Intraoperative autologous blood transfusion: a systematic review of the literature

Transfusão sanguínea autóloga intraoperatória: uma revisão sistemática da literatura

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ABSTRACT
Bleeding of the main health problems is intraoperative in hospitals, mainly. Control of adequate oxygen is essential for tissue oxygen. Autologous blood transfusion is used as a strategy to reduce the possibility of negative effects of allo transfusion and in situations of lack of donated blood. The aim of the study is to determine the importance and advantages of intraoperative autologous transfusion through a systematic review of studies addressing autotransfusion, published between 2016 and Busca2021. In studies, autotransfusion was mainly indicated in critically ill patients with massive bleeding induced by chest trauma associated with hemorrhagic shock, requiring emergency blood transfusion, where it is not possible to wait for blood preparation or where blood is lacking. In addition, its use has been reported in orthopedic surgeries such as total hip and knee arthroplasty. As benefits of lack of resources: reduction of benefits treatment resources, reduction of the need for local finance resources. No related complications were observed. In conclusion, despite the various advantages of autologous transfusion, published articles on the subject are still scarce. Thus, it is necessary to carry out clinical trials that compare the two methods, for the eligibility of the different perspectives of clinical application of each method in the trauma scenario.

Keywords: autologous blond transfusion, transfusion, intraoperative.

RESUMO
O sangramento dos principais problemas de saúde é intraoperatório em hospitais, principalmente. O controle do oxigênio adequado é essencial para a oxigenação tecidual. A transfusão de sangue autólogo é utilizada como estratégia para reduzir a possibilidade de efeitos negativos de toda transfusão e em situações de falta de sangue doado. O objetivo do estudo é determinar a importância e as vantagens da transfusão autóloga intraoperatória por meio de uma revisão sistemática de estudos que abordam a autotransfusão, publicados entre 2016 e Busca2021. Nos estudos, a autotransfusão foi indicada principalmente em pacientes críticos com sangramento maciço induzido por trauma torácico associado a choque hemorrágico, necessitando de transfusão sanguínea de emergência, onde não é possível aguardar o preparo do sangue ou faltar sangue. Além disso, seu uso tem sido relatado em cirurgias ortopédicas, como artroplastia total de quadril e joelho. Como benefícios da falta de recursos: redução dos recursos de tratamento de benefícios, redução da necessidade de recursos financeiros locais. Não foram observadas complicações relacionadas. Em conclusão, apesar das várias vantagens da transfusão autóloga, os artigos publicados sobre o assunto ainda são escassos. Assim, faz-se necessária a realização de ensaios clínicos que comparem os dois métodos, para elegibilidade das diferentes perspectivas de aplicação clínica de cada método no cenário do trauma.

Palavras-chave: transfusão autóloga de louro, transfusão, intraoperatório.

1 INTRODUCTION

Factors precipitate the need for blood transfusion in a hospital. In the perioperative period, with the replacement of normal blood volume correction levels for adequate tissue oxygenation, the loss of correction of hemorrhage correction in cases.(1)

Bleeding is one of the most recurrent complications and can occur in any type of surgery (elective or emergency). At some point, every surgeon is faced with intraoperative bleeding, which can be severe and diffuse, not responding to conventional hemostatic measures. Of all the situations that a surgeon may face, uncontrolled bleeding is one of the most critical.(2) Its management requires adequate venous access, with concomitant control of the source of bleeding and administration of appropriate blood products and/or volume replacement.(3) When there are limited resources for volume replacement, surgeons are faced with an even greater challenge in controlling severe hemorrhages that are refractory to treatment.

The most widely used method for this replacement is currently allogeneic transfusion, a fact that further increases the existing demand from blood banks.(4) The regulation that guarantees the quality control of the blood offered during all stages of hemotherapy is carried out by ANVISA . (5) The current hospital situation raises questions about autologous transfusion, which has become a very attractive option.(6,7) thus, more and more studies have been carried out on this technique in comparison with allogeneic transfusion, aiming to determine the associated risks and benefits. with each technique, as well as its application in hospital environments. Despite the relevance of the development of Brazilian hematology, the number of available studies is scarce and outdated, with no linearity of facts. (8)

In Brazil, the demand for blood products was, until 2006, met through imports, at an annual cost estimated at 500 million reais.(9) Therefore, autologous transfusion has been used as a strategy to reduce the incidence of the negative effects of allogeneic transfusion, avoiding the excessive use of donated blood, which is a limited resource.(10)

