A comparative review between the updated models of Brazilian, United Kingdom and American eye banks and lamellar transplants

Uma revisão comparativa entre os modelos atuais de bancos de olhos e transplantes lamelares do Brasil, Reino Unido e Estados Unidos

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The authors declare no conflicts of interest.

ABSTRACT

The corneal transplantation (CT) is the most commonly performed type of transplant in the world and the Eye Banks are organizations whose capture, evaluate, preserve, store and distribute ocular tissues. With the evolution of surgical techniques and equipment for CT, the BOs had to evolve to keep up with these requirements. This evolution goes from tissues capture techniques, donating money and clarification to the patient (e.g. internet-based), use of current equipment for more adequate tissues supply for the most current surgical techniques, integration of BOs of certain country and real-time management of stocks of ocular tissues, and adequacy of laws that manage the entire process. This review aims to make a comparative review between the updated models of Brazilian, United Kingdon and American Eye Banks. Like, check what the trend towards lamellar transplants in these three countries.

Keywords: Cornea; Corneal transplantation; Laser; Health services administration; Benchmarking; Brazil; United States

RESUMO

O transplante de córnea (CT) é o tipo de transplante mais realizado no mundo e os Bancos de Ojos (BO) são organizações que capturam, evoluem, preservam, guardam e distribuem tecidos oculares. Com a evolução das técnicas cirúrgicas e equipamentos para CT, os BOs precisaram evoluir para acompanhar estas necessidades. Esta evolução vai desde técnicas de captura de tecidos; doação de dinheiro e esclarecimento ao paciente (baseadas na internet, por exemplo); utilização de equipamentos modernos, para fornecimento mais adequado de tecidos para técnicas cirúrgicas mais atualizadas; integração dos BOs de determinado país e gerenciamento em tempo real dos estoques de tecidos oculares, e adequação das leis que gerem todo este processo. Esta revisão tem como objetivo fazer uma comparação dos modelos atualizados de BOs brasileiro, inglês e americano, além de avaliar a tendência dos tipos de CT nestes países e sugerir melhorias ao modelo de BO brasileiro.

Descritores: Córnea; Transplante de córnea; Laser; Administração de serviços de saúde; Benchmarking; Brasil; Estados Unidos

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INTRODUCTION

Eye Banks

The Eye Banks are nonprofit organizations whose capture, evaluate, preserve, store and distribute ocular tissues. Anywhere in the world through local legislation, these organizations were created, are regulated and inspected.

Lamellar Transplants

The lamellar transplantation (LT) was first performed by Von Hippel in 1888(1). This technique is more difficult to do and used to provide less visual acuity than the penetrant keratoplasty (PK). For these reasons, especially, the LT until about a decade ago, was done mostly for tectonic and/or cosmetics purposes, and the PK used for optical purposes, where wanted best final visual acuity, even if the patient needed to replace only part of the cornea, anterior or posterior(2). With the development of Eye Banks, surgical techniques and equipment as the artificial anterior chamber, microkeratome and femtosecond lasers, LT was more refined and technically reproducible, thus getting significant improvement in final visual acuity(2-10). Thus, LT (anterior or posterior) is becoming the technique of choice in conditions in which it is only necessary to exchange a part of the cornea (anterior or posterior)(2,3,9,10), as keratoconus and endothelial dysfunction. These two diseases remain among the top three causes of transplants in world(9,10).

This review aims to make a comparative review between the updated models of Brazilian, United Kingdom and American Eye Banks. Like, check what the trend towards lamellar transplants in these three countries.

In Brazil

Transplants

Brazil ranks second in the absolute number of transplants performed annually worldwide. If we consider the relative number of transplants and GDP (gross national product), Brazil ranks third, favored by investments made in this area and the stimulus given to its increase(11). Table 1 shows the evolution of the types of transplants in Brazil between 2001 and 2011.

The importance of corneal transplantation (CT) for Brazil can be observed, both by popular demand as the state investment, as represented 63.42% of all transplants performed in Brazil in 2011. In 2009, the MS invested about R$ 900 million in transplants(12). Despite the increase in the number of corneal transplants in Brazil, can be seen in Table 2 the great difference in numbers of transplants in several Brazilian States over the years, which reflects the inefficiency in generating a model of Eye Banks efficient nationwide.

Can be observed that there are states that do not perform any CT in 2011, another did not perform CT between 2001-2009, and that there are more developed states having fewer transplants than other less developed. On the other hand, only the State of São Paulo was responsible for 37.39% of corneal transplants performed in Brazil in 2011.

Lamellar Transplants

Of these nearly 15,000 CT held in Brazil in 2011, do not know for sure how many were LT and how many were PK, because there isn’t this kind of statistical control in Brazil.

In United Kingdom

Like in Brazil, if no wish has been expressed in life then specially trained healthcare professionals should approach the family for their authorization to proceed, based on their knowledge of the potential donor (opt-in)(13). Currently there are 14 European nations operating under a system of opt-out or ‘presumed consent’: Austria, Belgium, Czech Republic, Finland, France, Greece, Hungary, Italy, Luxembourg, Poland, Portugal, Slovak Republic, Spain, Sweden(13). In UK, 16.124.871 people (The total at 31 March 2009) registered on the NHS Organ Donor Register(13) (a web based database).

Transplants

Figure 1 shows the evolution of the number of corneas donated and the number of corneas grafted in the UK between 2002 and 2012(14).

Figure 2 shows the evolution, in a decade, of the numbers of LT for keratoconus, preserving the patient’s healthy endothelium and changing only the corneal stroma(9).

