a great therapeutic challenge. In contrast to intravesical foreign bodies in adults, the size of the pediatric urethra may preclude safe transurethral removal. Reddy and Daniel[9] reported a novel method for tackling such a situation. Using cystoscopy as the optical device through the urethra, a 10-mm laparoscopic port was introduced suprapubically under the vision for extraction of the complex foreign body (ie, blue tack while the bladder remained insufflated with carbon dioxide at a pressure of 12 mm Hg. By avoiding the use of irrigating fluid, they claimed that irrigating fluid-induced hypothermia can be avoided. Percutaneous retrieval of intravesical foreign body in a 4-month-old infant using direct transurethral visualization has been reported by Hutton and Huddart.[80]

CONCLUSION

Intravesical foreign bodies are not uncommon and their presence should be included in the differential diagnosis of patients presenting with chronic lower urinary tract problems. Radiological evaluation is necessary to determine the exact size, number, and nature of foreign bodies. The most suitable method for removal of intravesical foreign bodies will depend on the nature of the foreign body, age of the patient, and the available expertise and equipment. Most intravesical foreign bodies can be retrieved with endoscopic and minimally invasive techniques without resorting to open surgery.

CONFLICT OF INTEREST

None declared.

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