🎯 High-Yield Urology Notes

Final Year MBBS Exam Preparation | Surgery & Urology Topics

1. NEPHROLITHIASIS (Kidney Stones)

🧠 **MNEMONIC - Risk Factors: "CALCIUM"**

Calcium excess (hypercalciuria, hyperparathyroidism)
Acid urine (low pH for uric acid stones)
Low fluid intake (↓ urine volume)
Chronic UTI (struvite stones)
Intestinal disease (IBD, malabsorption)
Uric acid excess (gout, high purine diet)
Medications (loop diuretics, calcium supplements, vitamin D)

ETIOLOGY & PATHOPHYSIOLOGY

Stone Type	Frequency	Key Features	X-ray	Urine pH
Calcium Oxalate	70-80%	Hypercalciuria, hyperoxaluria, hypocitraturia. Envelope/dumbbell shaped	Radiopaque	Any pH
Calcium Phosphate	5-10%	Hyperparathyroidism, RTA. Wedge-shaped prisms	Radiopaque	Alkaline >7.5
Uric Acid	5-10%	Gout, ileostomy, malignancy. Rhomboid/rosette	Radiolucent	Acidic <5.5
Struvite (MAP)	10-15%	UTI with urease-producing bacteria (Proteus). Coffin-lid crystals, staghorn calculi	Radiopaque	Alkaline >7.0
Cystine	1-2%	Autosomal recessive defect. Hexagonal crystals	Faintly opaque	Any pH

CLINICAL PRESENTATION

Classic Triad

1. Colicky flank pain (waves of severe pain)
2. Hematuria (microscopic > macroscopic)
3. Nausea/vomiting

Location-Specific Signs

Renal pelvis: CVA tenderness
Upper ureter: Flank → groin radiation
Mid ureter: Lower quadrant pain
Distal ureter: Urinary frequency, urgency, dysuria

⚡ **EXAM PEARL - "The 3 Anatomical Narrowings"**

Stones most commonly lodge at: **(1) Pelvi-ureteric junction (PUJ)**, **(2) Pelvic brim (crossing iliac vessels)**, **(3) Vesico-ureteric junction (VUJ)**

DIAGNOSTIC APPROACH

📊 INVESTIGATION ALGORITHM

STEP 1: Basic Labs
- Urinalysis (hematuria, crystals, pH, WBC)
- Urine culture if pyuria/fever
- Serum: Creatinine, Ca^{2+}, Phosphate, Uric acid, PTH

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STEP 2: Imaging
- **GOLD STANDARD: Non-contrast CT KUB** (sensitivity 95-98%)
- USS KUB (pregnancy, children, radiation concern)
- KUB X-ray (NOT first-line, misses radiolucent stones)

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STEP 3: Stone Analysis
- Retrieve stone for chemical/crystallographic analysis
- 24-hour urine collection for recurrent stones (volume, Ca, oxalate, citrate, uric acid, creatinine, pH)

⚠ RED FLAGS - Immediate Urology Referral

- **Infected obstructed system** (pyonephrosis) → sepsis risk
- **Bilateral obstruction** or **obstruction in solitary kidney** → AKI
- **Anuria** or **rising creatinine**
- **Intractable pain/vomiting** despite analgesia

MANAGEMENT ALGORITHM

Stone Size	Location	Management	Pass Rate
<5 mm	Any	**Conservative/MET**: Hydration (2-3L/day), NSAIDs, α-blockers (tamsulosin)	90-95%
5-10 mm	Distal ureter	Trial of MET, consider ESWL or ureteroscopy	50-70%
>10 mm	Ureter	**Ureteroscopy + laser lithotripsy**	-
<20 mm	Kidney	**ESWL** (1st line) or flexible ureteroscopy	-
>20 mm	Kidney	**PCNL** (percutaneous nephrolithotomy)	-
Staghorn	Renal pelvis	**PCNL** + antibiotics (if struvite)	-

MET = Medical Expulsive Therapy: Tamsulosin 0.4mg OD + adequate hydration + NSAIDs. Trial for 4-6 weeks before intervention.

