Pyuria as Predictor of Bacteriuria in Catheterized Patients

Pages with reference to book, From 300 To 302

Mumtaz Ahmad (Departments of Urology, Rawalpindi Medical College and Rawalpindi General Hospital, Rawalpindi.)
Shamim Mumtaz (Departments of Pathology, Rawalpindi Medical College and Rawalpindi General Hospital, Rawalpindi.)
Jamila Iqbal (Department of Microbiology, Shaikh Zayed Hospital, Lahore.)

Abstract

Six hundred and nine urine samples were analyzed for pyuria to assess its efficacy as a predictor of bacteriuria, in catheterized patients, using different techniques of pus cells estimation.ln 235 and 323 urine samples, pus cells were counted per high power field in centrifuged and uncentrifuged urine respectively, while in 51 urine samples pus cells were counted per cubic millimeter in uncentrifuged urine. All the urine samples were simultaneously cultured. Pyuria (pus cells >10/HPF or CMM) was correlated with bacteriuria (colony count >105 per ml). The overall efficacy of pyuria as a predictor of bacteriuria was low (52.01-60.78%) and there was no significant difference among the different techniques. It was concluded that pyuria as predictor of bacteriuria is the least reliable technique to be recommended in routine clinical practice (IPMA 47:300, 1997).

Introduction

Urinary tract infections are one of the most common infection in the human being. The gold standard for the diagnosis of urinary tract infection and its distinction from contamination by organisms from the urethra or perineum is made by quantitative culture of urine[1]. In routine clinical practice, this is not always possible, as seriously ill septicernic patients need urgent treatment for urinary tract infection without waiting for the result of culture. Other reasons for the non-availability of this investigation could be cost, lack of facilities and the most frequent reason is that this simple important test is not prescribed. Various other methods are used in routine clinical practice as well as in the clinical laboratories, to predict the diagnosis of urinary tract infection. One of the most frequently ordered and favourite method used is estimation of pyuria as a predictor of bacteriuria. The validity of pyuria as a marker of significant bacteriuria has been debatable. The difference in methodology for measuring pyuria (leukocyte excretion rate per hour, haemocytometer chamber technique and microscopic glass slide method) and difference in patients population, contribute to inconsistent interpretation[2]. The present study was designed to conelate pyuria by various methods with bacteriuria in catheterized patients.

Materials and Methods

A single urine sample from 609 indoor catheterized patients was collected from the catheter into a sterile syringe and transferred into properly labelled containers. The samples were immediately transported to the laboratory where they were processed promptly. In case of delay, samples were stored at 4°C and analyzed within 2 hours of collection. In 235 urine samples pus cells per high power field (HPF) were counted in centrifuged urine specimen. About 5 ml of urine was centrifuged at medium to high speed for 3-5 minutes. The sediment was examined underhigh power field. Pus cells were counted in 5-7 fields and their average calculated. In 323 urine samples pus cells were counted per high power field in uncentrifuged urine sediment[3]. A drop of well mixed uncentrifuged sample of urine was placed on the middle of a glass slide. The film was examined under high power field (x40). The number of pus cells were noted in 5-7 high power fields and their average obtained.

In 51 urine samples pus cells were counted over a Neubaeur chamber in uncentrifuged urine specimen and pus cells were estimated per cubic millimeter (CMM)[4]. Neubaeur chamber was filled carefully with a drop of well mixed uncentrifuged urine. Afterwaiting for 2-3 minutes forthe cells to settle, pus cells were counted in all the 9 big squares of the chamber using 10 objective, with the condenser iris closed sufficiently to give a good contrast. The number of pus cells per cubic millimeter were calculated by the following formula:

Number of cells counted x dilution e

Volume of chamber x number of square

All the urine samples were simultaneously cultured[5] in CLED (cystine lactose deficient medium). Inoculation was done with the help of a 1 ul (0.001 ml) calibrated loop. The plates were incubated aerobically at 37°C for 24 hours and examined for bacterial count and growth. Only those samples of urine were declared positive which gave a colony count of 105 bacteria/rnl (CFU/ml).

Results

Inall the three methods, numberof pus cells ranged from nil to more than 20 per high power field or per cubic millimeter. Pus cells were correlated with bacteriuria. Urine samples with pus cells between 0-10 per HPF or CMM were taken as negative for pyuria, whereas urine samples with pus cells more than 10 pus cells per HPF or CMM were taken as positive for pyuria. The sensitivity, specificity, positive predictive value, negative predictive value and efficiency of each method is shown in Tables I. II, and III.

Table I. Pus cells per HPF in centrifuged urine and bacteriuria (n=235).

	Culture positive	Culture negative	Total
Pyuria positive	34	12	46
Pyuria negative	98	91	189
Total	132	103	235
Sensitivity		25.75%	
Specificity		88.34%	
Predictive value for:			
Positive result		73.91%	
Negative result		48.14%	
Efficiency		53.19%	

Table II. Pus cells per HPF in uncentrifuged urine and bacteriuria (n=323).

