

SEPARATORY QUANTITATIVE BACTERIURIA IN PYELONEPHRITIS

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The method introduced by Kass in recent years for quantitative investigation of bacteriuria, presently finds wide spread application in practice (quoted by 6). It is accepted that the presence of more than 100 000 (10^5) bacteria per millilitre of freshly passed urine represents an unquestionable indication for the existence of concealed or manifested inflammation of the kidneys and urinary tracts (2); from 50000—100000 — for doubtful and beneath 50000 (according to some authors (4,6) beneath 10000) — for absence of uroinfection. The bacterial culture of bladder urine however, does not give an indication as to the kidney wherefrom the infection originates. Furthermore, it does not furnish correct data as to the quantity of bacteria, owing to the fact that bacterial multiplication in the residual urine of the bladder is not precluded. Stapor (5) reports variable results from the bacteriological investigation of urine obtained from the bladder and directly from the kidney — different bacterial types from one and the same patient.

In the present paper the problem is posed for solution concerning the investigation, carried out separately from the left and right kidney, of quantitative bacteriuria in patients with chronic pyelonephritis with a view to obtaining more reliable data and more exact localization of the site of the inflammatory process. In the literature reviewed, we did not come across reports related to separate quantitative bacteriuria.

Material and Methods

A series of 30 patients was studied: 24 with chronic pyelonephritis and 6 — control cases (with hypertension — 3, rheumatoid arthritis — 2 and cholelithiasis — 1), all of them treated at the Internal Diseases Clinic — Higher Medical Institute in Varna.

In combination to other investigations as separate endogenic creatin clearance, diuresis etc., with the respective methods described in a previous report by one of the authors (3), the patients were also subjected to quantitative investigation of bacteriuria for each kidney separately. Urine was obtained from the renal pelvis through ureteral catheterization with sterile ureteral catheters № 6 and 7 (commercially available Porges) and gathered in sterile minute bottles following 20-minute-long adaptational period; urine passed during the latter period was eliminated. The investigation of the patients was carried out in the morning, after the first micturition and

drinking of 800 ml water; for at least four weeks previously the patients were not subjected to antibiotic and chemotherapeutical treatment. With a view to averting ascendent infection, 1 gr chlornitromycin was applied in the course of two days after the investigation. Till the end of the first hour after the obtaining of each urine sample (not centrifugated), urine cultures were carried out on blood agar and differentiating alimentary media for intestinal bacteria of the following quantities of urine: 0.001, 0.01, 0.05 ml. The residual urine was centrifugated and from the sediment cultures were likewise performed in order not to let unobserved lower bacteriuriae. Following an 18-hour cultivation, the number of the colonies was recorded and thereby morphological and biochemical study was performed as well as differentiation of the microorganism isolated. Lastly, its resistance was tested to various antibiotics after the diffuse agar method with disks of sterile filter paper. All the patients, in addition, were subjected to a detailed clinical examination, blood count, erythrocyte sedimentation rate, blood urea, residual nitrogen, xanthoproteins, creatinine, proteinogram, urine, Folchard's tests for concentration and dilution, blood pressure, fundi of the eyes, venous or ascendent urography, urine sedimentation after Addis, and in a few patients — also histological proving of pyelonephritis by means of intraoperationem biopsy.

Results and Discussion

Table 1 illustrates the results of the separate quantitative bacteriuria, in confrontation with the anatomical damage of the kidneys, based on the data received from the endogenic creatinine clearance and urography. It shows that in nearly all cases a parallelism exists. High bacteriuria — exceeding 10^5 per 1 millilitre was found in four patients with chronic pyelonephritis (16.6%), in two cases — from 10^4 to 10^5 bacteria per ml, in 15 cases (62.5%) the bacteriuria was beneath 10^4 and in one case with chronic pyelonephritis the urine of both kidneys was sterile. Out of a total of 6 control patients affected by non-renal diseases, the urine of both kidneys proved to be sterile in 5, and in one female patient an insignificant amount of staphylococcus albus was isolated. The relatively low bacteriuria in the patients with chronic pyelonephritis in our investigations should be explained with the direct obtaining of urine from the renal pelvis and with the higher diuresis induced in the course of investigations.

According to Walter and Weber (quoted by 2), 30% of all the infections of the urinary tracts are caused by *Escherichia coli*, and according to others (2) — in 8% and more. In instances of rather prolonged uroinfections, more frequently bacteria are isolated from the *Aerobacter* group, rather than true *coli* bacteria. In the course of the present investigations, of a total of 35 strains of isolated microorganisms, 4 appartain to the *Escherichia coli* group, 3 — to the *Aerobacter* group, 2 — *paracoli* and 2 — *Proteus* (Table 1). The role of enterococci as causative factors in uroinfection should be interpreted rather more discreetly (2). In our case material enterococci were isolated in six patients.

The four *coli*-bacteria strains isolated proved to be sensitive to streptomycin and resistant to tetracyclin, chlortetracyclin and chlornitromycin.