PREVENTION STRATEGIES

Stone Type	Dietary Modifications	Medical Therapy
Calcium Oxalate	↑ Fluids (2.5L/day), ↓ Oxalate (spinach, nuts, chocolate), ↓ Sodium, ↓ Animal protein, **NORMAL calcium** (not low!)	Thiazides (↓ calciuria), Potassium citrate (↑ pH)
Calcium Phosphate	↑ Fluids, ↓ Sodium, avoid excess vitamin D	Treat underlying cause (hyperparathyroidism, RTA)
Uric Acid	↑ Fluids, ↓ Purines (red meat, seafood), ↓ Alcohol	Allopurinol (↓ uric acid), Potassium citrate (alkalize urine pH 6.5-7.0)
Struvite	↑ Fluids, acidify urine (cranberry)	Antibiotics for UTI, complete stone removal
Cystine	↑↑ Fluids (3-4L/day), ↓ Sodium, ↓ Protein	Alkalization (pH >7.0), D-penicillamine, Tiopronin

MNEMONIC - Stone Prevention: "FLUIDS"

Fluid intake 2.5-3L/day (urine output >2L)
Limit sodium and animal protein
Uric acid control (allopurinol if needed)
Increase citrate (lemonade, potassium citrate)
Don't restrict calcium (normal dietary intake)
Specific therapy based on stone analysis

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2. DYSURIA

DIFFERENTIAL DIAGNOSIS FRAMEWORK

Category	Condition	Key Features	Buzzwords
INFECTIOUS	UTI (Cystitis)	Frequency, urgency, suprapubic pain, cloudy urine	Pyuria, Nitrites
	Pyelonephritis	Fever, flank pain, CVA tenderness, N/V	WBC casts
	Urethritis (STI)	Discharge, sexual history, gradual onset	Chlamydia/Gonorrhea
INFLAMMATORY	Interstitial Cystitis	Chronic pain, urgency, frequency, negative cultures	Hunner's ulcers
	Radiation Cystitis	Hx of pelvic radiation (prostate/cervical Ca)	Hemorrhagic cystitis
OBSTRUCTIVE	Nephrolithiasis	Colicky pain, hematuria, stone in distal ureter	VUJ obstruction
	BPH (Males)	LUTS, hesitancy, weak stream, nocturia	Post-void residual
OTHER	Vaginitis (Females)	External dysuria, discharge, itch, sexual history	Candida/Trichomonas
	Prostatitis (Males)	Perineal/rectal pain, fever, tender prostate on DRE	Gram-negative bacteria
	Chemical/Irritant	Spermicides, soaps, new products	Contact dermatitis

MNEMONIC - Dysuria Causes: "CURTIS"

Cystitis (UTI)
Urethritis (STI)
Renal infection (pyelonephritis)
Trauma/irritation (chemical, physical)
Interstitial cystitis
Stone disease (nephrolithiasis)

DIAGNOSTIC WORKUP

📊 DYSURIA EVALUATION ALGORITHM

HISTORY - "OPQRST + ROS"
- Character: Internal vs External dysuria
- Associated: Frequency, urgency, hematuria, discharge, fever
- Sexual history: Partners, contraception, STI risk
- PMH: Recurrent UTI, stones, diabetes, immunosuppression
- Medications: Recent antibiotics

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PHYSICAL EXAMINATION
- Vital signs (fever suggests upper UTI/systemic)
- Abdominal: Suprapubic tenderness, CVA tenderness
- **Males:** DRE (prostate), genital exam (discharge)
- **Females:** Pelvic exam if discharge/vaginitis suspected

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INVESTIGATIONS

Tier 1 (All patients):
- Urinalysis: Dipstick (LE, nitrites, blood, protein) + Microscopy
- Urine culture & sensitivity (if +ve dipstick or high-risk)

Tier 2 (If indicated):
- STI testing: NAAT for Chlamydia/GC (first-catch urine or swab)
- Pregnancy test (women of childbearing age)
- USS/CT KUB (if stones suspected)
- Cystoscopy (chronic/recurrent, negative cultures, hematuria)

⚡ EXAM PEARL - Urinalysis Interpretation

Leukocyte Esterase (LE) +ve = WBCs present (pyuria)
Nitrites +ve = Gram-negative bacteria (E. coli)
LE +ve, Nitrites -ve = Early UTI, Staph saprophyticus, TB, sterile pyuria
Hematuria + Pyuria + No bacteria = Consider TB, stones, malignancy, interstitial cystitis

