

Letter to the Editor

DOI: 10.5935/1678-9741.20130020

RBCCV 44205-1453

Impact on Early and Late Mortality after Blood Transfusion in CABG Surgery

“Lamb’s blood was used for the transfusion, and the man had a violent reaction, the horrible symptoms being chills and fever and black urine.”

Jean Baptiste Denis, 1665

Dear Editor,

I've read with great interest the article by Santos et al. [1]: “Impact on early and late mortality after blood transfusions in coronary artery bypass surgery”, to be published in the Brazilian Journal of Cardiovascular Surgery [1]. The matter is very relevant, but some important considerations are worth being discussed.

The first attempt at blood transfusion to humans occurred in France in 1665, when sheep blood was used for treating a psychosis. The aim was to restore sanity to the patient, however, what it was observed was the first reaction to blood incompatibility. The first report of blood transfusion using human blood occurred in the year 1665 in London by Richard Lower. The clotting problems, compatibility and storage of blood were later resolved. During armed conflicts (especially after World War II), blood transfusions were widely used [2].

The indication of blood products transfusion in patients undergoing cardiac surgery, measures to limit its use (fibrinolytic drugs, extracorporeal circuits coated with heparin), reuse of blood lost during surgery and non-use of cardiopulmonary bypass (CPB), all contributed to reduce the number of transfusions [3]. Actually, it is not always possible not to use blood products. Concerns exist when performing blood transfusions: infections (viral, bacterial), incompatibility and a silent complication, the immunosuppressive effects [4].

When assessing the outcome mortality related to blood transfusions in coronary artery bypass grafting, Santos et al. [1] reinforced the observations on the early and immediate impact. Koch et al. [5] reported, actually, that blood stored for more than 14 days would be more related to postoperative complications. Newer blood (less than 14 days of storage) has a lower relative risk (30%) compared to postoperative mortality. At 1 year, mortality was 11% for older blood (over 14 days of storage) [5]. Would this data be a new limitation to the study?

When we assessed only blood transfusion and its adverse events, we can not forget the efficacy and safety in the use of autotransfusion [6]. If, as noted by Koch et al. [5], the stored blood has a higher risk, so probably the same would be true for stored autotransfusion. But, if it is used early or even during surgery before CPB, would that impact on early and late mortality observed by Santos et al. [1] also occur? The study in question does not provide such data.

Hélcio Giffhorn
Cardiovascular Surgeon, Master's Degree in
Surgical Clinics, Curitiba, PR, Brazil

REFERENCES

1. Santos AA, Sousa AG, Thomé HOS, Machado RL, Piotto RF. Impacto na mortalidade precoce e tardia após transfusão de hemácias em cirurgia de revascularização miocárdica. Rev Bras Cir Cardiovasc. 2013;28[1]1-XXX.
2. Sturgis CC. The history of blood transfusion. Bull Med Libr Assoc. 1942;30(2):105-12.
3. Society of Thoracic Surgeons Blood Conservation Guideline Task Force, Ferraris VA, Ferraris SP, Saha SP, Hessel EA 2nd, Haan CK; Society of Cardiovascular Anesthesiologists

Special Task Force on Blood Transfusion, et al. Perioperative blood transfusion and blood conservation in cardiac surgery: the Society of Thoracic Surgeons and the Society of Cardiovascular Anesthesiologists clinical practice guideline. *Ann Thorac Surg.* 2007;83(5 Suppl):S27-86.

4. Dellinger EP, Anaya DA. Infectious and immunologic consequences of blood transfusion. *Crit Care.* 2004;8(Suppl 2):S18-23.
5. Koch CG, Li L, Sessler DI, Figueroa P, Hoeltge GA, Mihaljevic T, et al. Duration of red-cell storage and complications after cardiac surgery. *N Engl J Med.* 2008;358(12):1229-39.
6. Martin K, Keller E, Gertler R, Tassani P, Wiesner G. Efficiency and safety of preoperative autologous blood donation in cardiac surgery: a matched-pair analysis in 432 patients. *Eur J Cardiothorac Surg.* 2012;37(6):1396-401.

