

The importance of preventive measures in the prophylaxis of infections in patients submitted to heart transplant during the first thirty postoperative days

A importância de medidas preventivas na profilaxia de infecções em pacientes submetidos a transplante cardíaco nos primeiros 30 dias de pós-operatório

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Abstract

Objective: To describe the rate of infections presented by patients submitted to heart transplant during the first thirty days after surgery in respect to the topography and etiological agent and to compare the rate of infection during the immediately postoperative period with the preventive measures adopted for infection control.

Methods: A retrospective study was made of a population consisting of 125 patients submitted to heart transplant from June 1984 to January 2004. Data were collected by analyzing patients' records following a specific investigative sequence. The ages of the patients ranged from 9 days to 71 years old, with a median of 47 years. There was a predominance of men (75.2%).

Results: During the first thirty postoperative days, 32.8% of the patients presented with infections. These were

predominantly bacterial infections (32%), followed by fungal infections (5.6%) and those caused by viruses (4%). No difference was observed in the rate of infection comparing two situations: (1) nursing care of patients using protective isolation (29.9%); and (2) without protective isolation (36.2%) ($p = 0.835$).

Conclusion: Bacterial infections predominated followed by fungal and viral infections. The protective isolation initially used in post-heart transplant patients proved unnecessary as a measure to prevent or reduce rates of infection, confirming data obtained specifically in North American studies. These data are useful to guide protocols as they take specificities of our environment into account.

Descriptors: Heart transplantation, nursing. Infection control.

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Resumo

Objetivo: Descrever a incidência de infecções apresentadas pelos pacientes submetidos a transplante cardíaco, durante os primeiros 30 dias da cirurgia, quanto à topografia e agente etiológico e, comparar a incidência de infecções no pós-operatório imediato ao transplante cardíaco com as medidas preventivas adotadas no controle de infecções.

Método: Estudo descritivo de séries históricas numa população de 125 pacientes submetidos a transplante cardíaco, de junho de 1984 a janeiro de 2004. A coleta de dados foi realizada mediante a análise dos prontuários dos pacientes submetidos a transplante, com o auxílio de um roteiro investigativo específico. A idade da população variou de 9 dias a 71 anos, com mediana de 47 anos. A predominância foi do sexo masculino (75,2%).

Resultados: Apresentaram infecção, nos primeiros 30 dias pós-cirurgia, 32,8% dos pacientes. Houve predominância das

infecções bacterianas (32%), seguindo as fúngicas (5,6%) e as causadas por vírus (4%). Não se observou diferença na incidência de infecção, quando comparadas em duas situações: (1) na assistência de enfermagem ao paciente com uso de isolamento protetor (29,9%); e (2) sem isolamento protetor (36,2%) - $p=0,835$.

Conclusão: As infecções bacterianas predominaram nesta população, seguidas das fúngicas e virais. Observou-se que não houve diferença na incidência de infecções, quando comparadas as distintas medidas preventivas, com e sem uso de isolamento protetor, confirmando pesquisas norte-americanas. Esses dados mostram-se úteis para orientação de protocolos, visto que apresentam particularidades do nosso meio.

Descritores: Transplante de coração, enfermagem. Controle de infecções.

INTRODUCTION

The last decades have seen an immense improvement in the success of transplantations. Patients with a dismal prognosis had the opportunity of new treatment that improved their quality of life. There has been a progressive increase in the number of heart transplantations since the first performed by Barnard in South Africa in 1967, whose technique was standardized by Lower & Shumway in 1960 [1].

According to data from the International Transplantation Society, a total of 60,948 heart transplantations were performed in 297 centers worldwide from January 1982 to January 2002 [2].

In 1974, great changes in the survival of patients were attributed to the introduction of a technique of endomyocardial biopsy to monitor rejection. Another development related to survival was the introduction of cyclosporin in 1980 as a major immunosuppressant agent [3]. However the use of immunosuppression made the recipient susceptible to infections, which were responsible for the increase in morbimortality after transplantation even with the use of antibiotics.

