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Brain death and tissue and organ transplantation: the understanding of medical students

Morte encefálica e transplante de órgãos e tecidos: o entendimento dos alunos do curso de Medicina

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ABSTRACT

Objective: To evaluate the level of knowledge of medical students about transplantation and brain death.

Methods: An anonymous self-administered questionnaire answered by medical students from the first through the sixth year that was based on information from the *Associação Brasileira de Transplante de Órgãos e Tecidos*, the *Registro Brasileiro de Transplantes* and the resolution that defines the criteria for brain death.

Results: Of the 677 medical students asked, 310 (45.8%) agreed to answer the questionnaire. In total, 22 (7.0%) subjects

were excluded. Of the students who participated, 41.3% reported having already attended a class on organ transplantation and 33% on brain death; 9.7% felt able to diagnose brain death ($p < 0.01$); only 66.8% indicated the kidney as the most transplanted solid organ in Brazil.

Conclusion: The level of knowledge of medical students at this institution regarding brain death and transplantation is limited, which may be the result of an inadequate approach during medical school.

Keywords: Students, medical; Organ transplantation; Tissue and organ procurement; Brain death; Questionnaire; Education, medical

INTRODUCTION

Organ transplantation is an alternative for the treatment of certain diseases that are otherwise considered terminal.⁽¹⁾ Kidney and liver transplants have increased in the last few years.^(1,2) In contrast, the rates of lung, heart and pancreas transplants have remained stable in the last 10 years.⁽²⁾ Nonetheless, the waiting lists are still long and, many times, patients die before they are called, mainly because of the low number of effective donors.⁽³⁾

According to Amaral et al.⁽⁴⁾ the effectiveness of the transplant process depends on the knowledge of the population on the subject. The main individual responsible for transmitting this knowledge is the doctor, who often does not participate in the donation process. Thus, the poor knowledge of the physician (being unaware of a brain death (BD) diagnosis and maintaining a potential donor) regarding transplantation may negatively influence every step of the donation process.

To overcome this situation, it is important that more cases of BD be properly identified and that doctors know the transplantation process flowchart, in addition to training competent professionals in this area, to increase transplant numbers.⁽⁴⁾ Therefore, one effective strategy is to act early in the medical

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education system, focusing medical studies on transplant, including the BD diagnosis, identification of potential donors, and forming procurement teams and specific organ transplant teams in all areas.⁽⁵⁾

The *Sistema Único de Saúde* (SUS) in the State of São Paulo has the largest chain of high-complexity services in Brazil, a fact that is reflected in the characteristics of its production, which is, proportionately, more specialized in its procedures than the rest of the country. Thus, while the State of São Paulo has 22% of the population of Brazil, SUS/SP oversaw 29% of the high-complexity hospitalizations and 42% of the transplant hospitalizations in 2009 compared to the country as a whole.⁽⁶⁾ The majority (58.5%) of the people in the State of São Paulo are concentrated in three metropolitan areas: Greater São Paulo, Campinas and Santos.⁽⁷⁾ The first two have transplant services available that are mostly affiliated with training centers.

The present study aimed to assess the understanding of medical students at a private university with respect to BD and transplantation.

METHODS

Study design and population studied

This study was a cross-sectional descriptive study conducted with students from the first through the sixth year of medical school in a private college in the city of Santos (State of São Paulo - SP) that was affiliated with a reference public hospital. This hospital serves a population of over 1.6 million people living in nine counties of the Baixada Santista,⁽⁷⁾ but it does not have a transplant service, despite having two educational centers and 1,600 medical beds, 737⁽⁸⁾ of which are from the SUS.

The participants were asked to answer a voluntary anonymous questionnaire, to assess their degree of understanding about the organ donation process, BD diagnostic criteria and knowledge about the national scope of the transplant program. The study was initiated after it was approved by the Human Research Ethics Committee of the *Centro Universitário Lusitana* - UNILUS (protocol number 114/2011), and informed consent was obtained from all of the participants.