MANAGEMENT BASED ON ETIOLOGY

Diagnosis	First-Line Treatment	Duration	Special Considerations
Uncomplicated UTI (Women)	Nitrofurantoin 100mg BD OR Fosfomycin 3g single dose OR TMP-SMX DS BD	3-5 days	Avoid quinolones (resistance). Consider local antibiogram
Complicated UTI	Fluoroquinolone (Ciprofloxacin) OR Ceftriaxone	7-14 days	Males, pregnancy, catheter, immunosuppressed
Pyelonephritis (Outpatient)	Ciprofloxacin 500mg BD OR Ceftriaxone 1g IV → oral	14 days	Admit if severe, septic, unable to tolerate PO
Urethritis (Chlamydia)	Doxycycline 100mg BD OR Azithromycin 1g single dose	7 days	Treat partners. Test of cure in 3 weeks
Urethritis (Gonorrhea)	Ceftriaxone 500mg IM single dose + Azithromycin 1g PO	Single dose	Dual therapy for resistance. Treat partners
Bacterial Prostatitis	Fluoroquinolone (Ciprofloxacin) OR TMP-SMX	4-6 weeks	Longer duration for chronic. Consider α-blocker
Interstitial Cystitis	Behavioral (void training), Amitriptyline, Pentosan polysulfate	Chronic	Multidisciplinary. Avoid acidic foods/caffeine

⚠ ADMIT TO HOSPITAL - Complicated UTI/Pyelonephritis

- **Sepsis** or hemodynamic instability
- **Intractable vomiting** (unable to tolerate oral antibiotics)
- **Pregnancy**

- **Obstruction** (stone, stricture) → may need urgent drainage
- **Immunocompromised** (diabetes, transplant, chemotherapy)

Recurrent UTI Prevention (≥2 in 6mo or ≥3 in 1yr)

- Post-coital voiding
- Adequate hydration
- Avoid spermicides
- **Prophylaxis:** Nitrofurantoin 50mg ON, TMP-SMX SS ON, or post-coital single dose
- Cranberry products (weak evidence)
- Topical estrogen (postmenopausal women)

When to Refer to Urology

- Recurrent UTIs despite prophylaxis
- Suspected anatomical abnormality
- Hematuria (persistent microscopic or macroscopic)
- Failed treatment or resistant organisms
- Chronic prostatitis
- Interstitial cystitis not responding to conservative management

3. HEMATURIA

CLASSIFICATION & DEFINITIONS

Type	Definition	Clinical Significance
Macroscopic (Gross)	Visible blood in urine (pink, red, brown)	Higher risk of malignancy (5-20%). Always investigate.
Microscopic	≥3 RBC/HPF on 2-3 properly collected specimens	Lower risk (0.5-5%). Needs workup if persistent.
Symptomatic	With dysuria, frequency, pain, fever	Usually infectious/inflammatory. Treat cause, reassess.
Asymptomatic	No LUTS, painless	Bladder/renal cancer until proven otherwise (especially >35yo, smoker)

🧠 **MNEMONIC - Hematuria Causes: "TICS MAP"**

Tumor (bladder, kidney, prostate)
Infection (UTI, TB, schistosomiasis)
Calculus (stones)
Sickle cell disease
Medications (anticoagulants, cyclophosphamide)
Anatomic abnormalities (PKD, AVM)
Post-exercise (benign, transient)

ANATOMICAL DIFFERENTIAL DIAGNOSIS

Origin	Conditions	Distinguishing Features
GLOMERULAR	IgA nephropathy, Alport's, PSGN, Goodpasture's, Lupus nephritis	Dysmorphic RBCs, RBC casts, proteinuria, HTN, edema
RENAL (Non-glomerular)	RCC, stones, PKD, papillary necrosis, trauma, AVM, renal infarct	Flank pain/mass, clots possible, imaging findings
URETERAL	Stones, TCC of ureter, trauma	Colicky flank pain, vermiform clots
BLADDER	TCC bladder, cystitis, stones, schistosomiasis, cyclophosphamide	Terminal hematuria, LUTS, painless gross hematuria (cancer)
PROSTATE	BPH, prostate cancer, prostatitis	LUTS, initial hematuria, ↑ PSA, abnormal DRE
URETHRA	Urethritis, trauma, stricture, foreign body	Dysuria, discharge, initial hematuria

⚡ **EXAM PEARL - Timing of Hematuria**

Initial hematuria: Urethra/prostate pathology (blood at start of stream)
Terminal hematuria: Bladder neck/trigone pathology (blood at end of stream)
Total hematuria: Bladder, upper tracts, or diffuse bleeding (throughout stream)

DIAGNOSTIC WORKUP ALGORITHM

📊 HEMATURIA INVESTIGATION PROTOCOL

STEP 1: CONFIRM TRUE HEMATURIA
- Exclude pseudohematuria: Beetroot, rifampicin, myoglobinuria
- Urinalysis + microscopy: Confirm RBCs (not just +ve dipstick)
- Examine RBC morphology: Dysmorphic vs Isomorphic

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STEP 2: HISTORY & EXAMINATION
Red Flags for Malignancy: Age >35, smoking, occupational exposure (dyes, rubber, chemicals), painless gross hematuria, weight loss
Exam: BP, abdominal mass, DRE (males), pelvic exam (females), edema

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STEP 3: BASIC LABS
- Urinalysis: Protein, casts, WBC, bacteria
- Urine culture (if pyuria/symptoms)
- Serum: Creatinine, eGFR
- If glomerular suspected: Urine protein:creatinine ratio, complement (C3/C4), ANA, ANCA

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STEP 4: IMAGING - Upper Tracts
CT Urography (Gold Standard) - contrast-enhanced multiphasic CT for renal masses/stones/TCC
OR USS + MR Urography (if contrast contraindicated)
OR IVP (rarely used now)

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STEP 5: CYSTOSCOPY - Lower Tracts
Flexible cystoscopy to visualize bladder/urethra
Indications: Age >35, risk factors, gross hematuria, abnormal imaging, persistent microscopic hematuria

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STEP 6: NEPHROLOGY REFERRAL (if glomerular)
Indications: Dysmorphic RBCs/RBC casts, proteinuria >500mg/day, ↑ creatinine, HTN
May need: Renal biopsy for definitive diagnosis

⚠ HIGH-RISK HEMATURIA - Urgent 2-Week Urology Referral
- Age ≥45 with **unexplained visible hematuria** (without UTI) OR visible hematuria persisting/recurrent after UTI treatment
- Age ≥60 with **unexplained non-visible hematuria** + dysuria or ↑ WCC
- Palpable abdominal/pelvic mass suggesting urological malignancy

MANAGEMENT BASED ON ETIOLOGY

Diagnosis	Management	Key Points
UTI/Cystitis	Antibiotics as per culture. Re-check urine after treatment completion (2 weeks)	If hematuria persists → full workup needed
Nephrolithiasis	As per stone protocol (MET, ESWL, ureteroscopy, PCNL)	Stone passage resolves hematuria. Treat underlying metabolic cause
Glomerulonephritis	Nephrology referral. Treat underlying: ACEi/ARB, steroids, immunosuppression	Monitor BP, proteinuria, renal function. May need biopsy
Bladder Cancer (TCC)	**TURBT** (transurethral resection) for diagnosis & staging ± intravesical BCG/chemotherapy	Painless gross hematuria is classic. Smoking is #1 risk factor
Renal Cell Carcinoma	**Partial/Radical nephrectomy**. Consider ablation for small tumors	Classic triad (hematuria + flank pain + mass) seen in only 10%
BPH	α-blockers (tamsulosin), 5α-reductase inhibitors (finasteride), TURP if severe	Rule out cancer first (PSA, DRE, cystoscopy)
Trauma	Conservative if minor. Exploration/repair/nephrectomy if severe injury	Grading by CT: I-V. Most renal trauma is managed conservatively
Anticoagulation-related	Do NOT assume anticoagulation is the cause. Full workup still required	Anticoagulation unmasks underlying pathology (often malignancy)

CRITICAL CONCEPT: Hematuria in a patient on anticoagulation should NEVER be attributed to the anticoagulation alone. Full investigation is mandatory as anticoagulation often unmasks occult malignancy.

