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Efficiency of combined retrograde urethrography and anterograde cystourethrography procedures in the diagnosis of voiding difficulties

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Abstract
Combined retrograde urethrography and micturition cystourethrography (RGU/MCU)) are fluoroscopy-guided radiological imaging procedures that involve the use of X-ray ionizing radiations to diagnose lower urinary tract pathologies. Patients presenting urological conditions may be required to undergo combined RGU/MCU procedures. Our research emphasized combining both RGU and MCU procedures in evaluating pathological conditions, anatomical changes, and landmarks of the lower urinary tract and the effectiveness of combined procedures. Referring to existing research articles and data collected onsite from MMDU Super Specialty Hospital we found strain micturition, stricture urethra, BEP, and urgency to have been mostly complained indications, other presented indications including nocturia, partial and complete urinary retention, trauma, incontinence, frequent urination, hematuria, and other lower urinary tract symptoms (LUTS). At the end of this study, it was found that abnormal reports were 16 patients with a percentage of 45.71% while normal patients were 19 with 54.29 % however some patients' reports appeared normal while they claimed to have lower urinary symptoms, this is presented by smaller interval difference between normal and abnormal. Lower urinary tract anatomical changes highlighted included changes in urinary bladder shape, outline and capacity, dilatation of ureters, and change in urethra shape, outline, and caliber, however future study with multi-imaging and clinical correlations is recommended for exact evaluation.

Keywords: Urethrography, Fluoroscopy, Retrograde Technique, Urography

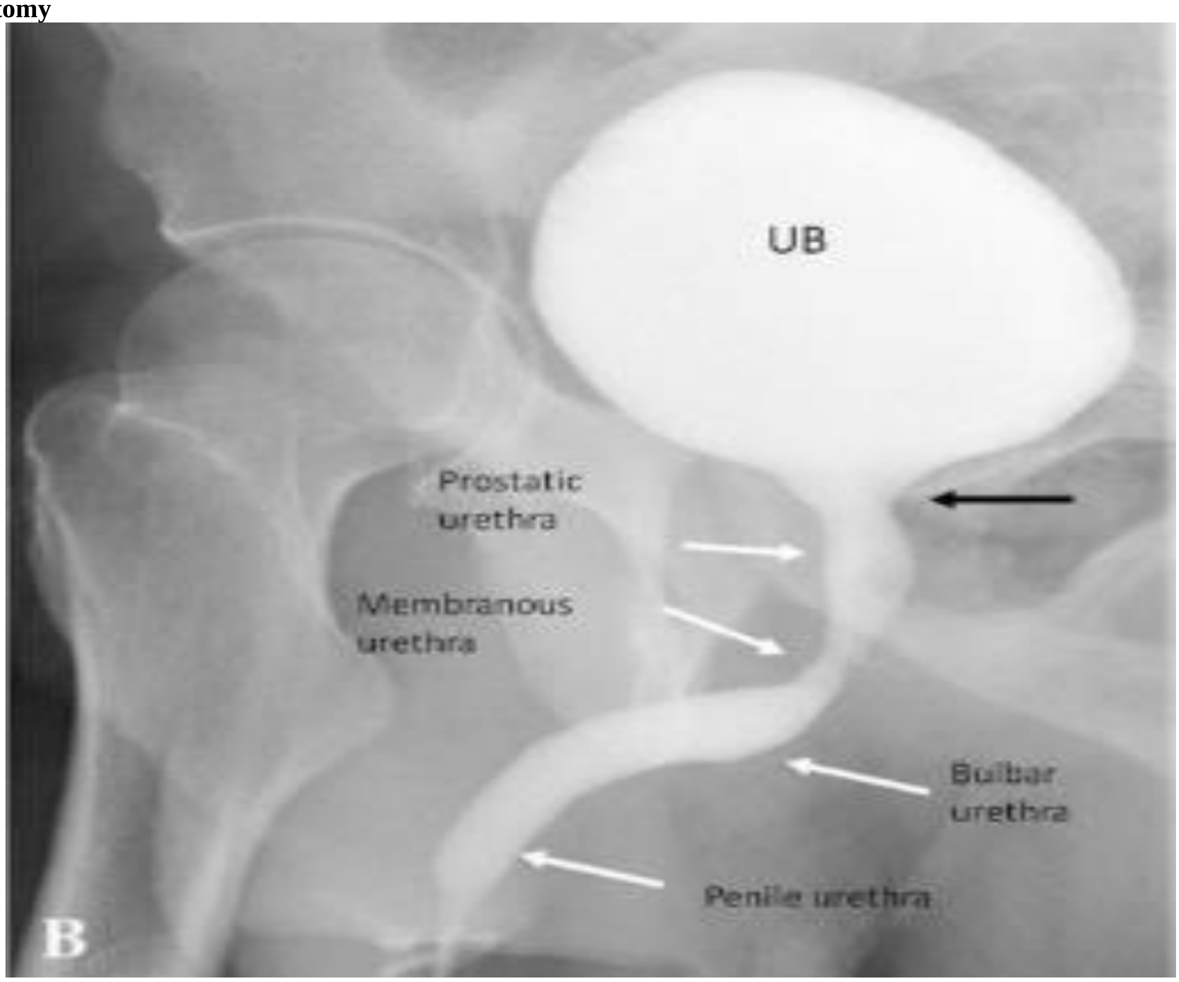
Introduction

Combined retrograde urethrography and anterograde cystourethrography (RGU/MCU) radiological imaging procedure of the male lower urinary tract is primarily significant for the demonstration of both anatomy and pathology related to the voiding difficulties and lower urinary tract symptoms [1]. Voiding difficulties as the main indications of RGU/MCU describe the lower urinary tract symptoms including both storage symptoms and micturating symptoms. Storage symptoms include nocturia, partial and complete urinary retention, urgency micturition, incontinence, and frequent urination. Micturating symptoms include dysuria, hesitancy, poor urine flow like reduced dribbling flow, and strain micturition [2]. Voiding difficulties as one of the indications of combined RGU/MCU procedure are observed during the micturition cycle which involves both the storage phase; where urine from the upper urinary tract is temporal stored in the urinary bladder, and the voiding phase; contraction of muscles of the urinary bladder and relaxation of urethra sphincters result in micturition [3].

