Catheter-associated UTIs

Asymptomatic catheter associated bacteruria commonest nosocomial infection

Rates of bacteriuria

- Single catheterisation: 1-5%
- Short-term catheterisation
  - Immediately: 10-20%
  - Thereafter: 5-10% per day
  - After 30 days: 100%

Short-term (< 30 day) catheter bacteruria typically single organism; long-term catheters usually multiple organisms

Eradication of bacteriuria impossible due to biofilm formation.

Biofilm

Accumulation of micro-organisms (and their nucleic acid fragments) within a mucopolysaccharide medium attached to a solid surface

- Not only on catheters, but other foreign bodies, prostatic calculi and renal scars
- Pseudomonas and Proteus particularly good at biofilm formation

3 layers

- Linking film
- Mucopolysaccharide base (containing viable bacteria and fragments)
- Luminal layer – releases planktonic organisms into urine

Indications for treatment

- Symptomatic
- Asymptomatic

  High risk of bacteraemia/septicaemia
  - Patient-related (immunocompromise)
  - Organism-related (e.g. serratia marcescens; ESBL etc.)
- Urological surgery
- Prostheses implantation
- Recurrent catheter blockage and Proteus spp.

Prevention

- Does the patient need a catheter?
- Could they have a condom catheter (reduced bacteruria)?
- If they need an indwelling catheter:
  - Aseptic technique
  - Closed catheter system
  - Shortest duration of catheterisation possible
- Special catheters
  - Encrustion – latex > coated latex > silicone
  - Reduced encrustation and biofilm with heparin-coated
  - Reduced bacteriuria reported for antibiotic-impregnated (nitrofurazone) and silver-impregnated catheters but no comment on symptomatic UTI or bacteraemia rates (Johnson 2006)

Antibiotic administration

- Controversial
- Reduces initial bacteriuria but equivalent rates by 4 days and risk of resistant bacteria increased
Requirement for antibiotics at the time of catheter changes unclear. Currently recommended by EAU, but recent randomised trial of antibiotics for catheter change in ITU patients with a positive CSU show no difference in rates of urosepsis (Leone 2007)

**Recurrent catheter blockage**

40-50% of long term catheterised patients

Typically due to *Proteus mirabilis* UTI

- Urease production - alkaline urine - encrustation with calcium phosphate and magnesium
- Biofilm formation and crystal apposition onto the luminal surface cause blockage.

Catheterised patients classified as blockers or non-blockers

Blockers have significantly elevated urinary pH, ammonium and calcium concentrations. Identified by pH testing and microscopy for struvite crystals

**Management**

- Acidic catheter maintenance solutions to minimise the build-up of mineral deposits (Suby-G citric acid solution)
- Systematic review evidence failed to demonstrate any beneficial effect of bladder washouts (Pratt 2000)
- All types of catheters are unable to resist encrustation by Proteus mirabilis biofilms; however silicone catheters have larger lumens compared to hydrogel catheters and are therefore preferred.
- No evidence to support the use of silver impregnated catheters in preventing catheter associated UTIs