ANSWER

Dear Editor,

Initially, we would like to thank the observations and comments made by Prof. Dr. Hécio Giffhorn about the article "Impact on early and late mortality after blood transfusions in coronary artery bypass surgery" [1].

Red cells stored in blood bags develop a series of structural and functional changes with the passage of time, known as "storage lesion" [2]. A meta-analysis involving 21 studies: 18 observational studies and three randomized clinical trials, with a predominance of cardiac surgery patients (6) and trauma (6), concluded that the use of blood stored for longer time was associated with increased mortality when compared the use of blood stored for less time [3]. Hajjar et al. [4] published a prospective randomized controlled clinical trial, comparing restrictive versus liberal strategy in 502 patients undergoing cardiac surgery. Regardless of the transfusion strategy used, transfusion of a single unit of blood was associated with significantly increased morbidity and postoperative mortality.

Nevertheless, this study used only bags of blood with little storage time (less than 10 days of storage), with an average of only 3 days of storage in both groups. Therefore, "new" blood transfusion is also associated with higher

mortality. One of the possible causes of an adverse clinical outcome even with the use of new blood is the fall of the bioactivity of nitric oxide in stored red blood cells, resulting in decreased oxygen delivery in the microcirculation. It was observed that this reduction occurs rapidly with only a few hours of storage [5,6]. Also, another critical factor is the immunomodulatory effect of transfusion, which results in reducing the number of circulating lymphocytes, T helper cells modification and activation of immune cells [7]. Evidently, this effect depends solely on the charge of transfused antigens and not storage time of red blood cells.

One limitation of our study, which was retrospective, was the inability to assess the storage time of each 4936 bags of transfused blood. It is possible, as suggested by PhD Hécio Giffhorn that longer storage of blood bags may have influenced a higher mortality rate in this study. Currently, in most institutions, it is common for patients who require blood transfusion units preferentially receive blood from their blood type with the greatest storage time. This practice aims a better storage of the limited supplies of blood [3].

Anyway, the fact that the storage time of transfused blood bags was not taken into account does not invalidate the final conclusion of this study, which showed numbers very similar to those found in the international literature. Furthermore, this study exemplifies the typical transfusion behavior employed by a large hospital in Brazil. We believe that the increased storage time of the blood bags could have further strengthened the final conclusion of our study.

One of the techniques used to decrease the use of allogeneic blood during the perioperative period is the autotransfusion, on which a preoperative donation is performed weeks before surgery and storage. Such a method would have as advantages the prevention of viruses transmission, such as HIV and hepatitis C as well as deleterious effects caused by immunological phenomena resulting from the use of allogeneic blood [8].

A systematic review of randomized controlled trials on the effectiveness of autotransfusion, published with collaboration of Cochrane, involved 14 randomized clinical trials and observed reduced risk of receiving an allogeneic blood transfusion [9]. However, the risk of receiving a transfusion of any type (autologous or allogeneic) was higher using the autotransfusion, and it is not possible to the authors to establish whether the benefits of autotransfusion were larger than its risks.

Furthermore, the autotransfusion in the form of preoperative donation and storage does not provide, theoretically prevention as the development of storing injury. On the other hand, preoperative acute normovolemic hemodilution involves removing blood from the surgical patient immediately before or after induction of anesthesia and its simultaneous replacement with appropriate volumes of crystalloid or colloids solutions. The collected blood

is then reinfused to replace blood loss occurred during surgery [10], without the inconvenience of storing injury. Goodnough et al. [11] suggest that acute hemodilution could replace benefits with the use of autotransfusion.

The intraoperative cell recovery is another technique used to minimize the use of allogeneic blood and consists of retrieve, filter and reinfuse blood lost by the patient intraoperatively with the aid of special equipment [12]. A systematic review of randomized clinical trials on the efficacy of intraoperative cell recovery, published by Cochrane, included 75 trials and concluded that it was effective in reducing the use of allogeneic blood in adult patients undergoing elective cardiac surgery, without causing adverse clinical effects [13].