A combination of RGU/MCU procedures is mostly performed to demonstrate pathologies of the urinary bladder and urethra such as urinary bladder diverticula, vesicoureteral reflux, urethral narrowing, urethra trauma, foreign bodies in the urethra, urethra fistula, diverticula, mucosal tumors, both complete and incomplete urethra obstruction[4][5]. Uroflowmetry test as a procedure test performed before the RGU/MCU procedure, significantly

shows urine flowrate during micturition, maximum flow rate Qmax, voided volume, and post-void volume. The mean flow rate is normally≥10ml/s while the maximum rate is ≥15ml/s. post-void residual volume ≤ 100ml means that urine flow rate value ≥10ml/s and post-void residual volume
≥100ml are abnormal and related to voiding difficulties [6]. Combined RGU/MCU is recommended to diagnose voiding difficulty-related pathologies in patients showing low voided volume, abnormal flow pattern, and maximum flow rate Q-max less than 15ml/s [7][8].

Anatomy



Knowledge of the anatomy and physiology oflower urinary tract parts, their neurologicalcoordination, and defects is crucial for the diagnosis of voiding difficulties. The anatomy of the male lower urinary tract comprises of urinary bladder for the temporal storage ofurine, and the urethra for the pass out of urine.The urinary bladder as a smooth muscle sac, consists of outer and inner longitudinal muscles and middle circular muscles that collectively form detrusor muscle, internally lined by a mucosa membrane. The urinary bladder possesses an apex, body, fundus(base), andneck, with 3 surfaces; superior, and 2 inferolateral surfaces.

The urinary bladder has endopelvic fascia, a ligament that holds the urinary bladder to the pelvic side walls. Anteriorly it is made by the pubovesical and puboprostatic ligaments that hold the bladder neck in the normal position. The rectovesical ligament is possessed from the bladder base toward the lateral rectum. The urinary bladder when empty shows the shape of a flattened tetrahedral. The ureter's orifices and internal urethra opening connect to the posterior wall of the urinary bladder to form a triangular smooth region named trigone. The urinary bladder is positioned in the pelvic cavity, but in infants, it is located in the abdominal region until puberty. The male urethra is a muscular hollow shape controlled by 2 valves: internal and external sphincters. The normal average sizeof the urethra is 16 to 20cm in length and 6-8mm wide. It is divided into two portions, a short 5cm posterior urethra, further parted into the prostatic urethra 3cm long and membranous urethra 2cm long, and a long anterior urethra 16cm parted into a short curved proximal bulbar urethra and a long distal penile or spongy urethra [9][4][10].

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Physiology

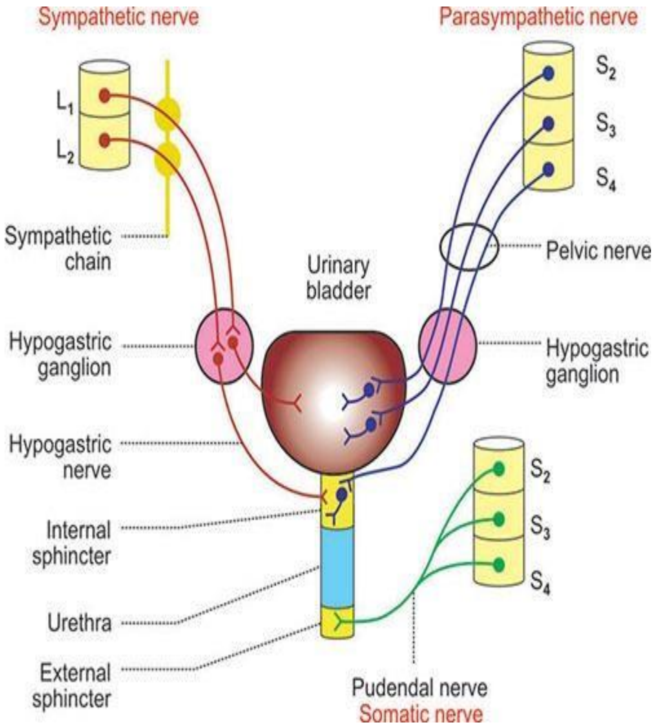


Figure1: Nerve supply of lower urinary

Lower urinary tract physiology includes the coordination of muscles, nerves, and reflex arc, which facilitate the storage and emptying phases of the urinary bladder. At the beginning of the filling phase, the parasympathetic nervous system is inhibited. As urine fills into the urinary bladder, the pressure receptors located in the wall of the urinary bladder are stimulated and send impulses to the hypogastric ganglions located in the wall of the urinary bladder and internal urethra sphincter through hypogastric and pelvic nerves.
Stimulation of these ganglions results in the relaxation of the bladder and contraction of internal sphincters hence filling phase is initiated. The impulse for voiding is triggered by thefilling of the bladder up to 400ml, which exerts pressure on the wall of the urinary bladder, stimulating stretch receptors found in the wall of the urinary bladder, which result in the generation of sensory impulses that carried through the parasympathetic nervous system (pelvic nerve) through the s2,3,4 sacral segments of the spinal cord to the facilitatory region located in the midbrain called pontine micturition center, PMC which induce a desire to micturate. This desire to empty the bladder from the cerebral cortex goes to the sacral segment leading to thestimulation of efferent parasympathetic fibers which pass through the pelvic nerve and causecontraction of the detrusor muscle and relaxation of the internal sphincter and the center in thebrain controlling external sphincter inhibited resulting in the emptying of the bladder [9][11].

