ONLINE EXCLUSIVE

Paediatric urology: what you need to know for FRCS (Urol)

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Lianne Pickett, Urology ST5 at Great Ormond Street Hospital (GOSH), and Ms Neetu Kumar, Consultant Paediatric Urological Surgeon at GOSH, provide expert insights into the key aspects of paediatric urology.

Curriculum

- Paediatric urology contributes one of the eight stations of the FRCS (Urol) viva. It is a double station, lasting 40 minutes.
- Based on the Intercollegiate Surgical Curriculum Programme (ISCP) Urology Curriculum (Figure 1) and The Joint Surgical Colleges Fellowship Examinations (JSCFT) syllabus, common topics include urinary tract infections (UTIs), inguinoscrotal conditions, phimosis, undescended testes, duplex systems, reflux, hydronephrosis, posterior urethral valves (PUV), spina bifida, intersex, and enuresis.

Figure 1: ISCP Paediatric Curriculum August 2021 (Version 2, July 2023)
• Embryology and anatomy of common congenital abnormalities, e.g. undescended testis, duplex systems, reflux and hydronephrosis.
• Investigations and management of perinatal hydronephrosis – investigation and management of PUJ obstruction.
• Investigation and management of ureteric reflux.
• Principles of functional assessment of the genitourinary tract.
• Basic embryology, anatomy of abnormality and natural history of intersex, spina bifida and posterior urethral valves.
• Concise knowledge of inguino-scrotal anatomy.
• Bacteriology of UTI in childhood.
• Investigation and management of recurrent urinary tract infections.
• Natural history and normal patterns of continence.
• Assessment and management of phimosis.
• Assessment and management of scrotal swellings in childhood.
• Assessment and management of the acute scrotum in childhood.
• Assessment and management of incontinence.
• Assessment and management of voiding dysfunction.

Embryology and commoncongenital abnormalities [1]

During normal foetal development, the mesonephric duct gives rise to the ureteric bud at the beginning of the fifth week of gestation. The ureteric bud, which gives rise to the ureter, calyces and collecting ducts, advances towards the caudal region of the intermediate mesoderm – the metanephros, fusing at around 32 days and commencing the process of nephrogenesis. Further details can be seen in Table 1.

Common topics / conditions

Recurrent UTI

VUR plays a central role linking UTI, pyelonephritis, renal scarring and end-stage renal disease (ESRD). The RIVUR Trial (2014) reported that prophylactic trimethoprim reduced the risk of recurrent UTIs, but did not reduce occurrence of renal scarring, and increased *E.coli* resistance patterns [2]. The recommended imaging schedule for babies and children with UTI is illustrated in the 2022 NICE guideline and can be accessed at https://www.nice.org.uk/guidance/ng224. Finally, meta-analysis shows that circumcision reduces the risk of UTI in boys with a history of recurrent UTI or VUR [3].

Urinary incontinence

Urinary incontinence is common in children with diurnal enuresis affecting approximately 15% of four-year-olds, diminishing to 2% in nine-year-olds. A focused history is key to excluding a neurological or anatomical cause (e.g., ureteric ectopia in girls). There is almost never an underlying organic cause for

Table 1

Urological condition	Definition	Embryological anomaly
Hypospadias	Hypoplasia of the tissues forming the ventral aspect of the penis beyond the division of the corpus spongiosum.	Incomplete closure of the urethral groove during the development of the genital tubercle (8–16 weeks).
Epispadias	Exposed urethral plate over dorsal surface of penis in males; in females the clitoral corpora are separated (bifid) with a very wide and short urethral plate lying open and exposed on its dorsal surface.	The embryological origins of primary epispadias are poorly understood. The exstrophy-epispadias complex is a spectrum of abnormalities arising from failure of development of the anterior abdominal wall during early gestation.
Renal agenesis	Absence of one or both kidneys at birth.	Aberrations of the reciprocal interaction (between ureteric bud and metanephros), or early disruption in kidney development (first trimester).
Multicystic dysplastic kidney (MCDK)	Kidneys replaced with cysts, resulting in non-functioning tissue.	Failure of the ureteric bud to connect with the metanephric mesoderm, preventing normal kidney development.
Vesicoureteral reflux (VUR)	Retrograde flow of urine from the bladder into the upper urinary tract.	Primary: Intrinsic failure of the valve mechanism at the VUJ. Secondary: Effect of elevated intravesical bladder.
Posterior urethral valves (PUV)	Abnormal tissue folds in the male posterior urethra obstructing urine flow.	Abnormal interaction between the mesonephric ducts and the urogenital sinus (seventh week).
Bladder exstrophy	The bladder forms outside the body, often associated with abnormal pelvic and abdominal wall development.	Failure of the urorectal septum to fuse properly with the cloacal membrane, leading to exposure of the bladder.
Ectopic kidney	A kidney located anywhere along the path of ascent (e.g., pelvis, abdomen).	Failure of the kidney to ascend properly from the pelvis during foetal development due to issues with the metanephric mesoderm or ureteric bud (6–10 weeks).
Cryptorchidism	Failure of one or both testes to descend into the scrotum.	Abnormal descent of the testes from the abdominal cavity to the scrotum during foetal development.
Ureterocele	Cyst-like dilation of the distal ureter, which can obstruct urine flow.	Abnormality in the development of the ureteric bud or improper fusion of the ureteric and mesonephric ducts during embryogenesis.
Horseshoe kidney	Kidneys fused together at the lower poles, forming a 'U' shape.	Failure of proper separation of the mesonephric tissue during early foetal development.
Duplex system	Presence of two ureters draining the same kidney, potentially causing reflux or obstruction.	Result of incomplete division of the ureteric bud or early bifurcation during kidney development. B: Weigert-Meyer rule.
Ectopic ureter	A ureter that drains into an abnormal location (e.g., vagina, bladder neck, or urethra).	Failure of the ureteric bud to insert into the bladder in the correct position, leading to abnormal drainage.