Infections related to heart transplantation occur in two principal periods. The first period is the immediate postoperative period up to the end of the first month, in which primary bacterial infections predominate; infections of the surgical wound, urinary tract infections and hospital pneumonia. During this period, immunosuppression therapy is high with the aim of preventing graft rejection. Moreover, recipients are subject to invasive monitoring with thoracic drains, endotracheal tubes, venous catheters and vesical

probes. The second period starts after the first postoperative month; in this period, opportunist infections caused by viruses, fungi and protozoa predominate.

Aiming at providing a greater protection for immunodepressed receptors, protective isolation was initially utilized as a preventive measure to care for the patient. Isolation included the use of a private room and healthcare professionals clothed in a gown, mask, surgical shoe covers and cap in addition to the established universal precautions. From 1997, the isolation policy was discontinued based on studies from the USA. Thus, there are two distinct periods that characterized nursing assistance, which are using protective isolation and after the cessation of this measure. The aim of this study was to investigate the incidence of infections during these two periods.

The size and the complexity of the developments of surgical procedures, the advent of new technology in surgeries, questions of professional practice in nursing, the continuous renovation of healthcare assistance, changes in recommended practices and the growth both of research and guidelines demand constant attention to educational and professional development [5].

Improved techniques to compare nursing interventions are urgently needed to obtain better results in the treatment of patients thereby minimizing exposure to risk.

METHOD

This is a descriptive study of a historical series from the Cardiology research institution - University Foundation of Cardiology of Rio Grande do Sul. Patients submitted to heart transplantation in the period of June 1984 to January

2004 participated in the study. The sample was composed of 125 patients.

The current study was performed by analyzing the records of patients submitted to heart transplantation, placing them in groups depending on the period in which the procedure was performed to classify them as protective isolation (June 1984 to January 1997) or without protective isolation (February 1997 to January 2004). In the analysis of the patients' records, the data considered relevant were investigated. The diagnosis of infections followed the criteria utilized by the clinical cardiology group responsible for the patients in the postoperative period based on the guidelines of the Centers for Disease Control (CDC), in which specific and non-specific laboratorial examinations were requested according to the routine practices of the service and the clinical state of the patient. Contributing to the reliability of the collected data and diagnosis of infections, the service of Hospital Infection Control accompanied the situation of patients during daily visits with all comments registered on the patients' records.

The work was approved by the Institution's Ethics Committee respecting the established norms for the use of databases.

Analysis of the data utilized the median, size, proportions and incidence. For comparisons between the qualitative variables of the two periods, the chi-squared test with continuous correction or the Fisher exact test were utilized. The level of significance was set at a p-value < 0.05.

RESULTS

In respect to the age of the studied population, the mean was 42.5 years and the median was 47 (ages range from 9 days to 71 years). Among the 125 patients, 94 were men (75.2%).

In relation to the surgical technique of heart transplantation, 98 (78.4%) patients underwent surgeries by the conventional technique (Shumway), 22 (17.6%) were submitted to the bicaval technique, three (2.4%) had heterotopic transplantations and two (1.6%) performed heart-lung transplantations.

Infections in the first 30 post-transplant days, according to the criteria utilized, were identified in 32.8% of the cases with 67.2% of the transplanted individuals free of infection in this period.

Eight percent of cases presented with colonization of the catheter tip (central or peripheral) without evolution to infection.

During the analysis of the patients' report cards, the period in which protective isolation was identified and the patients were classified in respect to the use of protective isolation or not. Thus, 53.6% of the patients were transplanted before discontinuation of protective isolation

and 46.4% after cessation of this practice. Comparing the analyzed periods (with and without protective isolation) in respect to infection, 29.9% of the protective isolation patients were infected and 36.2% patients without protective isolation. (Table 1)

There was no significant difference in the infection rates comparing the different periods (p-value = 0.835). Moreover, a comparison of colonized catheters also did not demonstrate significant differences between the two periods studied (p-value = 0.104).

Respiratory tract infections predominated, followed by tissue and urinary tract infections. (Table 2)

Different etiological agents were found in each of the topographies. In respiratory tract infections, *Enterobacter sp.* predominated (Figure 1).

