Amikacin - treatment of an urinary tract infection in a hemodialysis patient – what may be eventually missed?

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Abstract

The study is presenting a clinical case of a diabetic patient on regular haemodialysis treatment with an exacerbated urinary infection, demonstrated by fever, microhematuria, disuria and significant bacteriuria. The urinary bacterial infection (Pseudomonas aeruginosa >10^5, sensitive to amikacin) was treated ineffectively by an aminoglycoside (amikacin) until pH of the urine was changed to slight alkaline level – the appropriate media in which aminoglycosides are effective and reasonably applied. The successful treatment after alkalization proved that pH of the media is of great importance for aminoglycoside’s therapy and must not be neglected. Hippokratia 2006; 10(1):39-40

Key words: urinary tract infection, aminoglycosides, acid or alkaline media, diabetes mellitus, haemodialysis

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Case report

We present a 68 year-old patient with the following diagnoses: Diabetes mellitus-insulin dependent type; Diabetic nephropathy, retinopathy and neuropathy; Secondary recurrent chronic pyelonephritis; Adenoma prostate; End stage renal disease - on hemodialysis treatment; Secondary anaemia and hypertension; Uremic, hypertonic and febrile encephalopathy; Uremic and hypertonic cardiomyopathy; Cardiac failure; Psoriasis; Psoriatic arthri-
Urethral catheter for drainage of the urine.

The patient was admitted urgently in our clinic because during his last regular haemodialysis session he complained of severe fatigue, disorientation, hypertension - 200/100 mm Hg, fever with high temperature – 38.2°C. A blood culture for microbiology was taken and some antipyretics were administered. At the end of the session the status of the patient worsened and the patient became unconscious. The glucose blood level was slightly above the normal range – 6.8 mmol/l. Consulting neurologist concluded that there was a temporary disturbance in consciousness, related to the hypertonic reaction and the fever and recommended infusion of mannitol and antihypertensive treatment. The next day the patient regained consciousness but had an almost permanent higher temperature, reaching 39°C. The urine in the collecting bag was cloudy and its color was pale-pink (microhematuria). A randomly selected antibacterial treatment with cephazolin in appropriate doses was started and the urethral catheter was replaced with a new one. On two consequent days urine cultures for antibacterial treatment combined with alkalization of the urine were sterile and the patient’s status improved. The antibiotic had to act.

The patient was changed which showed presence of pseudomonas aeruginosa was negative). Five days later according to the results, microbiology were sent (meanwhile the blood culture showed the presence of pseudomonas aeruginosa. The patient was given oral sodium bicarbonate in high doses to alkalize the pH of the medium (urine) where amikacin was started. At the fourth day from the start of aminoglycoside’s therapy the temperature continued to be high and we decided to check urine pH. Not too much surprisingly pH was in the range of 5 - 5.5 and the patient was given oral sodium bicarbonate in high doses to alkalize the pH of the urine (where amikacin had to act. Three days later pH of the urine was in the range of 7.2 – 7.6 and the body temperature decreased to normal levels. The next 3 urine cultures were sterile and the patient’s status improved. The antibiotic treatment combined with alkalization of the urine has worked well. The patient was discharged in good health, considering his overall state, with normal body temperature, sterile urine and continuing ambulatory haemodialysis treatment.

Discussion and conclusions

The aminoglycoside antibiotics are predominantly used to treat infections caused by Gram negative bacteria and their effectiveness is much higher than in cases of Gram positive agents. Antibiotic activity of the aminoglycosides is pH dependent. Aminoglycosides are much more active in an alkaline pH.

Their antibacterial action at standard concentrations can be eliminated as the pH reaches 5 to 5.5 and it would be a mistake of the “medical art” to use them without taking into account pH level of the media where the antibiotic has to act. Small changes in the pH of the medium will affect the ratio of ionized and non-ionized aminoglycosides. That is quite important because only the non-ionized aminoglycosides are active. pH is particularly important in therapy of urinary tract infections. Alkalization of the urine with bicarbonate or carbonic anhydrase inhibitors (e.g., acetazolamide) may dramatically increase the antimicrobial effect of the aminoglycosides on bacterial pathogens.

Our experience, described in this case report, proved once again that simple fact and we would like to remember the nephrologists and urologists how important could be such a formally negligible detail for a successful treatment.

References: