

ULTRASONOGRAPHY

Ultrasonography is a good example of medical high technology which has found an important place in the management of patients of all ages and with a wide variety of medical and surgical disorders. Basic ultrasonography machines are by no means cheap - but they are relatively robust, and if handled with care, should provide years of service. The great advantage of ultrasonography is that it is non-invasive.

There is no doubt that ultrasonography is best done by those with training and experience. However, there can similarly be no doubt that a basic understanding of ultrasound and some hands-on experience of examination of patients with a limited number of paediatric problems is of considerable value to the clinician practicing in a setting without a trained ultrasonographer. Ultrasonography can save the patient invasive investigations, and can rapidly facilitate diagnosis.

Those medical officers responsible for the care of children should try to have some experience in the ultrasonography of:

1. the brain in neonates and infants - diagnosis of hydrocephalus
2. the liver and spleen - to detect abscesses and deviations from normal appearance
3. the peritoneal cavity - to detect the presence of ascites
4. the kidneys - to assess abnormalities in structure (eg cysts - hydronephrosis) and in appearance and size (eg chronic glomerulonephritis)
5. the mediastinum - to detect pericardial effusion.

CLINICIANS ARE STRONGLY ADVISED TO TAKE ANY OPPORTUNITY AFFORDED TO BECOME FAMILIAR WITH THE ABOVE BASIC EXAMINATIONS.

It should be possible for a reasonably experienced clinician to examine the heart with a simple ultrasound machine, looking for VSD and ASD. However, this is not always easy and artefacts are common.

UPPER RESPIRATORY TRACT INFECTION (URTI)

Give outpatient treatment, but tell the parents to return if the child becomes short of breath.

If afebrile

Explain to the parents that the cough is useful to the child in getting rid of the rubbish from the nose which is dripping into the chest. This is the reason that infant cough mixture is no longer in the Standard Treatment Book.

Give routine immunisation if the child is due for it - a child who is well enough to be sent home is well enough to be immunised.

If febrile

Give antimalarials and search for a cause of the fever. There is a high incidence of bacteraemia in children less than 6 months old with a temperature over 39.5 °C per axilla. If the child has otitis media, give amoxicillin orally for 5 days.

It is reasonable to give paracetamol to febrile children over the age of three months.

Cool sponging is not as effective as paracetamol - but it does have some effect and has the advantage of the parents being involved in the child's care.

REFERENCE

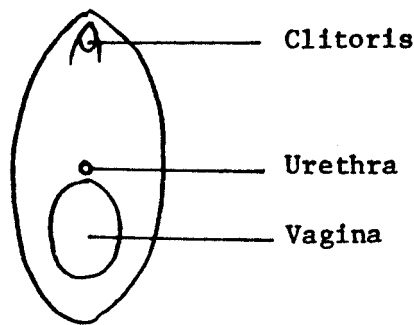
Agbolosu NB, Cuevas LE, Milligan P et al. *Ann Trop Paediatr* 17(3):283-288,1997. Efficacy of cool sponging versus paracetamol in reducing temperature in febrile children.

URETHRAL CATHETER

This procedure must always be done very carefully because of the risk of causing infection. Prolonged catheterization always results in infection.

1. Clean the genitalia as if you were taking a mid-stream urine sample.
2. Put on sterile gloves and drape the area. Clean the skin with aqueous chlorhexidine.
3. Lubricate the catheter tip with xylocaine jelly:

Under 3 kg:	use a 5 gauge feeding tube
3-8 kg:	use an 8 gauge feeding tube
9-12 kg:	use a 12 gauge catheter.
4. In males: hold the penis vertical. Hold the catheter with sterile forceps about 2 cm from its tip and gently push it along the urethra. After a short distance, resistance may be met at the external sphincter. If this cannot be overcome by gentle steady pressure, use a smaller catheter.
5. In females: in small children, identification of the urethra can be difficult. Hold the labia apart. The urethral orifice lies just anterior to the vagina. Hold the catheter 2 cm from its tip and angle it slightly backwards. Only a few centimetres are required to reach the bladder. Be careful that the catheter does not go into the vagina.



