



Research Article

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The Role of Pre-Operative Intravenous Urography in Preventing Urinary Tract Injury for Benign Pelvic Lesion



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Abstract

Due to close anatomical proximity of female urinary and genital tract, the ureter, urinary bladder and urethra are vulnerable for injury during gynaecological surgery. In a comparative observational study we evaluated 89 cases having benign and clinically high risk gynaecological conditions requiring surgery, for the incidence of urinary tract involvement and to determine whether pre-operative assessment of urinary tract by IVU diminishes the risk of operative injury. At what circumstances IVU will be justifiable is also evaluated. In our study IVU could detect urinary tract involvement in 41.37% cases preoperatively in selected benign gynaecological condition. In the study group 2 patients sustained intraoperative urinary tract injury whereas 5 cases in control group had the same.

It is evident from our study that IVU can detect urinary tract anomaly in large number of patients in comparison to control group; the information available to gynecologist allow him/her to take steps to either prevent or detect ureteric injury during operation.

Keywords: Intravenous urography; Benign; Pelvic lesion; Pre-operative

Introduction

The urinary and genital system develop from a common intermediate mesodermal ridge; therefore the anatomical proximity of female urinary and genital tract make the ureter, urinary bladder and urethra vulnerable to injury during gynaecological surgery.

Ureteric injury is one of the most serious complications during major gynaecological and pelvic surgery; the incidence varying from 0.4 – 2.5% for benign condition Drake & Nobel [1]. Obstetric and gynecological surgeries account for approximately 50 % of ureteric injuries Fry et al. [2] Apart from surgical trauma either from difficult surgery or careless surgery, urinary tract is much more liable to be injured with endometriosis, enlarged pelvic tumour, previous pelvic surgery, pelvic adhesion, pelvic inflammatory disease, distorted pelvic anatomy, advanced malignancy, previous radiation Harkki-Siren [3]. Carley et al. [4] reported that the incidence of bladder and ureteric injuries were 0.58% and 0% for vaginal hysterectomy respectively

and the same was 5.13% and 1.71% respectively for obstetric hysterectomy Carley et al. [4].

The pelvic surgeon should have a thorough knowledge and complete familiarity with normal pelvic anatomy. The pelvic pathology must be evaluated by clinical examination and supportive imaging as a preliminary step before any pelvic surgery. The decision to obtain a routine intravenous urogram (IVU) for evaluation of course of ureter before hysterectomy for non-malignant conditions has not been proven till date. No such randomized trial has been conducted till date to prove its application.

Aim and Objective

The aims and objectives of this study were directed to evaluate:

- The involvement of urinary tract in benign and clinically high risk gynaecological conditions requiring surgery.

- b. Whether pre-operative assessment of urinary tract by IVU diminishes the risk of operative injury.
- c. At what circumstances IVU will be justifiable.

Material and Methods

Settings

This study was conducted at North Bengal Medical College, Darjeeling and I. P.G.M.E.R , Kolkata over a period of three years from 1st June, 2007 to 31st May, 2010.

Design

This was a comparative observational study.

Population

The subjects of the study were selected from gynaecological outpatient department of those institutes mentioned above.

A group of 89 women with different benign gynecological conditions requiring surgery who underwent IVU were selected for study group.

Inclusion criteria for this study were as follows:

- a. Abdominal mass corresponding with ≥ 14 weeks size of pregnant uterus
- b. Adnexal mass along with pain radiating from loin to groin.
- c. Acute retention of urine with pelvi-abdominal mass.
- d. All cases of uterine procedentia.
- e. Pelvic retroperitoneal mass requiring surgery
- f. Gynecological lesion associated with urinary tract abnormality detected incidentally by USG or CT scan.
- g. Exclusion criteria were impaired renal function test and hypersensitivity to iodine containing dye and suspected malignant lesions.

Results

Table 1: Age, Parity and Mode of admission.

