



Bacterial and Fungal Infections in the Early Post-Transplant Period After Kidney Transplantation: Etiological Agents and Their Susceptibility

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ABSTRACT

Background. Infections remain serious complications in solid-organ transplant recipients, despite professional medical care, the introduction of new immunosuppressive drugs, and treatment that decreases the risk of infections.

Methods. The study covered 295 adult patients undergoing kidney transplantation (KTx) between September 2001 and December 2007. All the patients were followed prospectively for infections from the KTx date and during the first 4 weeks after surgery. Samples of clinical materials were investigated for microbiological cultures. The microorganisms were cultured and identified in accordance with standard bacteriological procedures. Susceptibility testing was carried out through the use of Clinical and Laboratory Standards Institute procedures.

Results. From 295 KTx recipients, 1073 clinical samples were taken for microbiological examination. Positive cultures were 26.9% (n = 289) of all samples tested; 525 strains were collected. Gram-positive bacteria were isolated in 52.2% (n = 274), Gram-negative bacteria were isolated in 40.8% (n = 214), and fungal strains were isolated in 7% (n = 37). Urine specimens (n = 582) were obtained from 84.5% of 245 recipients during the first month after transplantation. Among the isolated bacterial strains (n = 291), the most common were Gram-negative bacteria (56.4%). Gram-positive bacteria comprised 35.7%; fungal strains were found in 23 cases (7.9%). In surgical site specimens (n = 309), Gram-positive bacteria (72.1%) were the most common. Gram-negative bacteria comprised 24.4%. In blood specimens (n = 138), Gram-positive bacteria (81.6%) were the most common. Gram-negative bacteria comprised 15.8%; fungi were isolated in 2.6%. In respiratory tract specimens (n = 13), among the isolated bacterial strains (n = 8), the most common were Gram-positive bacteria (57.1%). Gram-negative bacteria comprised 14.3%; fungi were isolated in 28.6%.

Conclusions. Urine samples were predominantly positive after KTx. Our study showed Gram-positive bacteria in 52.2% after kidney transplantation. The proportion of isolates of multi-drug-resistant bacterial strains (MRCNS, vancomycin-resistant strains, high-level aminoglycoside-resistant strains, extended-spectrum beta-lactamase producers, and high-level aminoglycoside-resistant strains) was increased. These data indicate the need for strict adherence to infection control procedures in these patients.

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It has been reported in many studies that one of the main factors influencing morbidity and mortality in transplant patients is infections after transplantation [1-7].

Much of the data in the literature also indicates that the first month after transplantation is characterized by the occurrence of infections [8-11].

It is necessary an appropriate microbiological diagnostics etiological factors of these infections, which determines the targeted treatment and reduces the excessive use of antimicrobial agents [12].

This is important in connection with the possibility of multi-drug-resistant strains (MDR) of microorganisms and increase in the cost of antibiotic therapy [13,14].

Infections caused by bacterial strains resistant to chemotherapeutic agents are a growing problem in patients after transplantation [15].

The development of the solid-organ transplantation procedure in Poland requires a better understanding of the issue of infections in transplant recipients in our country. Therefore, it was justified to analyze the frequency at which microbe strains occur, their biochemical profile, and susceptibility to antimicrobial agents in patients after solid-organ transplantation in the early post-transplant period. The aim of our study was to estimate the etiological agents associated with infections and the susceptibility to antibacterial agents among patients after KTx at the Department of General Surgery and Transplantation of the Transplantation Institute, Medical University of Warsaw, performed from 2001 to the end of 2007.

METHODS

The patient population included 295 KTx recipients in the first post-transplant month. Of these, 116 were women and 179 were men (mean age, 43.7 ± 12.8 years) with end-stage renal disease who underwent transplantation (100% deceased donor; DD) between September 2001 and December 2007 and who survived for more than 72 hours.

All the patients were followed prospectively for infections from the day of KTx and for the first 4 weeks after surgery. This 6-year period of observation of transplant patients was subdivided into 2 sub-periods: from 2001 to 2004 and from 2005 to 2007.