urinary incontinence which occurs solely at night with no daytime symptoms (monosymptomatic nocturnal enuresis). Examination should focus on the abdomen (a palpable bladder which can be 'expressed' with suprapubic pressure is pathognomic of neurological disease; while palpable stool will point to constipation), the genitalia, and the spine. Investigations include frequency-volume chart and urinary tract ultrasound and should be performed in all children with diurnal enuresis. Their post-void bladder volume should not be greater than the 10% normal age-adjusted bladder capacity (years + one multiplied by 30). Management of enuresis includes urotherapy (an umbrella term for all non-surgical, non-pharmacological interventions for lower urinary tract disorders (LUTD) in children and adolescents). ERIC, the national charity for children's bowel and bladder health, is an excellent resource.

Phimosis

The natural history of the foreskin is key in the management timing of phimosis. Oster et al. reported that preputial adhesions were present in up to 63% of six to seven-year-olds, diminishing to 3% in 16–17-year-olds [4]. Prior to that, Douglas Gairdner published the landmark paper 'The Fate of the Foreskin' which illustrated that during the first few years of life when the prepuce is still developing, non-retractability is normal and not due to a pathological constriction [5]. A good resource for patient, parents and professionals is: https://4skin-health.alderhey.nhs.uk/

Hydroceles

A patent processus vaginalis (PPV) has been estimated to be present in 80–95% of all male newborns, declining to 60% at one year of age, 40% at two years, and 15– 37% thereafter. Therefore, congenital hydrocoeles should be managed conservatively (except for those with an associated hernia) during the first two years of life. If it persists beyond two years, a PPV ligation (always inguinal approach!) can be offered.

Testicular torsion

As per Mellick and colleagues (2019), salvage rates are highest when presentation and treatment is within zero and six hours (96%), however a proportion (10%) remain viable after >48 hours of symptoms, depending on the degree of torsion [6]. When I attended Torsion Wetlab, run by The South Thames Paediatric Network, a healthy debate revealed that paediatric urology surgeons have a very low threshold for exploration if torsion cannot be excluded, even beyond 48 hours, which is likely informed by the results of the above systematic review.

Cryptorchidism / non-palpable testicles

The undescended testis is a popular topic for the exam. Candidates may be quizzed on the embryologic timeline, the role of imaging (remember there is no role for ultrasound!), surgical treatment (palpable versus non-palpable), and timing of treatment with respect to the risk of testicular cancer [7] versus the risk of testicular atrophy, anaesthetic complications, and infection rate in early orchidopexy i.e., < one year of age [8]. Currently, the recommended age for orchidopexy is between six and twelve months of age.

Non-palpable testes should raise suspicion for congenital adrenal hyperplasia (CAH). CAH is the commonest form of 46XX DSD, and the most common form of ambiguous genitalia in the western world. Severe forms of CAH may present as a paediatric urology emergency due to severe hyponatraemia in neonates.

Hypospadias

The aim of surgical management of hypospadias is to achieve a penis straight enough for erections and intercourse. Understanding the over-riding concepts, rather than listing the various techniques is key. This comprises correction of any chordee, reconstruction of the urethra (i.e., a tubularised urethroplasty with or without incision depending on the width of the urethral plate), and sufficient skin coverage to achieve a good cosmetic result. The best way of understanding these concepts is to scrub in and assist. This will translate to a more fluent and authentic discussion in the exam. Notably, examiners have been known to quiz candidates on the type of dressing used! In general, surgical correction is recommended between six and eighteen months of age.

Hydronephrosis

The incidence of foetal hydronephrosis ranges from 0.5–5%, and when mild, usually represents a transient physiological state. Nevertheless, a significant minority (approximately 0.2%) will be associated with a clinically significant uropathy. The urinary tract dilatation (UTD) classification was developed to grade severity and guide investigations. Upper tract dilatation in the foetus / infant may lead to further discussion of the various underlying aetiologies (e.g., PUJO, VUR, PUV, and urethrocele). These topics may be presented to a candidate using an image (e.g., 'key-hole sign' in PUV).

Conclusion

Paediatric urology exam preparation is unpredictable; attending clinics, elective lists, and viva courses like that run by the British Association of Paediatric Urologists (BAPU) is invaluable. I would recommend key resources including the book *Essentials of Paediatric Urology* (published by CRC Press), PedsUroFLO lectures by the University of California San Francisco (https://pedsuroflo.ucsf.edu/home), and the Course in Operative Paediatric Urology (COPU) run by the paediatric urological surgeons at Leeds General Infirmary. Good luck!

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TAKE HOME MESSAGES

- Don't overlook paediatric urology for the exam.
- Use the curriculum as set out by ISCP and JSCFT to guide your revision.
- Focus on the clinical application of embryology.
- Know the 'basics' well.
- Attend paediatric urology clinics and lists.
- Familiarise yourself with the dates of key courses early so as not to miss out.

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