6. For a discussion of catheter care see Lancet 1:89-90,1982.

URINARY TRACT INFECTION AND URINE COLLECTION

INTRODUCTION

Urinary tract infections (UTI) are relatively common. In some series, UTI have been found in around 5% of febrile children. UTI has been found in more than 10% of hospitalised malnourished children. UTI in early childhood, when associated with ureteric reflux, can lead to renal scarring and eventually to hypertension and chronic renal failure in adult life.

Collection of urine is frequently omitted in the workup of a child who is febrile, malnourished or failing to thrive. Blood is collected but urine is not. Part of the reason for this is the mistaken belief that urine collection is a time consuming business and cannot be done on the spot. It is important that this misunderstanding is corrected. It is possible to collect samples of urine from babies and young children easily and relatively quickly.

DIAGNOSIS

Urinary tract infection should be suspected and urine cultures performed in patients with the following symptoms:

- Neonates:
 - “septic baby”
 - prolonged or severe jaundice
 - failure to thrive
 - recurrent vomiting
- Infants:
 - septic or febrile child
 - changes in voiding pattern
 - screaming on passing urine
 - malodorous urine (fishy rather than ammoniacal)
- Pre-school:
 - febrile illness
 - abdominal or flank pain
 - frequency, urgency, dribbling, wetting, dysuria
 - secondary enuresis
 - malodorous urine
 - haematuria
- Older children:
 - loin or lower abdominal pain
 - frequency, urgency, dysuria
 - secondary enuresis
 - haematuria.

Urinary tract infection should always be considered in malnourished children.

URINE COLLECTION

Midstream (older child)

1. Clean the genitalia with cotton balls soaked in aqueous chlorhexidine (Savlon):
 - a. in males: retract the foreskin, and swab from the tip of the penis to the base
 - b. in females: swab the vulva and perineum from anterior to posterior
2. Use each swab once, then discard it.
3. Dry the area thoroughly after it has been cleaned.
4. The patient then voids and, after a few seconds of micturition, a sterile specimen bottle is inserted into the stream for a short time.

Clean catch technique

This technique is simple, can be used in neonates, infants and young children, is non-invasive, takes only a few minutes and is almost as sensitive and specific as suprapubic urine collection.

1. Clean the genitalia and peritoneum (have a sterile urine collecting bottle handy - sometimes the cleaning procedure itself will precipitate micturition).
2. Ask the parent or assistant to hold the baby or child upright (in a "standing" position).
3. Either gently percuss suprapubically or gently "bounce" your finger or thumb suprapubically. Continue this for up to a minute. Very often, you will be able to feel the bladder contracting.
4. Collect the midstream part of the urine in the sterile container.

Urine bag (young child)

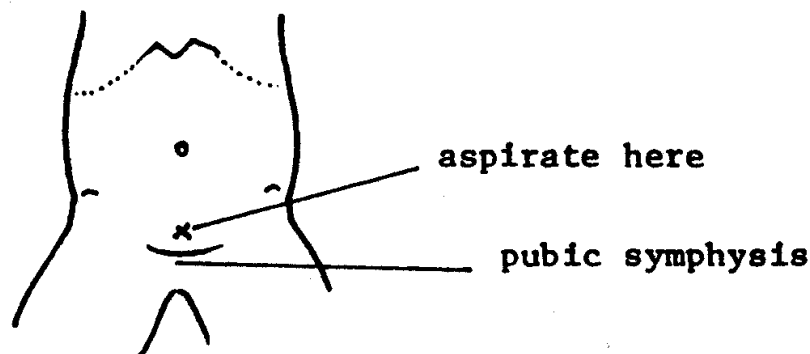
This method often yields a contaminated specimen. It is really not worth the effort in females. In males, it is only useful if care is taken with cleaning the penis and the bag is removed and the urine cultured immediately as soon as voiding has occurred.