In the urinary tract, *Candida albicans* was identified in three patients (2.4%) and *Escherichia coli* (1.6%) in

Table 1. Comparison of the incidence of infection in respect to the use of protective isolation of not

Infection	with protective isolation		without protective isolation		p-value
	n	%	n	%	
infection	20	29.9	21	36.2	0.835
No infection	39	58.2	35	60.3	
Colonization of catheters	08	11.9	2	3.4	0.104

Table 2. Distribution of infections in each topography

Topography	n	%*
Respiratory	25	20
Tissue	15	12
Urinary	10	8
Surgical wound	7	5.6
Sepses	4	3.2
Gastrointestinal	1	0.8
Free of infection	84	67.2

* Sample size: 125 patients

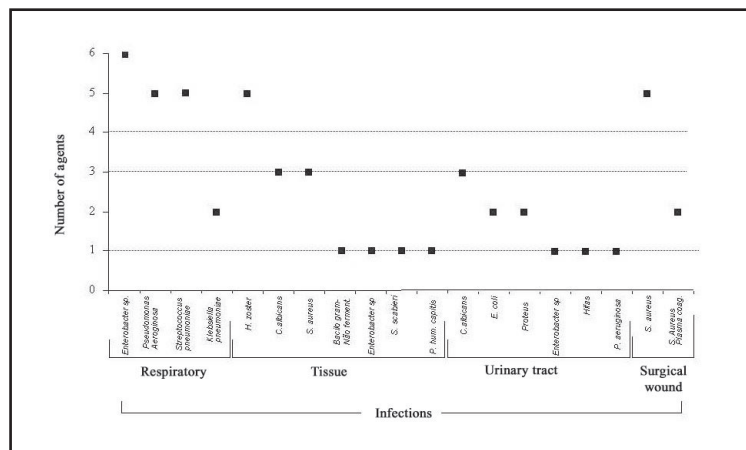


Fig. 1 – Distribution of etiological agents causing infections associated to main topographies

two. *Herpes zoster* characterized five cases (4%) of tissue infections (Figure 1) and there were five cases (4%) of surgical wound infections by *Staphylococcus aureus* (Figure 1). Two cases (1.6%) of sepsis by *Klebsiella* were identified. Infections of the gastrointestinal tract (0.8%) were restricted to one etiological agent – *Pseudomonas aeruginosa*.

DISCUSSION

The number of patients submitted to heart transplantation is increasing. In this population, infections occur in 31 to 90% of patients with many of these cases are related to the post-transplantation period [6].

The period analyzed in this study was the first 30 post-transplant days. In this period exposure to potential pathogens and the immunosuppression state of the patient which favors infections are important. These are the causes of 17 to 40% of deaths which most commonly occur between the 15th day and the third post-transplant month [7].

Bacteria were the most common agents found in this study, with hospital-borne pneumonia bacteria in 20% of the cases being the most common infections.

The infections that occur in the first month after transplantation frequently are the same bacterial hospital infections or infections caused by candida as those of the surgical wound, lungs, urinary tract or vascular accesses found in surgery patients without immunosuppression. Additionally, the graft itself can transmit bacterial or fungal infections in the first post-transplant month [4].

In a similar study by Aziz et al. [8], 248 patients submitted to heart transplantation in a single institution in the period

from April 1987 to April 1997 were evaluated. Eighty-three percent of the patients remained free from infection in the first post-transplant month. The most common sites of infection were the lungs (35%), the blood (19%), the gastrointestinal tract (10%), the urinary tract (6%) and the surgical wound (3%). Bacterial and viral infections were the most common (47% and 39%, respectively) with 8% of fungal infections. The greatest risk for bacterial infection was immediately after the surgery and by fungus it was in the fourth to sixth postoperative weeks. The highest incidence of viral infections was seen after approximately two months of the postoperative period.

As this study analyzed patients in the first 30 post-transplant days, a predominance of bacterial infections was seen (32%); there were 5.6% of fungal and 4% of viral infections.

Numerous studies support these findings, characterizing a predominance of pulmonary bacterial infections including those by Bernabeu-Wittel et al., Kirsch et al. and Almeida et al. [9,10].