Etiology

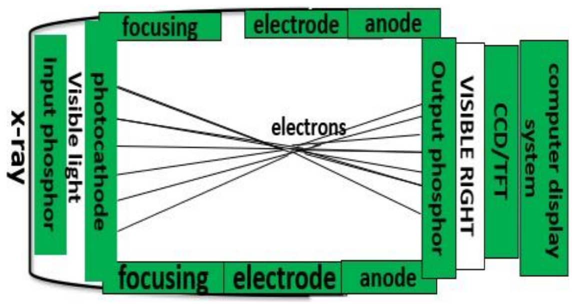
The alteration in structure and coordination of anatomical, and physiological components ofthe lower urinary tract with their vascular and neurological structures is the main cause of voiding difficulties. They are a broad range of etiology of voiding difficulties due to the wide anatomy of the lower urinary tract but the most known causes are benign prostate hyperplasia, prostatitis, urinary bladder defects such as both benign and malignant urinary bladder tumors, bladder diverticula, and diverticulitis, chronic cystitis lower urinary tract stones, lower urinary tract neurological disorders and urethra defects such as narrowing due to fibrosis, chronic urethritis, trauma, and urethra fistula. The risk factors of voiding difficulties are related to thedefect in structural and functional components of the lower urinary tract and these include age, diet, physical exercise, diabetes mellitus, depression, both physical and mental disorders, medication, and diuretics[12].

Fluoroscopy machine

RGU/MCU procedure is performed with imaging guidance of fluoroscopy imaging modality. In radiology medicine,fluoroscopy uses continuous productionand detection of X-ray radiation to givea real-time image of the human body. Theinvention of X-rays in 1895 by WilhelmConrad Roentgen was the cornerstone ofthe invention of the fluoroscopy techniqueby Sir Thomas Edison in 1896 which hasbeen used in medical imaging modalities. After the invention of this technique,remote fluoroscopy was introduced inmedical imaging which has been replaced by computed fluoroscopy which uses a photostimulable phosphor imaging plate as an image receptor. Digital fluoroscopy machines which use digital X-ray detectors and photoelectronic image receptors are currently used to produce digital X-ray spot images and real-time images [13].

Figure 2: fluoroscopy unity

Figure 3: Image intensifier tube



The main functional unity of fluoroscopy is the **image intensifier tube**. The function of an image intensifier tube is to convert x-ray photons into visible right which is further converted into an electrical signal by a charged coupled device CCD and digitized by analog to digital converter ADC to form a digital signal that is processed, displayed, and stored by computer display and storage system [14]. Digital fluoroscopy is a modern fluoroscopy machine made up of four main components: an X-ray generator, an X-ray tube, an X-ray detector system, and a computer display

system. Other accessories of digital fluoroscopy include automatic exposure control AEC, automatic brightness system ABS, fluoroscopic table, control panel, and positive beamlimiting device. The fluoroscopy generator uses a transformer and set of rectifiers to provide suitable voltage to the x-ray tube required to produce x-rays. The high-frequency generator that converts AC into DC at very high frequencies up to 100 MHz is used in fluoroscopy to provide constant potential with a low ripple factor of less than 2%.
A specialized X-ray tube that uses water or oil as coolants to dissipate heat is used.
It is composed of a tungsten filament as a cathode to produce electrons which are acceleratedby the high voltage to bombard the tungsten anode resulting in the bremsstrahlung beam of x-ray radiations. The control panel is one of the main parts of the fluoroscopy machine, it has multiple buttons that allow selection and variation of exposure parameters such as KVP, mas, exposure time, and other functions including controlling movement of the x-ray tube, collimator, and x-ray table. Radiation exposure depends on three main factors; mas, KVP, and exposure time, which determine the amount of exposure a patient will receive during the procedure. In the digital fluoroscopy unit, all exposure factors are adjusted and set with the help of automatic exposure control and automatic brightness control.

Automatic exposure control also known as a photo timer is mostly used in digital fluoroscopy machines for terminating exposure after reaching predetermined exposure parameters, whereas automatic brightness control ABC, controls the intensity of light being emitted from the output phosphor to set the overall brightness of the image. Fluoroscopy images are captured faster and stored in **picture archiving and communication systems**, PACS so that they can later be reviewed and manipulated. Image display and storage systems consist of computer networks and image processing algorithms that receive digital signals and allow post-image processingwhich can be further printed and stored.
PACS is a digital computer network algorithm used in radiology imaging to acquire, process, share, and archive digital images produced by radiology imaging modalities. Different X-ray film printers are used to produce hard copies of X-ray radiography**. Laser film printers** acquiredigital shared by PACS in the form of DICOM format (digital imaging and communication in medicine). A laser camera, a main component of laser film printer, converts digital signal into visible images which are printed on digital laser x-ray films[15][16].