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Figure 1: Evolution of the number of corneas donated and the number of corneas grafted in the UK between 2002 and 2012 (14).


Figure 2: Evolution, in a decade, of the numbers of LT for keratoconus. PK: Penetrant keratoplasty, DALK: Deep anterior lamellar keratoplasty (9).

In the UK it is possible to request and receive from Eye Bank a corneal donor lamella with specific thickness and diameter to the realization of LT. As in Brazil, the patient doesn’t pay to the donnor cornea.

In United States

Currently, there are 84 Eye Banks in the U.S. In 2013, the Eye Bank Association of America (EBAA) published the statistical report for 2012 (10). Since 2011, the EBAA began a new monthly collection methodology for the Statistical Report using EBAA CONNECT, a real-time, web-based statistical reporting and analytics engine designed specifically for the EBAA by Transplant.

Table 2

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Source: http://aplicacao.saude.gov.br/portal/public/transplantes/destaque/dest5; accessed on 04/21/2012

Figure 3 shows the evolution, in a decade, of the numbers of LT for endothelial failure, preserving the patient’s healthy stroma and changing only the corneal endothelium (9).

In the UK it is possible to request and receive from Eye Bank a corneal donor lamella with specific thickness and diameter to the realization of LT. As in Brazil, the patient doesn’t pay to the donnor cornea.

A comparative review between the updated models of Brazilian, United Kingdom and American eye banks and lamellar transplants
In this study, the data reported were from 80 Eye Banks. Prior to 2008, all keratoplasties were counted as “penetrating keratoplasty”. From 2008, pre-cut and uncut tissue utilization was stratified into penetrating grafts (PK), endothelial keratoplasty (EK), anterior lamellar keratoplasty (ALK), keratolimbal allografts (KLA), and tectonic grafts (TK). Keratoprosthesis (K-Pro) as a specific utilization was added in 2009. Before 2009, domestic and international data from U.S eye banks were combined. In 2009 and 2010, stratified data was only collected for tissue distributed and used within the U.S. For 2011 and beyond, tissue provided by U.S. eye banks was stratified and separated into domestic and international use. International use of tissue sent from U.S. eye banks was generally not included in statistical analysis before 2011.

Beginning in 2012, eight international banks began using the EBAA Connect data system.

Transplants

In the U.S., tissue supplied by U.S. Eye Banks for all keratoplasty procedures types in 2012 was 68,681. Of these tissues, 46,684 were used to transplants in US and 19,546 corneas were exported internationally. The Figure 4 shows the annual number of corneal transplants supplied by U.S. Eye Banks (US and exported).

Lamellar Transplants

Figure 6 shows the annual number of surgeries by type of cornea transplant between 2005-2012. It can be seen that since 2011 the number of LT (anterior and posterior) is greater than the number of PK, and that in 2012 the number of posterior LT alone was greater than the number of PK.

In the United States all Eye Banks provide donor corneal lamellae. The current cost of a corneal donor (lamella or not) varies on average between US$ 1,949.00 to US$ 2,449.00.

Comments and suggestions

Although the penetrating keratoplasty indications were similar in the world, management of eye banks model have improved in Brazil and the Brazilian corneal surgeons perform the most updated techniques of CT, it can be seen...
that there is an inefficiency of the Brazilian system at the national level by the huge discrepancy in the number of transplants in several Brazilian states. In 2010, only São Paulo made 1.7 times more CT than all UK did in 2012. In 2011, Brazil made 4.2 times more CT than all UK did in 2012. In the other hand, in 2011, the EUA performed 3.11 times more CT than Brazil in the same year. In this same period, the US exported more corneas than the number of CT across Brazil. Thus it is important to consider whether the Brazilians Eye Bank are following trends and best practices of other major Eye Banks in the First World. The three countries use the optimum system for cornea donation.

Clearly, it is observed that in the United States (since 2011) and the UK (since 2009) are performed more posterior LT (endothelial) than PK. There is also a significant number of anterior LT in these countries. In this issue specifically, in Brazil the vast majority of Eye Banks as corneal surgeons do not have equipment (microkeratome, artificial anterior chambers, femtosecond lasers) for manufacturing their own donor corneal lamellar (anterior or posterior) from the donor corneal-scleral button. Thus, the number of LT performed in Brazil is a tiny fraction of the total CT. So, despite being a global trend, the LT is not encouraged by the Brazilian Eye Bank System, where there is practically no supply of donor corneal lamellae by Eye Banks, as in England or the United States have.

Suggestions

1. Investment in national awareness campaigns, guidance and fundraising (donations, web-donations with CBO help);
2. Specific guidance program to improve patient’s knowledge about the main causes of CT and its treatments [22];
3. Developing a specific guidance program on protocols related to the importance, capture and donation of organs and tissues for TC, intended for all physicians and key stakeholders such as: CNCDOs, Intra-Hospital commissions, State and Municipal Health;
4. Investment for the 24 hours system of communication, transportation and collection nationwide;
5. Allow Eye Banks operate outside hospitals;
6. Partnership between the MS and the Brazilian Council of Ophthalmology (CBO) to develop and implement, in all national Eye Banks, software for on-line management, supervision and control of donated tissues and all types of cornea transplants;
7. Investment in equipment, material and human resources in Eye Banks for the possibility of making donor corneal lamellae;
8. Possibility of enrollment lamellar transplant (anterior and posterior) on Eye Banks;
9. Creating a web based database for the population could enroll as organ donors and tissues, as well as be able to make financial donations.

Figure 6: The annual number of surgeries by type of cornea transplant between 2005-2012 [10].

**Referências**


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