1. Clean and then dry the genitalia as above.
2. Remove the paper to expose the adhesive on a plastic urine collection bag, insert the penis through the opening in the bag and press the adhesive onto the skin. As soon as urine has been passed, remove the bag and seal it by folding the two adhesive surfaces together.
3. A contaminated specimen is suggested by:
 - a. the absence of white cells (but the presence of white cells does not prove infection)
 - b. the presence of epithelial cells
 - c. scanty growth (less than 100,000 organisms per ml) or mixed growth.
4. The presence of pus cells with no growth suggests prior antibiotic treatment or TB.

Suprapubic aspiration (bladder tap)

This is the most reliable means of obtaining uncontaminated urine for micro and culture. ONLY attempt it when the bladder is palpable, or when the child has not voided for at least one hour.

1. Have an assistant FIRMLY hold the child supine with legs together and extended.
2. Prepare the skin over the lower abdomen with 70% alcohol. Do not use local anaesthetic.
3. Insert a 23 gauge needle on a 5 ml syringe perpendicularly to the skin 1 cm above the pubic symphysis in the midline (this is usually just above the skinfold).



4. The depth of insertion varies with the size of the child and how fat he or she is. Do not insert the needle too far.

Under 2 kg:	about 1 cm
2 - 4 kg:	about 1.5 cm
4 - 6 kg:	about 2 cm
6 - 10 kg:	about 3 cm

5. Aspirate with the syringe. If you do not get urine at first, **SLOWLY** withdraw the needle, aspirating as you withdraw.
6. If you do not get urine on the first attempt, you can try **ONCE** more. Check that the needle is patent first. Insert it 1 cm further than the first time. If you are still unsuccessful, give the child a big drink and wait another hour before trying again.
7. If the specimen cannot be examined immediately, store it in the bottom of the refrigerator (do not freeze it).

URINARY TRACT INFECTION - TREATMENT

NEONATES

Neonatal urinary tract infection is usually associated with pyelonephritis. Treat with parenteral antibiotics - ampicillin and gentamicin for 10 days would be a reasonable treatment.

INFANTS AND OLDER CHILDREN

This depends on how sick the child is:

1. If the child is toxic and there is a possibility of septicaemia:
 - a. treat with parenteral antibiotics at least until the child improves - and then change to oral treatment, depending on the culture and sensitivity results. Treat for a minimum of 10 days.
2. If the child is not toxic:
 - a. treat with oral antibiotics. Either amoxicillin or cotrimoxazole would be reasonable. Treat for one week.

Note: It is important that children under 5 years of age are continued on low dose prophylactic antibiotic until ureteric reflux has been either found or excluded by a micturating cystourethrogram (see below).

Children with established vesicoureteric reflux should be treated with long-term prophylactic antibiotics (eg cotrimoxazole, amoxicillin, or nitrofurantoin, given at night) and regular urinary cultures, until the reflux - which is likely to improve over time - no longer occurs.

Repeat a urine culture one week after stopping treatment.

FURTHER INVESTIGATION

Because about one in 3 children with UTI have ureteric reflux, and because reflux nephropathy is a significant cause of chronic renal failure and hypertension, and because UTI may be associated with other abnormalities of the urinary tract (obstruction, calculi, anatomical features such as bladder diverticulae or duplex ureters), it is very important that a child with confirmed UTI is investigated appropriately. There have been a number of suggestions as to which children should receive which investigations - but in Papua New Guinea, it is reasonable to adopt the following approach:

1. All children with confirmed UTI should have ultrasonography of the upper and lower renal system. This can be done at any time during the infection or soon afterwards.
2. If any abnormalities in the kidneys are detected at any age, an IVP should be performed to assess renal function.
3. Children under the age of 5 yrs should have a micturating cystourethrogram to evaluate the possibility of ureteric reflux. This is usually done 4-6 weeks after the infection has subsided (since UTI itself may cause reflux).