Characteristic	Control Group(N=87)	Study Group(N=86)	P Value
Age			
Below 20 years	6 (6.89%)	5 (5.81%)	0.9836
21-25 years	16 (18.39%)	18 (20.93%)	0.8188
26-35 years	21(24.14%)	19 (22.09%)	0.8891
36-45 years	17(19.54%)	16 (18.60%)	0.9711
46-55 years	13(14.94%)	15 (17.44%)	0.8104
56-65 years	14(16.09%)	13 (15.12%)	0.9731
Parity			
P0	11(12.64%)	10 (11.63%)	0.9765
P1	13(14.94%)	12 (13.95%)	0.9752
P2	16(18.39%)	18 (20.93%)	0.8188

A cohort of similar number of patients having similar demographic profile and same inclusion criteria were selected for control group for whom IVU was not performed. History taking, clinical examination, pre operative evaluation and work-up were planned. Information regarding age, marital status, fertility and parity were also noted. USG whole abdomen was performed in patients of both groups. CT scan of abdomen was also done where situation demanded. All subjects underwent urinary analysis and renal function assessment. Preoperative IVU findings (in study group) were documented properly. DTPA (Diethylene Triamine Pentacaetic Acid) scan was performed for cases of non functioning kidney detected by IVU. A comprehensive approach for the gynecological and urological surgery was undertaken in consultation with urological surgeon. The site and type of ureteric injuries recognized at operation for both group were recorded.

Intra-operative, post operative findings and complications in relation to urinary tract were recorded for both groups and compared. Primary outcome measure in this study was incidence of urinary tract involvement in benign gynaecological conditions. Secondary outcome measures were incidence of intra-operative and post- operative urinary tract injuries of both groups and to observe whether pre-operative IVU could reduce such complication.

Two patients in study group and three patients in control group later on were found to be suffering from malignant conditions and excluded from result analysis. So 87 in study group and 86 in control group were evaluated and analysed.

Statistical analysis

The data were analysed using Medical Statistical Software Statistical analysis included Chi-square test and 't' test to compare the outcomes between the study group and the control group. A p-value less than 0.05 were considered as statistically significant.

≥P3	28(32.18%)	25 (29.07%)	0.7804
Unmarried	19(21.84%)	21 (24.42%)	0.8242
Admitted Through			
OPD	51(58.62%)	53 (61.63%)	0.8034
Emergency	23(26.44%)	21 (24.42%)	0.8962
Referred from other Dept	13(14.94%)	12 (13.95%)	0.9752

Table 2: Distribution of cases.

Nature of Pathology	Control Group(N=87)	Study Group(N=86)	P Value
Fibroid	32 (36.78%)	34 (39.53%)	0.8292
Endometriosis	17 (19.54%)	16 (18.60%)	0.9711
Broad ligament cyst	13 (14.94%)	11 (12.79%)	0.85
Procedentia	18 (20.69%)	15 (17.44%)	0.726
Chronic PID	04 (4.60%)	05 (5.81%)	0.9873
Ovarian neoplasm	02 (2.29%)	03 (3.49%)	0.9862
Adenomyosis with lower abdominal mass	01 (1.15%)	02 (2.33%)	0.9904

Table 3: Urinary tract abnormalities detected at IVU.

Diagnosis	Ureter Compressed		Ureter Displaced		Hydro ureter		Hydro nephrosis		Ureteric Stricture		Ureteric Involvement No.of cases & percentage	Other findings
	One	Both	One	Both	Unilat	Bilat	Unilat	Bilat	Unilat	Bilat		
Fibroid(n=32)											11 (34.37%)	
Intramural(n=6)	2		2									
Broad ligament(n=8)	2		2									
Cervical (n=4)	1			1								
Subserous (n=8)												
Endometriosis (n=17)											9 (52.94%)	
Endometrioma (n=14)												
Bilateral (n=9)					2		1	1				
Unilateral (n=5)					2							
Ureteric (n=3)									3			
Broadligament cyst (n=13)	2	1	3								6 (46.15%)	
Procedentia (n=18)					1	3	1	1			6(33.33%)	
Chronic PID (n=4)					1		1				2 (50%)	
Ovarian neoplasm (n=2)	1	1									2 (50%)	
Adenomyosis with mass in lower abdomen (n=1)											1	Horse shoe shaped kidney
Uterine fibroid with renal colic (n=32)											2	Ureiteic stone

Patients in both groups were comparable in relation to age distribution, marital status, parity and mode of admission (Table 1). Table 2 shows distribution of cases in both groups which are also comparable. Table 3 showed the diagnosis and urinary tract abnormalities by IVU in the study group. Out of 87 cases, IVU could detect urinary tract involvement in 41.3% case. Two patients with uterine fibroid had renal colic and detected to have calculus in ureter, whereas one case of horse- shoe shaped

Table 4: Surgical treatment undertaken.