	Culture positive	Culture negative	Total
Pyuria positive	30	5	35
Pyuria negative	150	138	288
Total	180	143	323
Sensitivity		16.66%	
Specificity		96.50%	
Predictive value for:			
Positive result		85.71%	
Negative result		47.91%	
Efficiency		52.01%	

Table III. Pus cells per cmm in uncentrifuged urine and bacteriuria (n=51).

	Culture positive	Culture positive	Total
Pyuria positive	12	7	19
Pyuria negative	13	19	32
Total	25	26	51
Sensitivity		48.0%	
Specificity		73.0%	
Predictive value for:			
Positive result		63.0%	
Negative result		59.0%	
Efficiency		60.78%	

Discussion

Microscopic examination of the urinary sediment adds valuable information to the diagnosis and evaluation of the patients with urinary tract infection. The majorerrorthat result from relying solely on the microscope for the diagnosis of urinary tract infection lies in the interpretation ofpyuria. There is no meaningless query in the whole field of medicine than "How many pus cells in the centrifuged urine are significant" [6]. The number of pus cells seen under the microscope depends on many factors which include method of collection of sample, degree of hydration, intensity of tissue reaction of urothelial surfaces to the disease process, volume, time and speed of centrifugation. Thus the number of pus cells

in the spun sediment can vary so markedly as to be meaningless. Moreover. mans' diseases of the urinary tract produce significant pyuria with absence of bacterial infection. Whereas, tuberculosis is the well recognized example of abacterial pynria. calculi, urothelial tumour, any injun to urinary tract from chlamvdial urethritis to glomerulonephritis and interstitial nephritis can elicit large number of pus cells in the urine[7]. Thus the presence or absence of pyuria in the centrifuged urine may be the worst of all criteria for the diagnosis of urinary tract infection. The usual method for quantitating the number ofleucocytes in the urine is glass slide microscopy where number of pus cells per high power field in the resuspended sediment of a centrifuged aliquot of urine are counted. By using this standard method in the present study, in 235 urine samples from catheterized patients pyuria (pus cells >10/HPF) was correlated with bacteriuria. The sensitivity, specificity, positive predictive value, negative predictive value and efficiency was 25.75%. 88.34%. 73.91%, 48.14% and 53.19 percent respectively.

In a study by Uppal[8], pyuria (pus cells >7 HPF) was correlated with bacteriuria, the sensitivity was 66.5 percent. In another study by Norman et al[9]. pyuria was correlated with bacteriuria in 664 urine samples from asyinptomatic non-catheterized ambulatory elderly men. The sensitivity of the test was 68%, specificity 99%, positive predictive value was 88% and negative predictive value was 97.0 percent. In another study (patients population not mentioned). the sensitivity of the test was 72%, specificity 77.3%, positive predictive value 51 .4% and negative predictive value 89.2 percent. In another study. pyuria (pus cells >L5/HPF) was correlated with bacteriuria in 216 urine sainples from pregnant ladies[10]. The sensitivity was 28.57%, specificity 95.04%, positive predictive value 28.57% and negative predictive value 95.04 percent. Puria was correlated with bacteriuria in a study on 150 hypertensive patients[11]. The sensitivity was 9.52%, specificity 93.79%, positive predictive value 20.0% and negative predictive value 86.42 percent. In the same study pvuria in 86 control group was correlated with bactcriuria, the results were sensitivity 33.3 3%, specificity, 92.77%, positive predictive value 14.28% and negative predictive value 97.46%. In 323 urine samples pus cells/HPF in uncentrifuged urine were counted and pyuria was correlated withbacteriuria. Except for a small difference in sensitivity (16.66% as compared to 25.75%), there was no difference in specificity, positive predictive value, negative predictive value and efficiency when results were compared with the standard method of estimation of pyuria per HPF in centrifuged urine.

In 51 urine samples when pus cells were quantitated per cubic millimeter, the result in tenn of sensitivity (48%) was definitely better (although the sample was small) than the results of measurement of pus cells per HPF in uncentrifuged (16.66%) and centrifuged (25.75%) urine. The results of specificity, positive predictive value, negative predictive value and efficiency are not different when compared with measurement of pus cells per HPF in uncentrifuged and centrifuged urine. Although measurement of pyuria per cubic millimeter was, thought to be more precise, but overall sensitivity of 48% was not an encouraging result. Even this sensitivity value could not be achieved by others using this method. In a study by Khan et al[12] when pus cells per CMM were correlated with bactenuria in 244 urine samples from school girls, the sensitivity was only 14.28%, specificity 99.53%, positive predictive value 50.0% and negative predictive value 97.29%. In conclusion, as the overall efficiency of pyuria as a predictor of bactenuna is low (52.01-60.78%) and does not differ significantly among the three methods, so pyuria as a predictor of bactenuria is the least reliable technique to be recommended in the routine clinical practice. Neither should a diagnosis be made nor an empirical antibiotic recommended solely on the basis of presence of pyuria. The absence of pyuria also does not rule out urinary tract infection.

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