This study did not assess the use of preoperative acute normovolemic hemodilution or intraoperative cell recovery and its impact on morbidity and mortality, but both techniques are excellent prospects for the development of future studies.

Again we appreciate the comments of PhD Hécio Giffhorn.

Dr. Antonio Alceu dos Santos
Cardiologist, São Paulo, SP, Brazil

REFERENCES

1. Santos AA, Sousa AG, Thomé HOS, Machado RL, Piotto RF. Impacto na mortalidade precoce e tardia após transfusão de hemácias em cirurgia de revascularização miocárdica. *Rev Bras Cir Cardiovasc.* 2013;28[1]1-9.
2. Koch CG, Li L, Sessler DI, Figueroa P, Hoeltge GA, Mihajljevic T, et al. Duration of red-cell storage and complications after cardiac surgery. *N Engl J Med.* 2008;358(12):1229-39.
3. Wang D, Sun J, Solomon SB, Klein HG, Natanson C. Transfusion of older stored blood and risk of death: a meta-analysis. *Transfusion.* 2012;52(6):1184-95.
4. Hajjar LA, Vincent JL, Galas FR, Nakamura RE, Silva CM, Santos MH, et al. Transfusion requirements after cardiac surgery: the TRACS randomized controlled trial. *JAMA.* 2010;304(14):1559-67.
5. Kor DJ, Van Buskirk CM, Gajic O. Red blood cell storage lesion. *Bosn J Basic Med Sci.* 2009;9(Suppl 1):21-7.
6. Reynolds JD, Ahearn GS, Angelo M, Zhang J, Cobb F, Stamler JS. S-nitrosohemoglobin deficiency: a mechanism for loss of physiological activity in banked blood. *Proc Natl Acad Sci U S A.* 2007;104(43):17058-62.
7. Blajchman MA. Immunomodulation and blood transfusion. *Am J Ther.* 2002;9(5):389-95.
8. Martin K, Kaller E, Gertler R, Tassani P, Wiesner G. Efficiency and safety of preoperative autologous blood donation in cardiac surgery: a matched-pair analysis in 432 patients. *Eur J Cardiothorac Surg.* 2012;37(6):1396-401.
9. Henry DA, Carless PA, Moxey AJ, O'Connell D, Forgie MA, Wells PS, et al. Pre-operative autologous donation for minimizing perioperative allogeneic blood transfusion. *Cochrane Database Syst Rev.* 2002;(2):CD003602.
10. Shander A, Rijhwani TS. Acute normovolemic hemodilution. *Transfusion.* 2004;44(12 Suppl):26S-34S.
11. Goodnough LT, Monk TG, Brecher ME. Acute normovolemic hemodilution should replace the preoperative donation of autologous blood as a method of autologous-blood procurement. *Transfusion.* 1998;38(5):473-6.
12. Esper SA, Waters JH. Intra-operative cell salvage: a fresh look at the indications and contraindications. *Blood Transfus.* 2011;9(2):139-47.
13. Carless PA, Henry DA, Moxey AJ, O'Connell D, Brown T, Fergusson DA. Cell salvage for minimizing perioperative allogeneic blood transfusion. *Cochrane Database Syst Rev.* 2010;(4):CD001888.

Second edition of the book **Cardiology and Pediatric Cardiac Surgery** is available

On November 29, 2012, during the XXII Brazilian Congress of Pediatric Cardiology in Foz do Iguaçu, Paraná, its second edition was officially launched celebrating the unity between the Brazilian Society of Cardiology and the Brazilian Society of Cardiovascular Surgery, represented by their respective departments of pediatric cardiology and pediatric cardiac surgery.

The second edition had 178 authors who sought to present the very best in the specialty. The text is illustrated with 1649 images distributed in 1240 pages, which practically became a book-atlas.