Glomerular vs Non-Glomerular Hematuria

GLOMERULAR:
- Dysmorphic RBCs (>80%)
- RBC casts
- Proteinuria (>500mg/day)
- HTN, edema, ↑ creatinine

NON-GLOMERULAR:
- Isomorphic RBCs
- Blood clots (glomerular can't clot)
- LUTS, pain, mass

When Cystoscopy Can Be Deferred

- Young patients (<35yo) with clear reversible cause (UTI, menstruation, vigorous exercise)
- Confirmed glomerular disease with normal upper tract imaging
- Terminal CKD (already under nephrology)

BUT: Any persistent or recurrent hematuria needs cystoscopy regardless of age

4. MALE INFERTILITY

DEFINITION & EPIDEMIOLOGY

Infertility Definition: Failure to conceive after **12 months of regular unprotected intercourse** (or 6 months if female partner >35 years)
Male factor contributes to approximately **50%** of infertility cases (30% solely male, 20% combined male-female)

🧠 MNEMONIC - Male Infertility Causes: "VITAMIN C & D"

Varicocele (most common correctable cause)
Infections (epididymo-orchitis, STIs)
Testicular factors (undescended testes, torsion sequelae)
Anatomic obstruction (vas deferens, ejaculatory duct)
Medications/toxins (chemotherapy, steroids, smoking, alcohol)
Idiopathic (40-50% of cases)
Neurological/sexual dysfunction (retrograde ejaculation, ED)
Chromosomal/genetic (Klinefelter's, Y microdeletions, CFTR)
Ductular obstruction (CBAVD - congenital bilateral absence of vas deferens)

ETIOLOGY CLASSIFICATION

Category	Specific Causes	Frequency	Key Features
PRE-TESTICULAR (Endocrine)	Hypogonadotropic hypogonadism, Hyperprolactinemia, Hypothyroidism, Steroid use	2-3%	↓ FSH/LH/Testosterone. Often reversible
TESTICULAR (Primary)	Varicocele, Undescended testis, Klinefelter's (47,XXY), Y-chromosome microdeletion, Chemotherapy/radiation, Mumps orchitis	30-40%	↑ FSH/LH, ↓ Testosterone. **Varicocele 40% of primary infertility**
POST-TESTICULAR (Obstruction)	CBAVD (CF mutation), Ejaculatory duct obstruction, Post-vasectomy, Post-infection (TB, GC)	10-20%	**Azoospermia with normal FSH/testis volume**
SPERM TRANSPORT/FUNCTION	Retrograde ejaculation, Erectile dysfunction, Anti-sperm antibodies	5%	Ejaculatory issues. Sperm in post-ejaculate urine (retrograde)
IDIOPATHIC	Unknown cause	40-50%	Diagnosis of exclusion after full workup

⚡ **EXAM PEARL - Varicocele**

Most common correctable cause of male infertility (present in 40% of primary infertility, 80% of secondary infertility)

"Bag of worms" on palpation, more prominent with Valsalva, usually LEFT-sided (90%)

Right-sided or non-reducible varicocele → investigate for retroperitoneal mass (RCC, lymphoma) obstructing spermatic vein

DIAGNOSTIC APPROACH - THE COMPREHENSIVE WORKUP

📊 MALE INFERTILITY EVALUATION PROTOCOL

STEP 1: DETAILED HISTORY
Sexual: Frequency, duration of infertility, previous pregnancies (him/partner), coital technique, libido, erectile function
Medical: Cryptorchidism, STIs, mumps, testicular trauma/torsion/surgery, chronic illness (diabetes, CKD), systemic disease
Medications: Chemotherapy, testosterone/steroids, 5α-reductase inhibitors, SSRIs, antihypertensives
Lifestyle: Smoking, alcohol, recreational drugs, occupational exposures (heat, toxins, radiation), tight underwear, hot baths
Family: Infertility, CF, genetic disorders

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STEP 2: PHYSICAL EXAMINATION
General: BMI (obesity ↓ fertility), gynecomastia, body hair distribution (hypogonadism)
Penis: Hypospadias, chordee
Testes: Size (normal >15ml/4cm length), consistency, masses. Small firm testes = testicular failure
Vas deferens: Palpable bilaterally? (absent in CBAVD)
Varicocele: Examine standing + Valsalva
DRE: Prostate size, tenderness