Aim and objectivesAims
The efficiency of combined retrograde urethrography and anterograde cystourethrography procedure in the diagnosis of voiding difficulties.

Objectives
1. Evaluating the effectiveness of combined retrograde urethrogram to diagnose pathologies related to voiding difficulties.
2. Evaluating anatomical changes and landmarks enhanced by combined retrograde urethrogram and anterograde cystourethrogram in patients representing voiding difficulties
3. Evaluating the efficiency of retrograde urethrogram and anterograde cystourethrogram to demonstrate voiding difficulty-related pathology in patients with abnormal uroflowmetrytest results

Literature review
1. The retrospective study published in the **American Journal of Radiology** in 2023 done by
M.M Elsingergy *et al* in the Department of Radiology, children's Hospital of Philadelphia whose objective was to review the indications, methods, and diagnostic efficiency of RGU, enrolled 180 young male patients of under 18 years. The most complaints presented were post- surgical, trauma, and stricture. RGU/MCU procedure done from 2010-2020 by aseptic instilling of water-soluble iodinated contrast media into the urethra and urinary bladder through foley catheter and patients were instructed to void after filling of the urinary bladder. Fluoroscopic images and videos were recorded during the instillation and voiding of contrastmedia and the report was made. This study has shown that RGU has a high sensitivity of 89% and specificity of 94% for the diagnosis of lower urinary tract pathologies however this studycould not explain why 83 cases (48% of total cases) presented RGU indications were reportedas normal. The study also reported 2 studies that showed false positive urethra stricture and on evaluation with MCU, one was normal and another was posterior urethra valve. This study also reported 4 false negative urethra strictures approved by further imaging of urethroscopy and MCU. This study concluded that RGU has a high diagnostic accuracy of anterior urethra pathology however MCU is the cornerstone for evaluating posterior urethra pathologies[17].

2. Another prospective study authored by **Y. Osman, *et al***, and published by the **American Association of Urology** in 2006 done at the urology department, urology & Nephrology Center, Mansoura University, Mansoura, Egypt had the objective of comparative evaluation of the efficiency of RGU and magnetic resonance urethrography

for evaluation of male urethra stricture have enrolled 20 male patients for follow up of urethra stricture by RGU and multiformat MR urethrography. During this study, RGU/MCU was efficient in visualizing urethra stricture, and with the help of PACS, the length of strictures was able to be measured however the length of stricture was not consistent with magnification and stretching. The study also reported the inability of RGU/MCU to highlight some pathologies causing strictures such as spongiofibrosis, posterior urethra distraction defect (PDDU), and likely miss small tumors.2 negative urethra strictures were also reported. [18].

Method and materialsStudy design
A descriptive study was carried out for research purposes.
Study place
The planned study was carried out in the radiology department of Maharishi Markandeshwar Institute of Medical Sciences and Research, Department of Radiodiagnosis.
The study was approved by the heads of the radiology department and done under the supervision of the radiology department teaching staff.

Subject to be investigated
35 male patients presented voiding difficulties indications enrolled for combined RGU/MCU procedure performed by use of digital fluoroscopy imaging modality.

Methods
A combined RGU/MCU procedure was performed using a digital fluoroscopy radiologyimaging modality.

Procedures of measurement
Data collected was collected, analyzed, and described by using statistical methods of dataanalysis.

Instruments for procedure
- Digital fluoroscopy unit
- Iodinated water-soluble contrast media
- F8 balloon catheter
- F6 balloon catheter
- Cannula
- Antiseptic solution
- Fluoroscopy unit control panel
- Contrast media
- Radiation protection lead apron andthyroid shield
- Sterile gauze pads and swabs
- Sterile gloves
- Computer display with PACS
- x-ray films
- Hospital gown
- Normal saline
- Emergency drugs
- Procedure tray
- Laser film printer
- Local anesthesia lubricating gel

Methods of data collection
- history collected from patient file
- Uroflowmetry test performed in eligible patients
- Observable complications during the procedure were recorded
- Radiograph film was printed and reported by radiologists and findings were recorded

Study variables
Demographic: according to age group, patient condition, use of radiation protection devices, and medical staff about radiation.

Duration of study: 10 months
Sample size
The study population includes 35 male patients and medical professionals who performed theprocedure.

Inclusion criteria
- Male patients
- OPD patients
- IPD

Exclusion criteria
- Female patients
- Uncooperative patients
- Medico-legal cases
- Unconsented patients

Patient preparation
Patients were explained about the procedure, expected significance, and possible complications. The informed consent form was signed and questions related to the procedurewere addressed. Patients were instructed to change clothes and wear hospital gowns. All possible wearables that can cause artifacts were removed and kept.

Procedure
The patient lay on the fluoroscopy table in posterior oblique projection and the anatomy of interest and surrounding parts were antiseptically cleaned. Plain film radiography was recorded and contrast media was administered in the urethra through the lubricated catheter with image guidance of real-time fluoroscopy images.
In patients with narrow urethra, a cannula and feeding tube were used to administer contrast media. After a full filling of the urinary bladder, a cystogram radiograph was taken. The patient was instructed to empty the bladder while positioned in an erect posterior oblique projectionand the flow of contrast media was recorded on real-time fluoroscopy. In patients whose suprapubic catheter SPC was placed in situ, and with severe narrowing urethra, contrast wasadministered through SPC. After complete emptying of the urinary bladder, post-voiding radiography was recorded. After the procedure, the patients were advised to drink plenty of water for the elimination of contrast media and monitored for possible post-procedure complications [5][19][20].