Research instrument

Because there have been few studies with the same purpose as the present study, no validated tools were found, which required the application of a questionnaire

developed by the authors that considered basic information on transplants provided by the *Associação Brasileira de Transplante de Órgãos* - ABTO,⁽⁹⁾ the *Registro Brasileiro de Transplantes* - RBT⁽²⁾ and Resolution No. 1,480/97 of the Federal Council of Medicine (*Conselho Federal de Medicina* - CFM),⁽¹⁰⁾ which defines the criteria for a BD diagnosis.

The questions were divided into three parts: (1) characterization of the population; (2) assessment of knowledge about the national scope of organ transplantation; and (3) assessment of knowledge about the diagnostic criteria for BD.

Population selection

The invitation was extended to all of the students of the institution, and the study was presented in class with the teachers' permission. The students were invited to participate after their learning activities, and those who signed the Informed Consent Form (ICF) were included. Students in boarding regimens were contacted at their respective wards. Anonymous self-administered questionnaires were used, and the participants were requested to return the questionnaire within 20 minutes. The completed forms were deposited at a specific location out of sight of the researchers. The approach in the classroom and in the wards was conducted in a standardized way over only one month to ensure that the collection was concurrent between students. Those participants who exceeded the 20-minute time limit to return the questionnaire were excluded.

Statistical analysis

Students from the first through the sixth year were divided into three subgroups: (1) first and second year; (2) third and fourth year; and (3) fifth and sixth year. There was no sample size calculation because we intended for all of the students to participate in the study. The statistical analysis was performed using the JMP 5.1 software. After a general description of the population, the differences were analyzed by the chi-squared test with a significance level of 5% ($p=0.05$).

RESULTS

Characterization of the students and their opinions on the subject

Of the 677 medical students, 310 (45.8%) agreed to answer the questionnaire. Of these students, 22 (7%)

returned the questionnaire without answering it or answered it in more than 20 minutes and were excluded from the study. The remaining students were not present at the time of the initial approach (Table 1). Of the participants, 41.3% reported having already attended a class on organ transplantation, including 14% in group 1, 43.6% in group 2 and 78.9% in group 3 ($p<0.01$). In total, 33% reported having attended a class on BD: 2.8% in group 1, 41.8% in group 2 and 62.8% in group 3 ($p<0.01$). In the self-assessment, 25.5% considered their knowledge level about organ transplantation as excellent or good, and 9.7% felt able to diagnose BD ($p<0.01$).

Assessment of knowledge about the national scope of organ transplantation

Regarding living donor transplantation, 98.9% thought that this type of procedure could be performed (Table 2) with the kidneys (96.2%), bone marrow (90.3%), liver (63.2%), lungs (27.8%) and heart (2.8%).

Regarding exclusion from the waiting list as a recipient, the students thought that the following patients should be excluded: drug users (33.7%), alcoholics (24.6%), non-donors (7.3%), foreigners (4.2%) and criminals (2.8%), and 57.6% thought that no one should be excluded. Regarding exclusion of donors, students reported that HIV+ patients (89.6%), cancer patients with metastases (83%), patients with brain tumors without metastasis (6.6%) and patients with sepsis or multi-organ system failure (MOSF) (75%) should be excluded. Among all the students, 77% thought that SUS pays for living donor transplantation and deceased donor transplantation, 16.3% thought that SUS only pays for deceased donor transplantation, and 4.9% thought that SUS only pays for living donor transplantation.

Evaluation of knowledge about brain death

Regarding BD diagnosis, 66.0% of the students thought that two doctors not members of the transplantation team would be necessary, which was a more frequent belief in the group of 5th and 6th year students ($p<0.01$); 43.7% of the students thought that two clinical evaluations with a time interval determined by the age of the patient would be necessary ($p=0.09$). As a complementary test, 35.4% of the students indicated the need for a transcranial Doppler ($p<0.01$). Regarding an indication to perform resuscitation in the event of cardiorespiratory arrest, 78.1% thought that the patient should be resuscitated ($p=0.46$) (Table 3).

DISCUSSION

The present study showed that medical students have a low level of knowledge about organ and tissue transplantation and BD. This subject of organ transplantation is not addressed uniformly in the curriculum of medical schools.⁽¹¹⁾ In addition, the low level of knowledge about BD is due, in part, to the limited contact that students have with this subject prior to graduation.⁽¹²⁾ Regarding the medical education at the institution studied, there is only one specific class about kidney transplantation in the nephrology division and one class about BD in the clinical neurology division. However, students have shown a proactive posture in seeking out this specific information given that 41% of the respondents had encountered the subject of transplantation in activities outside the regular curriculum (academic leagues, transplant modules at academic conferences and others).