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STEP 3: SEMEN ANALYSIS (Cornerstone)
Collection: 2-7 days abstinence, 2 samples 2-12 weeks apart, within 1 hour of ejaculation
WHO 2021 Reference Values (Lower Limits):
• Volume: ≥1.4 mL
• Concentration: ≥16 million/mL
• Total count: ≥39 million per ejaculate
• Motility: ≥42% total, ≥30% progressive
• Morphology: ≥4% normal forms (strict criteria)
• Vitality: ≥54% live
• pH: ≥7.2

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STEP 4: HORMONAL ASSESSMENT
Initial (All patients with abnormal SA):
• FSH, LH, Testosterone (morning sample)
Additional (if indicated):
• Prolactin (if ↓ libido, ED, galactorrhea)
• Estradiol (if gynecomastia)
• Karyotype (if severe oligospermia/azoospermia, ↑ FSH, small testes)
• Y-chromosome microdeletion (if sperm count <5 million/mL)

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STEP 5: FURTHER INVESTIGATIONS (Based on Findings)
USS Scrotum: Varicocele, testicular pathology, epididymal cysts
TRUS (Transrectal USS): If ejaculatory duct obstruction suspected (low volume, azoospermia)
Genetic Testing: Karyotype (Klinefelter's 47,XXY), CFTR mutations (CBAVD), Y-microdeletions (AZF regions)
Post-ejaculate Urinalysis: If retrograde ejaculation suspected
Anti-sperm Antibodies: If agglutination on SA
Testicular Biopsy: Differentiate obstructive vs non-obstructive azoospermia (for sperm retrieval)

SEMEN ANALYSIS INTERPRETATION

Finding	Definition	Possible Causes
Normozoospermia	Normal parameters	Female factor, unexplained infertility, lifestyle
Oligozoospermia	↓ Sperm count (<16 million/mL)	Varicocele, idiopathic, partial obstruction, hormonal
Azoospermia	No sperm in ejaculate (0/mL)	**Obstructive:** CBAVD, vasectomy, infection. **Non-obstructive:** Klinefelter's, chemotherapy, Y-deletion
Asthenozoospermia	↓ Motility (<42% total or <30% progressive)	Varicocele, anti-sperm antibodies, infection, idiopathic
Teratozoospermia	↓ Normal morphology (<4%)	Varicocele, oxidative stress, genetic, idiopathic
Oligoasthenoteratozoospermia (OAT)	↓ Count + ↓ Motility + ↓ Morphology	Severe testicular dysfunction, genetic causes
Low Volume (<1.4mL)	Hypospermia	Retrograde ejaculation, ejaculatory duct obstruction, hypogonadism, incomplete collection

⚡ **EXAM PEARL - Azoospermia Differentiation**

OBSTRUCTIVE Azoospermia: Normal FSH, normal testicular volume (>15ml), normal testosterone → Problem is mechanical blockage
NON-OBSTRUCTIVE Azoospermia: ↑ FSH, small testes (<12ml), ↓ testosterone → Problem is spermatogenesis failure
Testicular biopsy: Obstructive shows normal spermatogenesis, Non-obstructive shows Sertoli-cell-only or maturation arrest

MANAGEMENT OPTIONS

Category	Treatment	Indications	Success Rate
SURGICAL	Varicocelectomy (Laparoscopic or microsurgical)	Palpable varicocele + abnormal SA. **No benefit if subclinical varicocele**	60-70% improvement in SA, 40-50% pregnancy
	Vasovasostomy (Vasectomy reversal)	Post-vasectomy. Best if <10 years since vasectomy	90% patency, 50-70% pregnancy (time-dependent)
	TURED (Transurethral resection ejaculatory ducts)	Ejaculatory duct obstruction (low volume, dilated ducts on TRUS)	25-50% pregnancy rate
MEDICAL	Hormonal therapy (hCG/hMG or pulsatile GnRH)	Hypogonadotropic hypogonadism (↓ FSH/LH/Testosterone)	Good if hypothalamic/pituitary cause
	Antibiotics (Doxycycline)	Leukocytospermia, proven infection	Variable
ASSISTED REPRODUCTIVE TECHNOLOGY (ART)	IUI (Intrauterine Insemination)	Mild oligospermia, cervical factor, unexplained. Need ≥5 million motile sperm	10-20% per cycle
	IVF (In-vitro Fertilization)	Moderate oligospermia, tubal factor, endometriosis	30-40% per cycle
	ICSI (Intracytoplasmic Sperm Injection)	Severe oligospermia, OAT syndrome, failed IVF, azoospermia with sperm retrieval	50-60% fertilization, 30-40% pregnancy
	Sperm Retrieval: TESE/TESA/MESA/PESA	Obstructive azoospermia (CBAVD, vasectomy). Non-obstructive (if focal spermatogenesis)	High success in obstructive, 50% in non-obstructive
LIFESTYLE	Smoking cessation, alcohol moderation, weight loss, avoid heat/tight clothing, antioxidants (Vit C, E, Coenzyme Q10)	ALL patients, especially idiopathic/mild abnormalities	Modest improvement (15-20%)
DONOR SPERM	Donor insemination (DI)	Complete azoospermia (no sperm retrieval possible), genetic disease, failed ART	60-80% pregnancy over 6 cycles