Data analysis

Age group data distribution

AGE GROUP	NUMBER OF PATIENTS	PERCENTAGE
11-20	6	17.14
21-30	5	14.29
31-40	3	8.57
41-50	6	17.14
51-60	5	14.29
61-70	7	20.00
71-80	3	8.57
81-90	1	2.86

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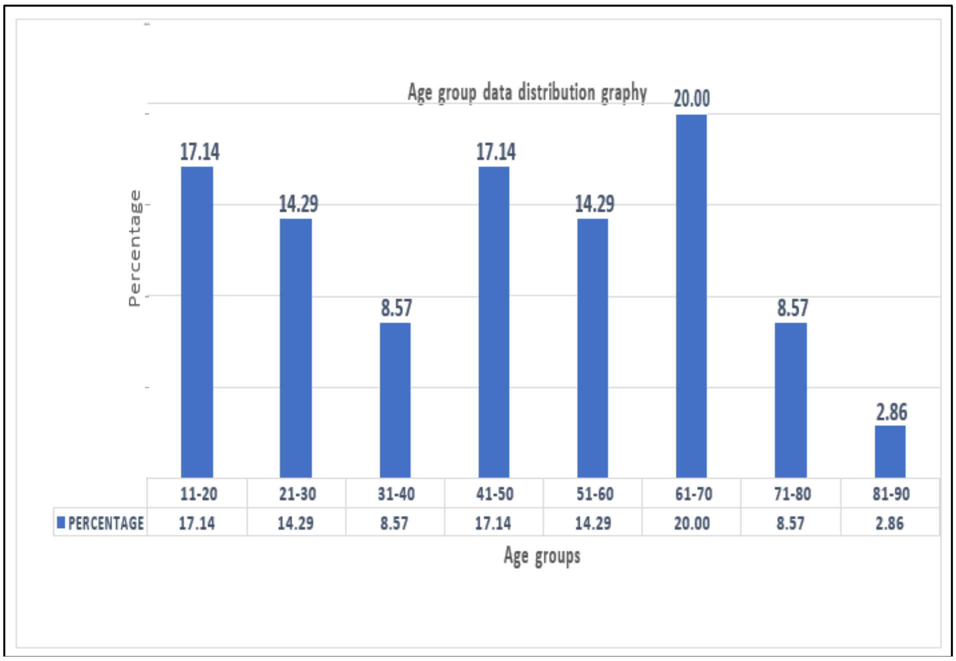

Age group data distribution analysis

The ages recorded range from 11 to 90 years where the minimum and maximum age were 14and 84 respectively. The analyzed statistical data are grouped into 8 sets by the range of 10. According to the age data collected, the first set ranges from 61-70 years which holds a maximum patients of 7 with 20.00%, the set of 11-20 and 41-50 contains 6 patients for each with percentages of 17.14% consecutively, the set of 51-60 holds 5 patients which contributes 14.29%, the groups of 31- 40 and 71-80 both hold 3 patients with 8.57% consecutively whilethe lowest set is 81-90 years which contains a single patient and with a percentage of 2.86%.

Clinical indications data distribution

INDICATIONS	NUMBER OF PATIENTS	PERCENTAGE
Strain micturition	15	18.29
pain	1	1.22
BOO	3	3.66
LUTS	11	13.41
SPC insitu	2	2.44
stricture urethra	7	8.54
intermitency	2	2.44
nocturia	4	4.88
urgency	5	6.10
acute urinary retension	4	4.88
BEP	7	8.54
burning micturition	1	1.22
scrotal wall abscess	2	2.44
distended UB	3	3.66
penile fistula	1	1.22
abnormal UFR results	4	4.88
hematuria	1	1.22
trauma	1	1.22
chronic UTI	2	2.44
cystitis	2	2.44
frequency	4	4.88

Indications of 35 patients were recorded. Some patients claimed to have more than one indication, meaning that one can be seen in more than one patient. Strain and LUTS were highly recorded with strain micturition seen in 15

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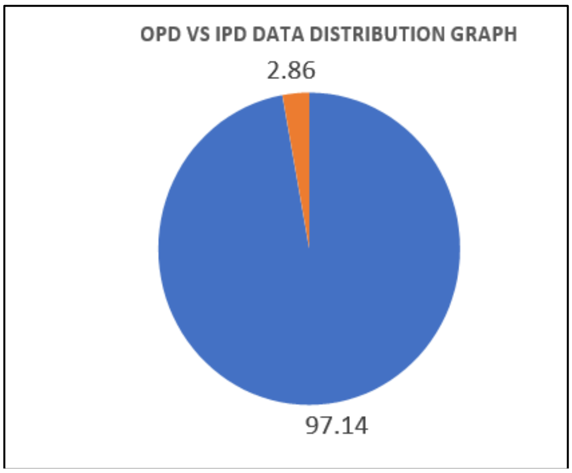
at a rate of 18.29% and LUTS in 11 patients at a rate of 13.41respectively. Strictures and BEP are indicated by 14 patients, with 7 patients each, accounting for 8.54% each. Urgency was seen in 5 patients, making up 6.10%. 4 patients, constituting 4.88% each, exhibited acute urinary distention, nocturia, frequency, bladder outlet obstruction BOO, and distended urinary bladders were seen in 3 patients each, corresponding to 3.66% each. Chronic UTI, cystitis, scrotal wall abscess, intermittency, and SPC were seen in 2 patients each, with a corresponding percentage of 2.44%. Pain, burning micturition, penile fistula, hematuria, and trauma were indicated by 1 patient each with a rate of 1.22% each.