In the present study, the mean response rate was 42.5% of the students, which was higher than the study of Galvão et al.,⁽¹³⁾ (32%), which analyzed students from a public medical school in São Paulo, and higher than a South African study⁽¹⁴⁾ (30%) with a similar objective.

Table 1 - Characteristics of the students

| | 1 st year | 2 nd year | 3 rd year | 4 th year | 5 th year | 6 th year | Total | p value |
|---------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|------------|---------|
| Enrolled students | 80 | 85 | 147 | 169 | 91 | 105 | 677 | |
| Number of participants | 67 | 40 | 42 | 68 | 53 | 18 | 288 | |
| Number of refusals/other losses | 3/10 | 8/37 | 0 / 85 | 8/93 | 3/35 | 0 / 87 | 22 / 367 | |
| Adherence | 83.7 | 47 | 28.6 | 40.2 | 58.2 | 17.1 | 42.5 | |
| Mean age (years) | 19.80±2.03 | 20.67±1.73 | 22.02±2.28 | 22.83±1.78 | 22.86±1.80 | 25.16±2.57 | 21.86±2.47 | |
| Gender | | | | | | | | 0.31 |
| Female | 46 (68.7) | 26 (65.0) | 27 (64.3) | 48 (70.6) | 39 (73.6) | 8 (44.4) | 194 (67.4) | |
| Male | 21 (31.3) | 14 (35.0) | 15 (35.7) | 20 (29.4) | 14 (26.4) | 10 (55.6) | 94 (32.6) | |

Results expressed in number or percentage (%); mean age±standard deviation. Chi-square test

Table 2 - Assessment of the knowledge about the national scenario of organ transplantation

| Questions | Curricular year | | | | p value |
|--|----------------------------------|----------------------------------|----------------------------------|------------|---------|
| | 1 st /2 nd | 3 rd /4 th | 5 th /6 th | Total | |
| Organ transplantation is a: | | | | | 0.41 |
| Treatment | 71 (67.0) | 64 (59.2) | 47 (67.0) | 182 (64.0) | |
| Cure | 35 (33.0) | 44 (40.8) | 23 (32.0) | 102 (36.0) | |
| Total | 106 (100) | 108 (100) | 70 (100) | 284 (100) | |
| Which one is the most transplanted organ in Brazil? | | | | | <0.01* |
| Kidney | 53 (50.5) | 83 (75.4) | 55 (77.4) | 191 (66.8) | |
| Liver | 37 (35.2) | 11 (10.0) | 16 (22.6) | 64 (22.4) | |
| Lung | 4 (3.8) | 7 (6.4) | 0 (0.0) | 11 (3.8) | |
| Heart | 11 (10.5) | 9 (8.2) | 0 (0.0) | 20 (7.0) | |
| Total | 105 (100) | 110 (100) | 71 (100) | 286 (100) | |
| Can people under 18 years old be donors? | | | | | 0.7 |
| Yes | 82 (77.4) | 86 (78.9) | 57 (82.6) | 225 (79.2) | |
| No | 24 (24.6) | 23 (21.1) | 12 (17.4) | 59 (20.8) | |
| Total | 106 (100) | 109 (100) | 69 (100) | 284 (100) | |
| Is it possible to perform living donor transplantations? | | | | | 0.07 |
| Yes | 104 (97.2) | 110 (100) | 71 (100) | 285 (98.9) | |
| No | 3 (2.8) | 0 (0.0) | 0 (0.0) | 3 (1.1) | |
| Total | 107 (100) | 110 (100) | 71 (100) | 288 (100) | |

Results expressed in numbers (%). Chi-square test.* The p value refers to the comparison between the kidney and the other organs.