Infections caused by fungus generally occur between the first month and six months after transplantation of solid organs with an association to deaths in this period. Infection by candida (endogen or exogen) occurs in immunocompromised patients in intensive care units [11].

Some less severe opportunist infections such as reactivation of herpes can occur with a certain frequency within the first postoperative month.

In this work, a low incidence of viral infections was observed as they more frequently occur between the second and sixth postoperative months. In this period the main opportunist infections appear including those caused by cytomegalovirus, toxoplasmosis and reactivation of Chagas Disease [12].

Due to the susceptibility of post-transplant heart patients to infections because of low immunosuppression, initially isolation was used as special protection for the patient. This measure includes the use an individual room and specific clothing, including protective gown, mask, gloves, surgical shoe covers and cap as well as the normal precautions. These are indicated for all patients where contact with blood and other body fluids, secretions or excretions, broken skin and mucous membranes is anticipated [13].

Washing of hands and universal precautions are used as protective support for hospitalized patients [3].

A retrospective review of 51 transplanted patients treated in isolation and 55 transplanted patients without isolation revealed that the change did not have any significant impact on the incidence of infections or mortality or morbidity rates associated with infections [14].

Sixty heart transplant patients with a mean age of 49

years were analyzed in a randomized prospective study in which 30 patients were treated with protective isolation and the other 30 patients spent the recovery period in an intensive care unit. In the ICU there were patients submitted to other types of transplantation, as well as post-trauma, neurosurgical and general surgical patients. Surgical and pulmonary infections occurred in both groups. There was no significant difference between the two groups in respect to the incidence of infections. The number of deaths was also the same, that is, two deaths in each group. In relation to etiological agents (bacterial, viral, fungal and protozoa) there were also no significant differences between the two groups [15].

In another North American study, two groups of patients submitted to different solid organ transplants, with the exception of kidney transplants, were compared. This was a randomized prospective study in which 100 patients were allocated to a group with a rigorous protocol of hand washing and 100 other patients were treated with protective isolation using a gown and gloves. After one year, the overall infection rate of the groups was similar [16].

For transmission of infectious diseases to occur it is necessary to have: a host susceptible to infectious agents; the presence of an infectious agent in a sufficient concentration to cause the infection; an entrance for the agent to contaminate the host and an adequate transmission route of the agent to the host [17].

The acquisition mechanisms of infections continue the same, however currently, patients are compromised by more severe diseases and present with worse prognoses. Immunosuppressant medications are widely used favoring the development of infections by bacteria resistant to antimicrobial therapies and patients are submitted to invasive procedures in specialized units with much manipulation by healthcare specialists [18].

Since the first publication on protective isolation in 1970 the precautions against infections have been modified in an attempt to find the ideal model that reflects a good efficacy and cost-benefit ratio of the measures used; however, one measure has prevailed in all models since 1845 thanks to Semmelweis: hand washing [19].

Rosenthal et al. [20], in their observational study on the effect of continuous education in hand washing in Argentinean hospitals, showed that, in the first phase of the study, when the professionals had had no training in hygiene, there was an adherence rate of 16.5%. In the subsequent phase of this study however, after training these professionals there was an adherence rate of 58.1%.

Education is essential in respect to perfecting these practices, with the aim of preventing infections. Education of healthcare professionals should be provided at every level of experience within an institution [21].

The limitations of this study should be considered. It is an observational study of a retrospective nature there

are numerous confounding factors that may interfere in the results. However, data collection was rigorous in an attempt to minimize losses and follow the same protocol in both of the periods. In spite of the growing complexity of the procedures and infections, isolation does not prove to be more efficacious in preventing infections, reinforcing previously published results.

CONCLUSION

In conclusion, no significant difference was observed in the incidence of infections when comparing the distinct periods – with and without protective isolation – confirming published data mainly from North American research.

These data prove useful for the planning of protocols.

Prevention of infections is one of the most important objectives of the nursing team whilst caring for the patients. Thus, all aspects should be analyzed, discussed and studied aiming at providing the greatest safety for the patient and impeding infections from interfering with the success of heart transplantations.

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