OPD vs IPD data distribution

ADMISSION	NUMBER OF PATIENTS	PERCENTAGE
OPD	34	97.14
IPD	1	2.86

OPD VS IPD DATA DISTRIBUTION GRAPH



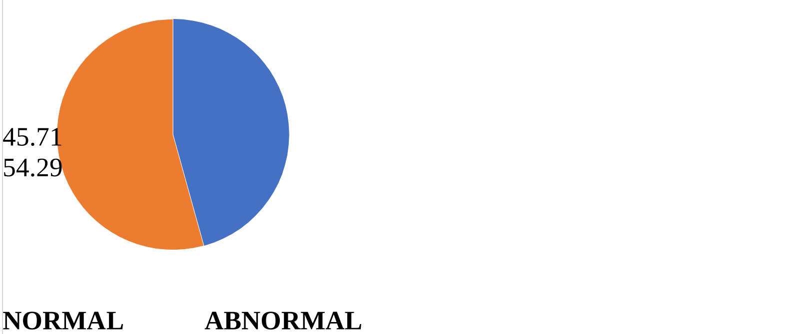
OPD VS IPD data distribution analysis

Both in and outpatients were involved in our research study, and the number of OPD patientswas considerably higher than IPD patients. Recorded OPD patients were 34 in total at a rate of 97%, and only 1 IPD patient was present during our research study with a rate of 2.86%

Normal vs abnormal radiology report data distribution

REPORTS	NUMBER OF PATIENTS	PERCENTAGE
NORMAL	16	45.71
ABNORMAL	19	54.29

NORMAL VS ABNORMAL DATA DISTRIBUTION GRAPH

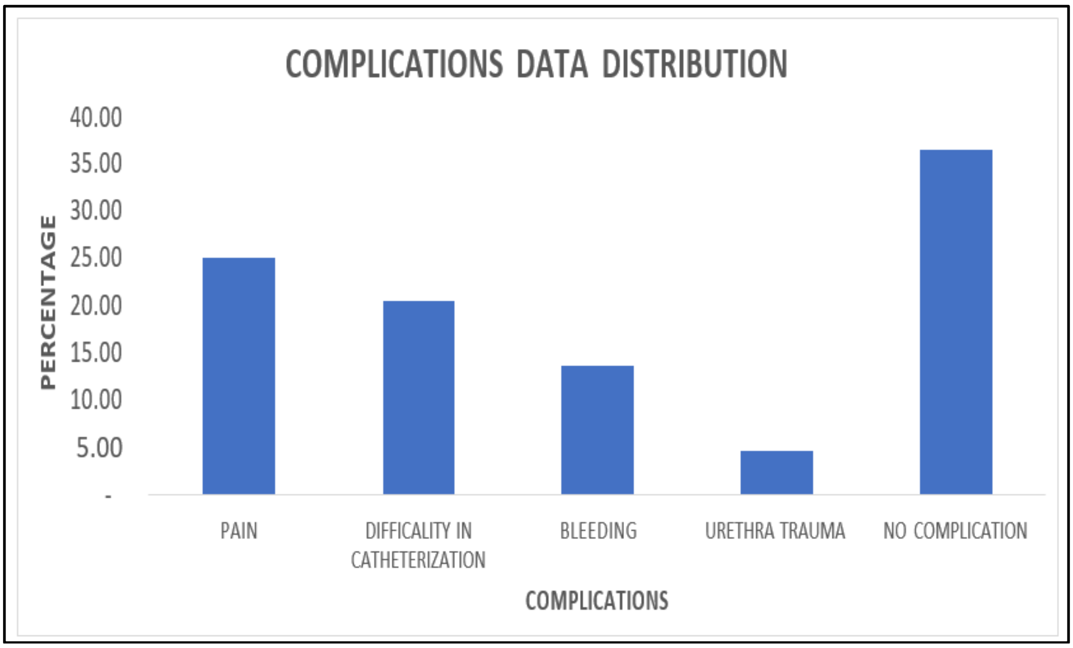


Normal vs abnormal report data distribution analysis

During our research study, both normal and abnormal reports were recorded, patients with normal report studies were 16 in total at a rate of 45.71% and patients with abnormal reportstudies were 19 at a rate of 54.29%.