Standard immunosuppression consisted of calcineurin inhibitors with antiproliferative agents and steroids, according to recommendations of the Polish Transplantation Society.

Basic antimicrobial prophylaxis was administered intravenously from the day of transplantation: ceftriaxone (1 to 2 grams daily) was given for 3 days after transplantation, and co-trimoxazole (480 mg daily) was given to the majority of recipients according to recommendations of the Department of General Surgery and Transplantation of the Transplantation Institute, Medical University of Warsaw.

The clinical samples were investigated for microbiological cultures. Isolated strains were identified and characterized by means of standard microbiological methods at the Chair/Department of Medical Microbiology at the Medical University of Warsaw.

The microorganisms were cultured and identified according to standard bacteriological procedures (ATB System, bioMerieux, France). Susceptibility of the strains to antibacterial agents was evaluated by use of the Clinical and Laboratory Standards Institute guidelines.

An analysis of the susceptibility of the strains to antimicrobial agents was performed for microbes that are pathogenic for humans.

The presence of MDR bacterial strains after KTx required a separate susceptibility analysis for MDR strains.

Because of the different scope of medical management in the first month after the transplantation, the microbiological results were analyzed separately for each of the consecutive 4 weeks. All data were recorded on standard forms and entered for computer analysis with the use of MediStat software (Poland). The differences between isolated strains in these 4 periods were evaluated by means of statistical analysis with the use of the SAS 9.1 program: χ^2 test and Fisher test. Differences between the incidence rates in 2 periods (2001 to 2004 versus 2005 to 2007) were performed by use of the bootstrap method. The significance level was considered to be $\alpha = 0.05$.

Because of the different characteristics and scope of medical care in renal transplant recipients, liver, kidney, and pancreas, an early period after transplantation was divided into 4 sub-periods in detail (I: 1 to 7 days, II: 8 to 14 days, III: 15 to 21 days, IV: 22 to 30 days), and each type of organ transplant underwent separate analysis.

RESULTS

All the KTx recipients were followed prospectively for the first 4 weeks after surgery. From 295 patients, 1073 of the clinical samples were taken for microbiological examination. Positive cultures were 26.9% ($n = 289$) of all samples tested; 525 strains were collected. Gram-positive bacteria were isolated in 52.2% ($n = 274$), Gram-negative bacteria were isolated in 40.8% ($n = 214$), and fungal strains were isolated in 7% ($n = 37$). Urine specimens ($n = 582$) were obtained from 84.5% of 245 recipients during the first month after transplantation. Among the isolated bacterial strains ($n = 291$), the most common were Gram-negative bacteria (56.4%). Gram-positive bacteria comprised 35.7%; fungal strains were found in 23 cases (7.9%). In surgical site specimens ($n = 309$), the most common were Gram-positive bacteria (72.1%). Gram-negative bacteria comprised 24.4%. In blood specimens ($n = 138$), the most common were Gram-positive bacteria (81.6%). Gram-negative bacteria comprised 15.8%; fungi were isolated in 2.6%. In respiratory tract specimens ($n = 13$), among the isolated bacterial strains ($n = 8$), the most common were Gram-positive bacteria (57.1%). Gram-negative bacteria comprised 14.3%; fungi were isolated in 28.6%.

Urine specimens were examined in 245 recipients (84.5%) during the first month after transplantation; 582 urine samples were investigated. Bacterial and fungal strains were cultured in 132 (22.7%) positive urine samples. Among the bacterial strains isolated in early period after KTx ($n = 291$), the most common were Gram-negative bacteria (56.4%) with domination of *Serratia marcescens* (32.3%), *Enterobacter cloacae* (14.6%), and *Escherichia coli* (12.2%). The extended-spectrum beta-lactamase producers (ESBL+) from *Enterobacteriaceae* family strains were isolated in 52.5%. Gram-positive bacteria comprised 35.7%; the most common strains were enterococci (87.5%). The percentage of high-level aminoglycoside-resistant strains (HLAR) was 87.8% and the percentage of vancomycin-resistant (VRE) strains, was 11%. The strains of

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