🧠 **MNEMONIC - Sperm Retrieval Techniques: "TEMP"**

TESE - Testicular Sperm Extraction (open surgical biopsy)
E - (Micro-TESE for non-obstructive - uses microscope to find focal sperm)
MESA - Microsurgical Epididymal Sperm Aspiration (obstructive)
PESA - Percutaneous Epididymal Sperm Aspiration (needle, obstructive)

TREATMENT ALGORITHM BASED ON SEMEN ANALYSIS

🎯 MANAGEMENT DECISION TREE

AZOOSPERMIA
→ Check FSH, testicular volume
→ If normal FSH + normal testes = **Obstructive** → Surgical correction or sperm retrieval + ICSI
→ If ↑ FSH + small testes = **Non-obstructive** → Micro-TESE + ICSI vs Donor sperm

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SEVERE OLIGOZOOSPERMIA (<5 million/mL)
→ Genetic testing (karyotype, Y-microdeletion)
→ Treat varicocele if present
→ **ICSI** is primary ART option

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MILD-MODERATE OLIGOZOOSPERMIA (5-16 million/mL)
→ Varicocelectomy if clinically significant varicocele
→ Lifestyle modification + antioxidants
→ **IUI or IVF** depending on count/motility

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ISOLATED ASTHENOZOOSPERMIA or TERATOZOOSPERMIA
→ Treat infections if present
→ Anti-sperm antibody testing
→ **IUI** for mild, **IVF/ICSI** for severe

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NORMAL SEMEN ANALYSIS
→ Focus on female factor investigation
→ Consider unexplained infertility
→ Empirical treatment: Lifestyle + timed intercourse → IUI → IVF

⚠️ **GENETIC COUNSELING REQUIRED**

- **Klinefelter Syndrome (47,XXY):** Azoospermia/severe oligospermia. Can attempt micro-TESE but offspring may have chromosomal abnormalities
- **CFTR mutations (CBAVD):** Female partner must be tested - if carrier, 50% risk of offspring with CF
- **Y-chromosome microdeletions:** Deletions transmitted to male offspring → future infertility
- **ICSI itself:** May transmit male infertility genes to sons

Lifestyle Modifications (ALL Patients)

- **Smoking cessation** (↓ count, motility, DNA fragmentation)
- **Alcohol:** Limit to <14 units/week
- **BMI:** Target 18.5-25 (obesity ↑ estradiol, ↓ testosterone)
- **Heat avoidance:** Avoid hot tubs, saunas, laptops on lap, tight underwear
- **Medications:** Review and stop if possible (steroids, opioids, 5α-RI)
- **Supplements:** Folic acid 5mg, antioxidants (Vit C, E, selenium, zinc, CoQ10)

When to Refer to Andrology/Fertility Specialist

- Azoospermia or severe oligospermia (<5 million/mL)
- Abnormal hormones (↑ FSH, ↓ testosterone, ↑ prolactin)
- Suspected genetic cause (small testes, family history)
- Previous treatment failure
- Couple requesting ART
- Female partner age >35 (time-sensitive)

⚡ **FINAL EXAM PEARL - Combined Approach**

Male infertility is NEVER evaluated in isolation. **ALWAYS assess the female partner simultaneously** (ovulation, tubal patency, uterine factors) as 20% have combined male-female factors. Delayed female investigation wastes precious time, especially if partner >35 years old.

End of High-Yield Urology Notes

Comprehensive review for Final Year MBBS examination success