Complications data distribution

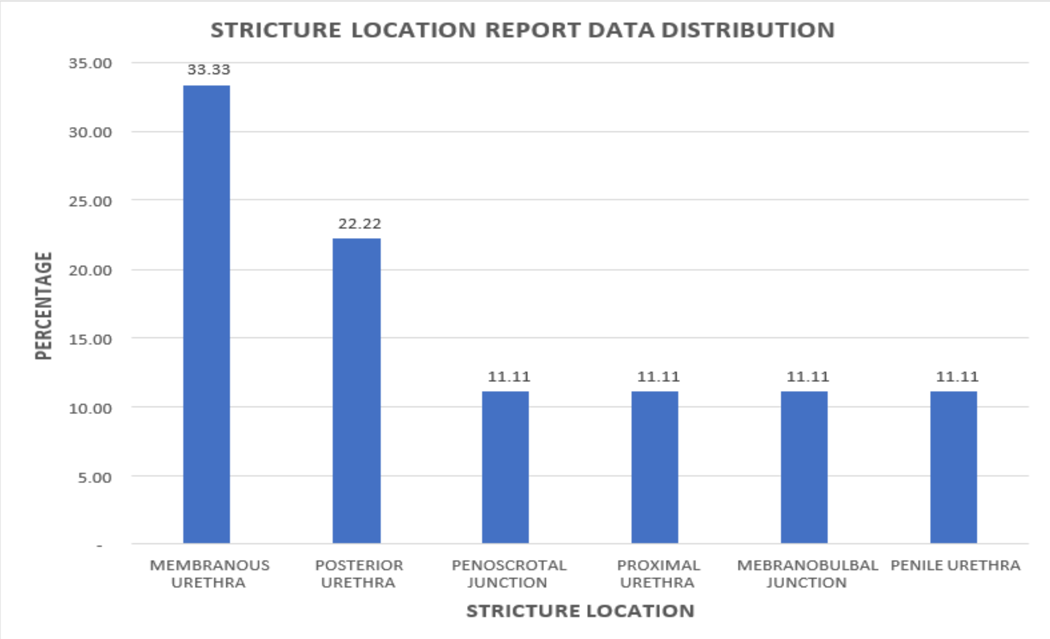
COMPLIICATIONS	NUMBER OF PATIENTS	PERCENTAGE
PAIN	11	25.00
DIFFICULITY IN CATHETERIZATION	9	20.45
BLEEDING	6	13.64
URETHRA TRAUMA	2	4.55
NO COMPLICATION	16	36.36



In a study of 35 patients, only 19 had complications. The most common complication reported was pain, seen in 11 patients with 25.00%, difficulty in catheterization shown by 9 patients of20.45%, while 6 patients (13.64%) had bleeding and 2 patients of 4.55% had urethral trauma, a rare complication. Meanwhile, 16 patients had no complications.

Stricture location data report distribution

STRICTURE LOCATION	NUMBER OF PATIENTS	PERCENTAGE
MEMBRANOUS URETHRA	3	33.33
POSTERIOR URETHRA	2	22.22
PENOSCROTAL JUNCTION	1	11.11
PROXIMAL URETHRA	1	11.11
MEBRANOBULBAL JUNCTION	1	11.11
PENILE URETHRA	1	11.11

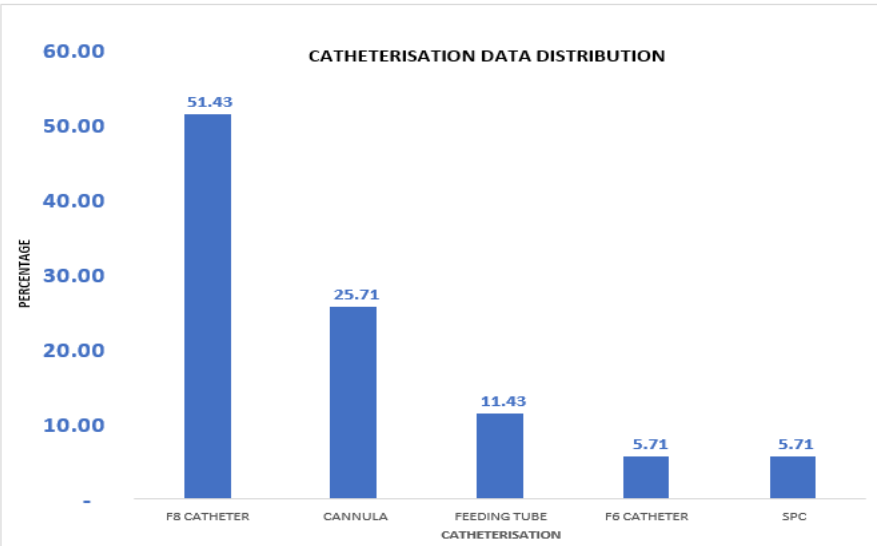


Stricture location data distribution analysis

The urethra narrowing location appeared in 9 patients during our research study. According to data collected urethra narrowing appeared more in the middle section of the urethra which isknown as the membranous urethra at a rate of 33.33%, posterior urethra narrowing was the second most reported urethra narrowing location observed in 2 patients at a rate of 22.22%, penoscrotal junction narrowing, proximal urethra narrowing, membrano-bulbo junctionnarrowing, and penile urethra narrowing were reported at same rate of 11.11% each, by 4 patients in total and they were least observed urethra narrowing location.

Catheterization data distribution

CONTRAST ADMINISTRATION MODE	NUMBER OF PATIENTS	PERCENTAGE
F8 CATHETER	18	51.43
CANNULA	9	25.71
FEEDING TUBE	4	11.43
F6 CATHETER	2	5.71
SPC	2	5.71



Catheterization data distribution analysis

Different modes of contrast administration were used during data collection depending on the patient's condition, during our research study contrast media was mostly administered using an f8 catheter at a rate of 51.43% by 18 patients, the second most used mode of administration was cannula at a rate of 25.71% by 9 patients, a feeding tube was also used at a rate of 11.43% by 4 patients, and both f6 catheter and supra pubic catheter were used at the same rate of 5.71% each by 4 patients in total.