Name of Operation	Study Group (N=87)	Control Group (N=86)	P Value
Myomectomy	13 (14.94%)	10 (11.63%)	0.6765
Abdominal hysterectomy	12 (13.79%)	11 (12.79%)	0.9759
Abdominal hysterectomy with bilateral salpingo-oophorectomy	23 (26.44%)	24 (27.91%)	0.9630
Removal of endometrioma	9 (10.34%)	10 (11.63%)	0.9775
Removal of broad ligament cyst	8 (9.19%)	9 (10.46%)	0.8951
Vaginal hysterectomy	18 (20.69%)	19 (22.09%)	0.9688
Ureteral resection & uretero-neo cystotomy	3 (3.45%)	1 (1.16%)	0.6197
Salphingo –oophorectomy	1 (1.15%)	2(2.33%)	0.9904

kidney was seen by IVU in a patient of adenomyosis.

Table 4 depicted the different surgeries performed in both groups which were comparable. Intra-operative and post-operative urinary tract injury had been shown in Table 5 & 6 respectively. In the study group only two patients had intra-operative ureteric injuries whereas in control group five patients sustained ureteric injury.

Table 5: Intraoperative urinary tract injuries.

Type of Injuries	Study Group (N=87)	Control Group (N=86)	P Value	Methods of Repair
Contusion	1 (1.15%)	2 (2.33%)	0.9904	Conservative
Inclusion in ligature	0	1 (1.16%)	0.9973	Excision and end to end anastomosis
Crushing	1 (1.15%)	2 (2.33%)	0.9904	Ureteroneocystostomy
Division	0	0	-	-

Table 6: Urinary tract injuries detected at convalescence phase.

Type of Injuries	Study Group (N=87)	Control Group (N=86)	P Value	Presentation	Management
Division	0	1 (1.16%)	0.9973	Urinoma collection	Drainage of urinoma, then ureteroneocystostomy later
Ligation of ureter	0	1 (1.16%)	0.9973	Pain in loinHydroureter of left side	Ureteroneocystostomy later

Discussion

Several studies have defined the prevalence of abnormal pre-operative IVU in gynaecological conditions. Roden et al. [5] noted 15.3 % genitourinary anomalies in 455 patient undergoing major pelvic surgeries Roden et al. [5]. Scharzt et al. [6] found 13.4% prevalence of genitourinary involvement in their study Scharzt et al. [7]. 14.2% prevalence of genitourinary abnormality was reported for all type of gynaecological surgery by Klissaristos et al. [8] whereas Piscitelli et al. [10] in retrospective review found 27% abnormal finding in pre-operative IVU Klissaristos et al. [8]; Piscitelli et al. [10]. Our finding was 41.37% in study group and was higher; this might be due to inclusion of selected cases like pelvic mass more than 14 weeks and referred cases and also routine IVU was not used as a diagnostic tool.

Large intramural leiomyoma occupying above the pelvis, broad ligament fibroid and cervical fibroid had caused compression and displacement of ureter in 34.37 % in our study. In a retrospective study at Duke university medical center the authors reported 20% prevalence of ureteral dilatation and 10% of ureteral deviation by uterine size 12 weeks or larger. Larger fibroid above pelvic brim causing obstruction had been disputed in a study which showed only significant obstruction in only 9 cases out of 598 patients with fibroid of all sizes Buchsbaum & Schmidt [11]. Ureteral obstruction by extrinsic compression is reported by large pelvic tumour most commonly leiomyoma Thompson [12]. Intra-ligamentary fibroid is relatively fixed and because of their position can cause ureteral displacement and obstruction Barnik & Cardizo [13]. Once the pelvic mass has

been removed the radiography changes rapidly revert to normal Barnik & Cardizo [13]. Our study conform to these studies.

Marked dilatation of ureter and hydronephrosis had been reported when complete uterine procidentia had been chronic over many years. We had noted hydroureter and hydronephrosis in 33.33% of patient in our study group; most of them were long standing for five years or more. Rudin et al. [14] studied 95 patients with uterine prolapse and found 7% prevalence of hydro-ureteronephrosis Rudin et al. [14]. Jones and Evison reported a huge 66% prevalence of ureteral dilatation in patient with sever procidentia Jones & Evison [15]. Third degree prolapse with 17 % hydroureter was noted in a study at Duke University medical center Piscitelli et al. [10] The prevalence of mild, moderate and severe hydronephrosis with pelvic organ prolapse were detected in 4%, 2.8% and 0.9% of subjects respectively by Beverly et al in a study of 375 patient of genitor urinary prolapse Beverley et al. [16]. The obstruction is usually relieved by surgical correction Thompson [17]. The true incidence of urinary complication with endometriosis is neither known nor all sufferers were fully urologically investigated. We observed 34% of the patients of ovarian endometriosis had ureteric dilatation and hydronephrosis. Thomson and Schroder suggested that it is important to consider urinary tract involvement in all cases of severe endometriosis Thomson & Schroder [12]. To date over 100 cases of ureteral involvement by endometriosis had been reported. About 25% kidney are lost when endometriosis obstruct the ureter Moore et al. [18]. Prevalence of 18% ureteral dilatation patients was reported out of 16 patients Piscitelli et al. [10]. It is recommended that routine IVU or ultrasound follow up after treatment of endometriosis is required Miller & Morgan [19]. In extrinsic involvement the ureter becomes compressed by endometriosis originating at broad ligament or ovary. In intrinsic involvement the endometriotic implant arises within ureteric wall and some portion of ureter has to be resected Barnik & Cardizo [13]. In our study three such cases were observed and ureteroneocystostomy was done in the study group.

