A simple and efficient urine sampling method for bacteriological examination in elderly women

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Abstract

Aim: to determine how collecting urine voided directly into a container compares with urine obtained by suprapubic aspiration.

Method: urine samples were collected in a sterile recipient placed in the toilet or in the bed-pan during voiding, after the vulval region had been cleaned by water. These samples were compared with samples of the same urine obtained by suprapubic aspiration. The samples were examined for pyuria and bacteriuria. Applying the Kass criteria on the voided urine specimen and assessing the presence of leucocyturia, it was possible to differentiate urinary tract infection, asymptomatic bacteriuria and contamination.

Results: all 13 cases of infection found on suprapubic aspiration were also identified by this sampling technique. The technique produced four false-positive results.

Conclusion: this simple sampling method may not only obviate the need for suprapubic aspiration but also for bladder catheterization in the diagnosis of urinary tract infection in many elderly women.

Keywords: elderly women, suprapubic aspiration, urinary tract infection, urine collection

Introduction

Urine analysis is crucial for the diagnosis of urinary tract infection (UTI) and for isolation of the causative organism. A representative urine sample has to be obtained for this purpose. Midstream urine collection has become the routine method of sampling in women, although this is not always easy [1].

In elderly women this approach is particularly difficult due to co-ordination problems. Moreover, the urine is often contaminated if it is collected by the patient herself. Therefore, retrograde urinary catheterization has become the method of choice for obtaining a urine sample in elderly women [2, 3]. However, although catheterization is simple, it may cause discomfort or pain and is time-consuming. Moreover, catheter-induced infection may be as high as 20% in hospitals [4, 5]. A more practical approach might be to collect urine in a sterile container placed in the toilet or in the bed-pan during voiding, after the vulval region has been cleaned with water.

The aim of our study was to compare whether urine collected in this way was as reliable as the ultimate 'gold standard': suprapubic aspiration. Suprapubic puncture of the bladder under ultrasound guidance is a safe and relatively painless procedure. In this way contamination of the urine with urethral, vaginal and perineal flora can be avoided.

Methods

Urine samples for bacteriological and microscopic examination were obtained from 58 patients. The youngest patient was 65 years old and the oldest 99, the average age being 81 years.

In all cases, urine examination was requested by the treating physician not only because of symptoms of
urinary infection (painful or frequent micturition and incontinence), but also when atypical symptoms (such as urine with a foul odour, confusion and fever) were present. In some patients diabetes dysregulation was the reason for urine sampling. A suprapubic urine specimen was obtained just before voiding.

The urine sample was routinely processed for sediment and culture. The sample was inoculated with a 0.001 ml calibrated loop on tryptic soy agar with 5% sheep blood and on eosin-methylene blue agar as selective medium for Gram-negative organisms (Becton Dickinson, Cockeysville, MD, USA).

On the voided urine samples, colony counts were performed and interpreted according to Kass criteria \([10^5 \text{ colony-forming units (c.f.u.) per ml}]\) and UTI was diagnosed when both of the following criteria were fulfilled: (i) bacterial count in culture \(\geq 10^5 \text{ c.f.u. per ml}\) and (ii) \(\geq 10\) leucocytes per high-power field (magnification \(\times 400\)).

If there were \(\geq 10^5\) c.f.u. per ml in the voided urine and \(< 10\) leucocytes per high-power field, a diagnosis of bacteriuria was made. When the sample showed \(< 10^5\) c.f.u. per ml or \(\geq 10^5\) c.f.u. per ml but with several species of bacteria, it was considered to be contaminated [6].

For the urine specimens obtained by suprapubic aspiration, UTI was defined as \(\geq 10\) leucocytes per high-power field and growth on culture. In this kind of sampling, bacteriuria was defined as \(< 10\) leucocytes per high-power field and positive growth [6].

Contamination can take place during sampling time or during manipulation of the sample in the laboratory. Iatrogenic or laboratory contamination was considered if the aspirated culture yielded no growth on the primary plates and the only growth was of a bacterial species belonging to normal skin flora (e.g. corynebacterium species, coagulase-negative staphylococci) after >24 h enrichment in a thioglycolate broth.

Results and discussion

The results are summarized in Table 1. UTI was diagnosed in 13 suprapubic specimens and in 17 voided samples. This difference was not significant (\(\chi^2\) analysis).

When suprapubic aspiration is taken as the gold standard of sampling urine, UTI was present in 13 patients. In all these cases the voided urine sample also showed UTI. In four cases, UTI with two microbial species was present: all four cases were correctly diagnosed using both sampling methods.

Applying the criteria for UTI in the voided urine samples, there were another four patients with UTI. These cases could be classified as false positive. In one case, however, there was growth on cultures of the urine obtained by suprapubic aspiration but in the sediment there were \(< 10\) leucocytes per high-power field. This patient had symptoms of UTI and was treated successfully with antibiotics, suggesting that UTI was indeed present.

In the other three patients pyuria and bacteriuria were demonstrated in the voided specimen but not in the aspirated specimen. In one of these three patients, growth of coagulase-negative staphylococci only occurred after enrichment of the aspirated specimen. The diagnosis of urethritis was considered in these patients. Micturition was painful, there were no symptoms or signs of vaginitis and in the urine sediment there were \(> 10\) leucocytes per high-power field. This could be the so-called 'urethral (pyuria/dysuria) syndrome' [7]. Little is known about the frequency of urethritis in elderly women, because there are no studies in this population where a urine specimen obtained by suprapubic aspiration has been compared with a midstream urine specimen. These three patients were also successfully treated with antibiotics.

In 15 patients there was bacteriuria \((\geq 10^5\) c.f.u. per ml) with \(< 10\) leucocytes per high-power field in the voided urine sample. In 14 of them there was growth on culture and \(< 10\) leucocytes per high-power field in the aspirated specimen. Since these patients had no symptoms of UTI, the diagnosis of asymptomatic bacteriuria was made and no antibiotic treatment was necessary.
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given. The aspirated urine sample of the 15th patient was sterile. In this patient asymptomatic bacteriuria was probably caused by clinically insignificant urethritis.

Thirteen voided urine samples were considered to be contaminated. For 12 of these, the corresponding suprapubic aspiration sample was sterile. In the remaining case, growth of Corynebacterium spp. occurred only after enrichment.

In 13 patients the voided urine was sterile. The culture of the suprapubic aspirate confirmed these results although in one case there was growth of coagulase-negative staphylococci and Corynebacterium spp. after enrichment.

As expected, the voided urine samples showed no false-negative results for UTI.

In our study urine samples were obtained during voiding, without having recourse to midstream sampling, which is often difficult in elderly women. Urine was collected in a sterile container during normal voiding. Applying Kass criteria and the presence of leucocyturia, UTI, asymptomatic bacteriuria and contamination could be differentiated.

Conclusion
This study suggests that in elderly women, urine collection in a sterile container during normal voiding after cleaning the peri-urethral region with water is a reliable method for obtaining a representative urine sample. This method can reduce the need for bladder catheterization for diagnosis of UTI in elderly women.

Key points
- Collection of midstream urine specimens can be particularly difficult in older women and urinary catheterization is sometimes necessary to obtain a sample of urine.
- A simpler approach is to collect urine into a sterile container after cleaning the vulva with water.
- This sampling technique identifies all cases confirmed by suprapubic aspiration.
- Any false-positive results are probably the result of urethritis.

References

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