Table 3 - Assessment of the knowledge about brain death

| Questions | Curricular year | | | | p value |
|--|----------------------------------|----------------------------------|----------------------------------|------------|---------|
| | 1 st /2 nd | 3 rd /4 th | 5 th /6 th | Total | |
| Regarding the diagnosis | | | | | |
| Two doctors not affiliated with transplant | 53 (49.5) | 77 (70.0) | 60 (84.5) | 190 (66.0) | <0.01 |
| Two clinical assessments with a time interval that varies according to the age | 38 (35.5) | 53 (48.2) | 35 (49.3) | 126 (43.7) | 0.09 |
| Regarding complementary exams used for diagnosis | | | | | |
| Cerebral angiography | 36 (33.6) | 31 (28.2) | 36 (50.7) | 103 (35.8) | <0.01 |
| Transcranial Doppler | 14 (13.0) | 44 (40.0) | 44 (62.0) | 102 (35.4) | <0.01 |
| Skull x-ray | 7 (6.5) | 4 (3.6) | 1 (1.4) | 12 (4.8) | 0.22 |
| Electroencephalogram | 88 (82.2) | 92 (83.6) | 56 (78.9) | 236 (81.9) | 0.71 |
| Regarding the indication to perform resuscitation maneuver in case of CRA | 71 (80.7) | 62 (79.5) | 42 (72.4) | 175 (78.1) | 0.46 |

CRA - cardiorespiratory arrest. Results expressed in numbers (%). Chi-square test.

To increase the number of transplants, doctors should be able to diagnose BD.^(15,16) In the studied school, in total, 90.3% of the students did not feel able to diagnose BD, though there was a significant difference between the overall rate and the rate for students from group 3. Ten years ago, Amaral et al. conducted a similar study with teachers and found that 44% of them could not diagnose BD.⁽⁴⁾ In Belo Horizonte (State of Minas Gerais - MG), a study found that 83.5% of the students performing self-assessments had only "a little" knowledge about BD.⁽⁵⁾

In summarizing the results, we would emphasize that only three findings were significant ($p < 0.05$) in a way that was consonant with the increasing knowledge of the students throughout the graduation: the kidney as the most commonly transplanted organ in Brazil; two physicians not affiliated with the transplantation are required to diagnose BD; and the transcranial Doppler as a complementary test to diagnose BD.

The present study had limitations because it used a single center, there was no sample size calculation, the

questionnaire was not validated, and there was some difficulty in finding students in grade sixth because the board regimen stages do not always take place in the hospital (basic health units and secondary hospitals).

Brazil hit the mark of 12.6 donors per million inhabitants in 2012,⁽²⁾ and this is an insufficient number compared with developed countries. Spain, which is a reference nation for its organ procurement model, had a rate of 35.3 donors per million in the same period.⁽¹⁷⁾ This difference exists, at least in part, because doctors are alert to potential donors, diagnose BD early and contact

the central procurement agency. Organ transplantation is a reality of everyday medical practice for which the recognition of potential donors is extremely important. Thus, medical education is essential for the adequate functioning of the national transplant program.⁽¹⁸⁾

CONCLUSION

The level of knowledge of medical students at our institution regarding brain death and transplantation is limited, which could be the result of inadequate education during medical school.

RESUMO

Objetivo: Avaliar o nível de conhecimento dos acadêmicos de Medicina sobre transplante e morte encefálica.

Métodos: Questionário autoaplicado não identificado respondido pelos alunos do curso de Medicina do primeiro ao sexto ano, com base em informações da Associação Brasileira de Transplante de Órgãos e Tecidos, Registro Brasileiro de Transplantes e pela resolução que define os critérios para morte encefálica.

Resultados: Dos 677 alunos do curso de Medicina, 310 (45,8%) concordaram em responder. Foram excluídos 22 (7,0%) pacientes. Dos

que participaram, 41,3% informaram que já assistiram à aula sobre transplante de órgãos e 33% sobre morte encefálica; 9,7% se sentiram aptos a diagnosticar morte encefálica ($p < 0,01$); apenas 66,8% responderam o rim como o órgão sólido mais transplantado no Brasil.

Conclusão: O nível de conhecimento sobre morte encefálica e transplantes dos alunos de Medicina da instituição é limitado, o que pode ser resultado de uma abordagem inadequada durante o curso de Medicina

Descritores: Estudantes de Medicina; Transplante de órgãos; Obtenção de tecidos e órgãos; Morte encefálica; Questionários; Educação médica

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