Table 1

No	Name	Sex	Age	Kidney afflicted	Quantity of bacteria per 1 ml urine		Genus of isolated bacterium
					left kidney	right kidney	
1	Z. N.	f	34	right	beneath 200	11000	Staphylococcus aureus
2	Tz. P.	f	64	bilateral	34000	8000	Bacterium paracoli
				mainly right	—	3000	Staphylococcus albus
3	M. R.	m	48	right	1000	14000	Escherichia coli
4	R. M.	f	59	bilateral	beneath 200	beneath 200	Staphylococcus aureus and enterococcus
5	M. N.	f	56	bilateral	3400000	4500000	Staphylococcus albus
				mainly right			
6	T. V.	f	47	mainly right	sterile	beneath 200	Bacterium lactis aerogene
					—	beneath 200	Sarcina flava
7	I. S.	f	43	bilateral	2000	beneath 200	Staphylococcus albus
8	N. K.	f	51	bilateral	460	4000	Bacterium lac'is aerog- nes
9	V. G.	f	52	bilateral	6000	beneath 200	Bacterium coli — left Enterococcus — right
10	D. T.	f	27	left	beneath 200	beneath 200	Diptheroid bacteria
11	A. P.	f	50	bilateral	sterile	sterile	—
12	N. A.	f	25	bilateral	120000	242000	Escherichia proteus
				mainly left			
13	N. M.	f	43	bilateral	beneath 200	beneath 200	Bacterium proteus
14	I. V.	f	52	bilateral	2020	480	Bacterium paracoli
					1080	—	Staphylococcus albus
15	D. P.	f	53	bilateral	beneath 200	8000	Enterococcus
16	P. Y.	f	62	bilateral	beneath 200	beneath 200	Bacterium proteus
17	J. D.	f	39	bilateral	56000	9000	Bacterium lactis aero- genus
				mostly left			
					2000	840	Sarcina flava
18	Tz. A.	f	44	bilateral	beneath 200	beneath 200	Staphylococcus aureus
				mostly right			
19	S. S.	f	39	bilateral	beneath 1000	beneath 200	Escherichia coli — left Staphylococcus albus — right
20	V. H.	f	46	bilateral	beneath 200	beneath 200	Streptococcus pyogenes — left
							Sarcina — right
21	I. M.	f	63	bilateral right— no urine passed	5100000	no urine passed	Bacterium proteus
22	N. K.	f	65	bilateral right— no urine passed	4700000	no urine passed	Enterococcus
23	Y. T.	f	40	left — no urine passed	po urine passed	beneath 200	Streptococcus pyogene
24	D. P.	f	57	left — no urine passed	no urine passed	beneath 200	Enterococcus

Controls

25	V. N.	f	39	Cholelithiasis	sterile	sterile	—
26	S. V.	f	51	Hypertension	sterile	sterile	—
27	E. T.	f	50	Hypertension	beneath 200	beneath 200	Staphylococcus albus
28	S. M.	f	58	Hypertension	sterile	sterile	—
29	F.	f	55	Rheumatoid arthritis	sterile	sterile	—
30	R. K.	f	40	Rheumatoid arthritis	sterile	sterile	—

The *Lactis aerogenes* strains exhibited higher resistance to antibiotics as compared to the true coli-bacteria. Of the 3 strains isolated, two appeared to be resistant to streptomycin, 1 — to chlortetracyclin, whereas the remainder showed weakly pronounced sensitivity in relation to the antibiotics listed, and to tetracyclin and chlornitromycin as well. The three strains isolated from the *Proteus* group displayed mildly manifested sensitivity to tetracyclin and chlortetracyclin, whereas two were resistant to streptomycin.

Of the six enterococci strains isolated, 3 proved to be resistant to penicillin, 2 — to streptomycin and 1 — to tetracyclin and chlortetracyclin. Of the 10 strains of staphylococci isolated, six were resistant to penicillin, three — to streptomycin, two — to erythromycin, vulkamycin, resistomycin, chlornitromycin and orafuran (Furadantin). The two strains isolated from streptococcus pyogenus exhibited high sensitivity to erythromycin, vulkamycin, chlornitromycin, moderate — to streptomycin, resistomycin, rovamycin, chlortetracyclin and resistant to penicillin and tetracyclin.

Inferences

1. For the first time a separate quantitative counting of bacteria in the urine is carried out in pyelonephritis.

2. The method of separate quantitative bacteriuria yields more accurate results compared to investigation of bladder urine and is preferable, provided it is carried out in combination with other investigations.

3. The normal separate quantitative bacteriuria values should be recorded substantially lower than in bladder urine.

4. The separate quantitative bacteriuria provides for orientation in cases of unilateral pyelonephritis.

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СЕПАРИРОВАННАЯ КОЛИЧЕСТВЕННАЯ БАКТЕРИУРИЯ ПРИ ПИЕЛОНЕФРИТЕ

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РЕЗЮМЕ

Исследована сепарированная количественная бактериурия — из левой и правой почки — у 30 больных: 24 с хроническим пиелонефритом и 6 контрольных. Отмечается более низкое содержание бактерий в 1 мл мочи при хроническом пиелонефрите, что авторы ставят в связь с особенностью метода — моча забирается прямо из почечной лоханки. Указывается на большую достоверность результатов при этом методе исследования и на направляющие данные при одностороннем пиелонефрите. Среди контрольных случаев, в 5 моча была старильной, а в одном — содержала менее 200 бактерий в 1 мл мочи.