REFERENCE

Hoberman A, Wald ER. *Pediatr Infect Dis J* 16:11-17,1997. Urinary tract infections in young febrile infants.

URINE TESTS

All hospitals should have a supply of Multistix (or equivalent) dipstick urine testing strips. The test strip should have tests for glucose, albumen, blood, bilirubin and urobilinogen as the minimum requirement. Some strips contain tests for urinary pH, specific gravity, nitrite and leucocyte esterase (these latter two tests are helpful in the diagnosis of urinary tract infection). Always check the expiry date on the Multistix (or other test strips).

In the absence of test strips, the older laboratory tests can be used. All doctors should be able to examine a urine sample microscopically and to interpret the findings.

LABORATORY TESTS

Albumin

Boil the urine in a test tube, and if it turns cloudy, add 3 drops of dilute acetic acid. Albumin is present if it stays cloudy. Allow the test tube to stand. Over 1/8th solid is significant albuminuria.

Bilirubin

Dark urine may be due to dehydration (concentrated urine), bilirubin or haemoglobin. Shake the urine vigorously in a closed test tube. If the froth on top is yellow, bile is present. If the froth is white, bile is not present.

A jaundiced patient with no bile in the urine has haemolysis (p.177), and should be admitted for investigation. A patient with bile in the urine who does not look sick probably has hepatitis (p.178), and can be sent home.

Blood

Many patients say that their urine contains blood when it is merely dark. Always check the urine yourself by microscopic examination for red blood cells. Up to two RBC per HPF is normal.

Haemoglobin

Test strips do not distinguish between the presence of blood and haemoglobin.

If the urine is red but red cells are not present on microscopy, and there is a positive stix test for blood, haemoglobinuria is highly likely.

If test strips are not available, add 3 drops of dilute acetic acid to the urine and allow it to stand. Haemoglobinuria is probably present if there is no precipitate and the urine still looks red after one hour. Haemoglobinuria is caused by blackwater fever (p.200), G6PD deficiency (p.140), incompatible blood transfusion, severe burns, snakebite, septicaemia, and severe exertion.

Microscopy

Put a drop of well-mixed uncentrifuged urine on a clean counting chamber and examine for white cells, red cells, epithelial cells, casts, crystals and candida albicans (monilia). Use the 40x objective to count white cells.

1. Fuchs-Rosenthal Chamber: count the white cells in 5 of the 16 large squares.
2. Neubaur Chamber: count the white cells in 5 of the 9 large squares AND MULTIPLY BY TWO (as for CSF, p.70). This gives the number of white cells per cmm:

Less than 10 WBC/cmm:	normal
10 - 30 WBC/cmm:	moderate
Over 30 WBC/cmm:	heavy

Sugar

Add 8 drops of urine to 5 ml of Benedict's solution in a test tube and boil. Alternatively, put 5 drops of urine and 10 drops of water in a test tube and add one Clinitest tablet. Blue means no sugar. Green is +, yellow ++ and brown or orange ++++. Benedict's solution or Clinitest tablets detect any reducing sugar (glucose, galactose, lactose, fructose, maltose or pentose). False positives may be caused by aspirin, massive doses of penicillin, chloral hydrate, streptomycin, isoniazid, probenecid, creatinine or uric acid. Clinistix and Boehringer glucose test strips detect ONLY glucose.

A positive test with Benedict's or Clinitest, but a negative test strip suggests the presence of galactose, fructose, maltose, pentose or a drug.

A negative test with a Clinitest tablet but a positive Benedict's test or test strip suggests that only a small amount of sugar is present.

The same tests (Benedict's and Clinitest) can be used for testing liquid stool for reducing substances.