Multisite study on ureteroscope reprocessing effectiveness

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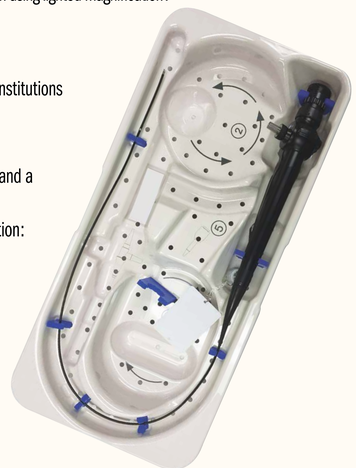
Introduction and purpose

- Contaminated duodenoscopes, gastroscopes, bronchoscopes, and cystoscopes have been linked to outbreaks[1,2]
- Damaged or contaminated ureteroscopes have also caused injuries and infections[3-5]
- Functional failures discovered during procedures or reprocessing lead to frequent repairs[6,7]
- Current guidelines recommend careful visual inspection during reprocessing[1,2]
- This study sought to answer the following research questions:
  - How much contamination can be detected in sterilized flexible ureteroscopes?
  - How much damage or debris is visible when using lighted magnification?

Methods

- Prospective study conducted in two large institutions
- The research team:
  - Audited reprocessing practices
  - Obtained samples using surface swabs and a flush-brush-flush technique
  - Performed tests for residual contamination:
    - Protein, hemoglobin, and adenosine triphosphate (ATP)*
    - Microbial cultures
  - Conducted visual inspections of:
    - External surfaces using lighted magnification and a digital camera
    - Channels and ports using a 0.8 mm fiber optic borescope



*Published benchmarks for manually-cleaned gastrointestinal (GI) endoscopes were used since there are no benchmarks for permissible contamination levels on sterilized ureteroscopes

Results

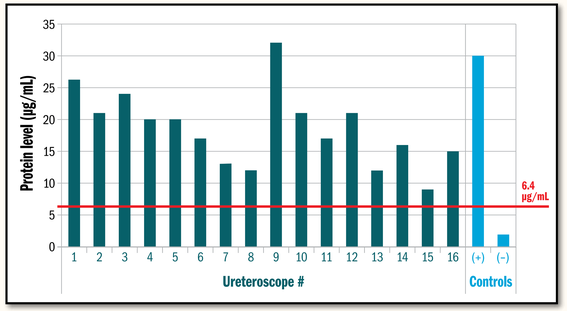
- Flexible ureteroscope characteristics (N=17):
  - Average age 2.1 years
  - Repairs required after an average of 19 uses due to:
    - Failed leak tests
    - Inadequate image quality
    - Broken fibers
    - Pinched insertion tubes
- Reprocessing involved:
  - Manual cleaning by reprocessing technicians
  - Sterilization with hydrogen peroxide gas
- Audits found both sites had inadequate processes for:
  - Bedside pre-cleaning by OR staff
  - Visual inspection by OR and reprocessing staff
  - Drying prior to sterilization
- Examinations found visible irregularities (Photos 1-3) and contamination on 100% of ureteroscopes (Table 1, Figure 1)

Table 1. Results of visual inspections, biochemical tests, and microbial cultures (N=16*)

Test	Benchmark	Number (%) above benchmark
Visual inspection	No damage or debris	16 (100%)
Protein	6.4 µg/mL	16 (100%)
Hemoglobin	2.2 µg/mL	1 (6%)
ATP	200 RLU†	1 (6%)
Microbial cultures	No growth	2 (13%) *Micrococcus luteus* *Corynebacterium glaucum*

*One ureteroscope was out for repair during the site visit †RLU: relative light units

Figure 1. Protein levels on sterilized ureteroscopes



Red line = "clean" benchmark; Controls: dirty ureteroscope (+); brand new ureteroscope (–)

Photo 1. Channel port with rusty discoloration; oily deposits and white, foamy residue near port

Photo 2. Scratches and gouges surrounding channel port

Photo 3. Filamentous debris protruding into channel

Summary and next steps

Sterilized ureteroscopes had high contamination levels, visible damage, and debris

- Tests conducted on sterilized flexible ureteroscopes found:
  - All had visible irregularities
  - All had contamination above benchmarks for clean GI endoscopes
  - Two (13%) had positive microbial cultures
- Results highlight the need for:
  - Improvement in adherence to guidelines, including:
    - Bedside pre-cleaning by OR staff to prevent buildup of residue
    - Biochemical tests that verify cleaning effectiveness
    - Visual inspections with lighted magnification to identify irregularities
  - More frequent preventive maintenance
  - Reprocessing methods that are proven effective to ensure patient safety

Disclosures and acknowledgements

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