Coordinators claimed to believe that this work is an important contribution to the development of cardiology and also the pediatric cardiac surgery in our country, as well as demonstrating the high level of knowledge, involvement and capacity of those professionals working in the area. "Many young doctors can study and learn the most basic and important points in this book," said the book general coordinator, Professor Ulisses Alexandre Croti.



(From left to right.) Maria Del Pilar Paya (Roca Editorial Manager – National Editorial Group - GEN), Vera Demarchi Aiello (nomenclature coordinator), Sandra da Silva Mattos (clinical coordinator), Ulisses Alexandre Croti (general coordinator) Valéria de Melo Moreira (images coordinator). Valdester Cavalcante Pinto Jr. (surgical coordinator) is not in the photo because he was in another event abroad

Following the global trend, the book was also presented in e-book platform which can be purchased at <http://grupogen.com.br>. There are also many images and videos to be accessed for free, confirming once again, one of the main goals of the book, which is knowledge dissemination.

Cardiac surgery: the infinite quest

Hi Rodolfo -- I finally got the time to go over your very ambitious paper. I am impressed that a specialty journal would have the leadership to publish such a far-reaching piece. And it is also impressive that you are able to integrate so much relevant and important material. I

would be interested to know what feedback you get from the readership. And I look forward to the next chapters.

All the best, and congratulations.

Miles Frederick Shore
Cambridge/MA, USA

Rodolfo,

I just finished reading part II of " Cardiac Surgery, the Infinite Quest" - it's beautifully written and very provocative. You are on a trajectory to become the "master of missives" in cardiac surgery!

All the best,

James K. Kirklin
Birmingham/AL, USA

100 citations

Dear friends

I received a notification of the Google Scholar with the information that our article (Basics notions of heart rate variability and its clinical applicability - Luiz Carlos Marques Vanderley, Carlos Marcelo Pastre, Rosangela Akemi Hoshi, Tatiana Dias de Carvalho and Moacir Fernandes de Godoy, published in issue 24.2 of BJCVS) reached the significant milestone of 100 citations!! Congratulations to all and a special thanks to Prof. Domingo Braile for enabled us to have this published in a journal with so great expressiveness and penetration as the Brazilian Journal of Cardiovascular Surgery.

A hug to everyone.

Moacir Godoy
São José do Rio Preto -SP

Accessing Google Scholar, I watched the Moacir reported by prof Moacir.

The paper was designed for us from an internal strategy from laboratories aiming a scientific update on HRV and this idea was catalyzed on post-doctoral meetings, strongly encouraged by Professor Moacir and finally started from the action of Luiz Carlos.

From that, every search for references and organization of data were made by Rosangela and Tatiana. The outcome was, in my point of view, extremely impressive, and by the way, for the academic community as well. I'm sure that was not the view of Professor Domingo, such information would not have such a movement and projection. I reiterate the importance of BJCVS in this context!

I sincerely thank for the privilege to have worked on this project: my academic brother Luiz, my dear teachers and Teachers Moacir and Braile and especially Memi and Tatiana, who were tireless and patient to answer any requirements, including mine.

It was worth it and I think we're ready for a new challenge!!

A brotherly hug!!

Marcelo Pastre
São José do Rio Preto-SP

Reflections of a translator in the Human Anatomy area

Dear Editor,

I've sent an article "Reflections engendered as a practicing translator concerning the language of Anatomy - Reflections of a translator in the Human Anatomy area", which was published in Brazilian Journal of Cardiovascular Surgery 2012;27(3):453-6. In this article, my mistake, was omitted the name of co-author: PhD Fernando Batigália, MD Human Anatomy Tutor, Health Sciences Stricto Sensu Post-Graduate Programme; São José do Rio Preto Medical School (FAMERP). I request the issue of an erratum to correct the error. With nothing further to add at this time, I count on your support.

Sincerely,

Alexandre Lins Werneck
São José do Rio Preto-SP