Chronic Pelvic inflammatory disease with adenexal mass had caused hydroureter and hydronephrosis in 2 out of 4 cases in our study group. In one study preoperative IVU in 44 patients with tubo-ovarian abscess, ureteral dilatation & deviation were observed in 30% and 36% patients respectively (Phillips, 1974). In another similar study, out of 34 patients of PID with adenexal mass, 21% had ureteral dilatation and 9 % had deviation Piscitelli et al. [10]. In our series out of 4 cases of PID, two had hydroureter.

Large ovarian neoplasm, can cause pressure effect on the ureter leading to obstruction, as they tend to be cystic and mould to the contour of the pelvis Barnik & Cardizo [13]. The incidence of benign tumour causing ureteral obstruction was 57.8% in the same study. We noted in two patients of ovarian tumour had caused ureteric compression in our study.

In our study group two patients had intra-operative ureteric injury of which one had contusion of ureter in a case of central

cervical fibroid and another had crushing injury in a case of pelvic inflammatory disease with tubo-ovarian mass. They were managed conservatively and by uretero neocystostomy respectively. There was no unrecognized urinary injury in this group during operation. In the control group a total of five cases had different types of ureteric injuries during operation which include contusion, inclusion in a ligature and crushing injury. In two cases of huge broad ligament cyst we had crushing injuries of ureter which were managed conservatively. Ureter was included in the ligature in a case of central cervical fibroid which was detected during the operation and treated by excision and end to end anastomosis. In two cases of bilateral endometrioma of ovary with gross pelvic adhesion, ureter of left side were crushed and managed by uretero neocystostomy.

Ureteric injuries were recognized during convalescence in two patients of control group but none in the study group. In a case of severe pelvic inflammatory disease with tubo-ovarian mass, ureter was devided in its lower part and patient developed urinoma which was managed by drainage of urinoma and later by ureteroneocystostomy. In another case of severe endometriosis, left ureter was involved in the ligature and ureteroneoureterostomy was performed later.

Numerous studies reported the frequency of ureteric injury related to hysterectomy. Not a single study conclusively stated whether a preoperative IVU reduces the risk of injury. To evaluate the role of pre-operative IVU in preventing preoperative ureteric injury, Seek compared a group of 70 patients undergoing abdominal hysterectomy with pre-operative IVU with a group of 260 patients without pre-operative IVU Seek, [20]. The author concluded that he had failed to prove that pre-operative IVU helped to prevent urinary tract injury during abdominal hysterectomy as there was one ureteral injury identified in non IVU group.

The study of Piscitelli et al. was limited by small sample size and methodologically retrospective Piscitelli et al. [10]. But in a different study²² the authors pointed out that routine pre-operative IVU was not cost effective, as 833 patients had to undergo IVU to prevent a single ureteric injury Schwenzer & Beek [6]. These authors suggested abnormal finding in clinical & physical examinations will be taken into account for selectively perform IVU to decrease cost and adverse reaction of IVU.

Conclusion

It is evident from our study that IVU can detect urinary tract abnormality in large number of patients in comparison to control group; the information available to gynaecologist help him/her to take steps to either prevent or detect ureteric injury during operation.

Moreover pre-operative IVU has got medico-legal importance as stated by a group of worker Schwenzer & Beek [6,21]. Damage to the efferent urinary passage during abdominal or vaginal hysterectomy cannot always be prevented no matter how careful one may proceed pre-operatively and intra-operatively. However

all possibilities of avoiding complication or at least recognizing and eliminating these before surgery, must be explored especially in high risk cases using IVU and other supportive investigations.

The effectiveness of pre-operative intravenous urography in preventing intra-operative ureteral injury will continue to remain debatable unless a large prospective randomized controlled trial is carried out.

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