Radiology report	**Number of patients**	**Percentage**
Normal study	16	34.78
Urethra stricture	9	19.56
Urinary retention	7	15.21
Contrast media extravasation at the urethra	5	10.86
Bladder diverticula	2	4.34
Dilatation of prostatic urethra on MCU	1	2.17
Cystitis	1	2.17
Dilatation of bulbarurethra	1	2.17
Beaded urethra	1	2.17
Irregular lobulated urinary bladder	1	2.17
Urethritis	1	2.17
Severe bilateral VUR	1	2.17

Uroflowmetry test results vs radiology report data distribution

Radiology report	Flow rate(ml/s)	Voided volume	Uroflowmetry test impression
Normal	18.6	317	Insignificant
Dilation of prostatic urethra	3.5	154	Significant
Normal	3.5	413	Significant
Beaded urethra	11.7	167	Insignificant
Posterior urethra narrowing	6.6	4.1	Significant
Extravasation at Bubo-penile junction	3.6	206	Significant
Urinary retention	5.5	177	Significant

In this study of 35 patients, a uroflowmetry test was done only on 7 eligible patients to examine urine flow. Urine flow rate and voided volume data were recorded and classified such that urine flow rate and voided volume below 10ml/s and 100ml are clinically significant. Uroflowmetry test results were analyzed in comparison to the radiology report. Significant uroflowmetry results were seen in 4 patients whose pathology radiology reports of dilatation of prostatic urethra, posterior urethra narrowing, extravasation at the bubo-penile junction, urine retention, and 1 normal radiology report patient. Insignificant uroflowmetry results were seen in 2 patients; one whose radiology report of beaded urethra and another of normal study.

DISCUSSION

The age distribution of indications showed some results similar to the review of literature, however, in the reviewed literature, benign enlargement of the prostate was not highly reported since the research involved young age patients [17]. In 35 patients ranging from 11 to 90 years, The youngest patient was 14 years old, and the oldest was 84. The age distribution was categorized into 10-year intervals, with the highest number of 7 patients in the 61-70 age range, where many patients showed indications of Benign Prostatic Hyperplasia (BEP). The 11-20 and 41-50 age ranges had 6 patients, with many showing indications of Lower Urinary Tract Symptoms (LUTS). The 71-80 and 81-90 age ranges had the fewest patients, with 3 and 1 respectively, likely life expectancy. Indications were described based on either suspected pathology or the range of symptoms presented by patients. LUTS was used for patients experiencing voiding difficulty symptoms. Strain micturition was the most common indication, exhibited by 15 patients (18.29%).

Other prevalent indications included LUTS in 11 patients (13.41%), and both urethral stricture and BEP in 7 patients each (8.54%). The trend in indications is related to age, underlying pathology, and clinical history. According to admission distribution, 34 (97.14%) were admitted to the outpatient department (OPD) patients, and 1 patient (2.86 %) was admitted tothe patient department (IPD). This variation is because most diagnosed cases did not require surgical interventions, except for one OPD patient who had a penile fistula and a scrotal wallabscess. The literature review highlights the presence of urethral narrowing, focusing on itslocation and length, which provides valuable insights into its implications. Our research indicates significant urethral narrowing, characterized by specific locations, dilatation, sizevariations, and a beaded appearance.

When considering the bladder, we observe key factors such as bladder volume, extravasation, diverticula formation, outlet obstruction, and irregular bladder shape. Additionally, we noted the effects on the ureters, particularly the backflow of contrast media from the urinary bladder into the ureters due to vesicoureteral reflux (VUR), resulting in ureteral dilation [18].

Uroflowmetry results indicate a urine flow rate below 10ml/s and voided volume under 100ml as significant. One patient with urinary retention showed significant retention with a flow rate of 5.5ml/s but had a normal voided volume. Another patient with posterior urethra narrowing had significant results with a flow rate of 6.6ml/s and a voided volume of 4.1ml. Two patients, one with a normal radiology report and another with a beaded urethra, had insignificant uroflowmetry test results. According to these data, retrograde urethrogra m (RGU) and micturating cystourethrogram (MCU) correlate well with uroflowmetry tests; however, 2 patients with normal radiology reports and 1 patient with a dilated posterior urethra showed significant uroflowmetry results that RGU/MCU could not explain.

Conclusion

This study involved the collection of qualitative data from 35 different patients at M.M Super- specialty Hospital in the Department of Radiology for 10 months, the research objective was to evaluate the efficiency of combined RGU/MCU in the diagnosis of the lower urinary tract(LUT). Urethral narrowing at different locations, and other urethra anatomical changes like dilatation, size variations, and a beaded appearance were observed. When considering thebladder, we observed bladder volume, extravasation, diverticula, bladder outlet obstruction(BOO), and irregular bladder shape. Additionally, we noted the effects on the ureters, particularly vesicoureteral reflux (VUR), backflow of contrast media from the urinary bladder into the ureters, resulting in ureter dilation.

Uroflowmetry test results and radiology reports of 7 patients showed a correlation significance of 71.9% in five 5 patients where both abnormal and normal uroflowmetry test results were related to radiological findings. Most pathologies that caused abnormal uroflowmetry test results were urethral stricture and urine retention however the research could not properly explain the irrelevance of the radiology report and uroflowmetry test results in two 2 patients with 28.5%. Statistical data indicated patients having abnormalities at a rate of 54.29% while normal patients have a rate of 45.71%, this data indicates the effectiveness of combined RGU/MCU techniques in demonstrating voiding difficulty-relatedpathologies, and it is minimally invasive.

Urethra trauma and the effects of radiation are the main concerns however employing an experienced radiographer, facilitated by a radiologist and urologist minimizes the probability of trauma and utilizes better imaging techniques with less radiation exposure. Understanding pathology, physiology, and anatomy is a pivotal concept in determining any difficulty that may arise in the lower urinary tract, as some of the difficulties can be caused by underlying pathological and physiological factors that are hardly detected by RGU/MCU andfuture comparative studies of the efficiency of RGU/MCU with other imaging modalities is recommended to evaluate its limitation, sensitivity, and specificity in evaluating voiding difficulties.

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