Blood autotransfusion can be divided into 3 classes according to the purpose and timing of the transfusion: preoperative autologous blood donation, acute normovolemic dilution of autologous blood, and intraoperative or postoperative autotransfusion.(11)

Intraoperative blood autotransfusion is a procedure in which the blood lost by the patient in a hemorrhage and accumulated in the thoracic or abdominal cavities is reintroduced; being collected by various means, and reintroduced into the patient's circulation.(12) This technique is commonly applied in cardiothoracic and hepatobiliary surgeries, however, it is not frequently used in other surgical scenarios.(9)

Currently, international recommendations for intraoperative autologous blood transfusion are based on the anticipation of loss greater than 20% of the patient's total blood volume.(13) However, the indications and benefits of this blood transfusion method in other scenarios still remain inaccurate. Based on this scenario, a systematic review was carried out to understand the main indications and benefits of intraoperative blood autotransfusion.

2 METHOD

A systematic review of controlled clinical trials on intraoperative autologous blood transfusion was performed. The inclusion criteria for the research were: articles published between 2016 and 2021, which had as their theme intraoperative or postoperative blood autotransfusion with the aim of restoring blood volume. Studies that addressed the techniques of autologous transfusion in the preoperative period and normovolemic dilution with autologous blood and that aimed to analyze the benefit of the "cell saver" equipment were excluded. Research involving children, cadavers or non-human animals (rats, pigs, lambs, dogs) were also excluded.

The search strategy was the search for articles carried out through the Virtual Health Library in the IBECS, BINACIS, Lilacs and MedLine databases using the intersection of descriptive health terms (MeSH): Autologous Blood Transfusion with the terms Intraoperative Period and Postoperative Period.

At first, an analysis was performed based on the titles and abstracts of the articles found, discarding those that did not meet the inclusion criteria or that presented one or more exclusion criteria. In a second step, the studies approved in the analysis of titles and abstracts were submitted to a full analysis of their texts, carried out by 2 different researchers and independently of each other. After consensus on the eligible articles, a study analysis sheet was prepared, including the following data: type of study, patient sample, age group, gender, frequency of autologous and homologous transfusions, advantages and disadvantages of each technique, method of transfusion, complications, indications for transfusion, in addition to year of publication of the study, results and main conclusions.

3 RESULTS

The search strategy described found 1058 articles published in the last 5 years and only controlled clinical trials were selected, resulting in a total of 194 studies. After evaluating titles and abstracts and applying inclusion and exclusion criteria, 26 were characterized as complete and retrieved for eligibility analysis and 168 were excluded. In the analysis of eligibility for

reading the articles in full, 21 studies were discarded. In the end, there were 5 articles that made up the corpus of analysis of the review. Figure 1 presents the flowchart with the stages of identification, selection and inclusion of texts.

Among the studies included in the analysis, 2 randomized controlled trials, 2 prospective case-control studies and 1 retrospective clinical trial were included. Of these, 2 refer to the Gynecology and Obstetrics specialty scenario, 1 related to the Oncological Surgery scenario, 1 pertinent to the Trauma Surgery scenario and the last related to the Orthopedic Surgery scenario. The studies involved a sample of about 373 patients analyzed. The summary of information from the studies is compiled in Table 1.

4 DISCUSSION

Autotransfusion of blood in the intra or postoperative period is a procedure that aims to reintroduce blood lost during surgery or after drainage of a cavity in which there is accumulation of blood.(11) In this process, the collected blood goes through a series of processes such as filtration, washing and anti-clotting before being reintroduced into the patient's body.(14) The benefits, indications and safety of this modality of autologous transfusion are still uncertain.

In the oncology scenario, the safety of autotransfusion is still controversial, since it is believed that blood can influence the increase in malignant cell proliferation and the process of neoplastic metastasis. However, when comparing the effects of autotransfusion with homologous transfusion in patients with hepatocellular carcinoma undergoing liver transplant surgery, there were no significant differences between groups at 1, 3, and 5 years. (15)

In pregnant women, one of the suggested complications of autotransfusion is Amniotic Fluid Embolism. Aiming at this, a clinical trial was carried out in patients undergoing cesarean section who received autologous or homologous blood and analyzed the differences in serum biochemical markers related to amniotic fluid embolism, such as: complement C3 and C4, fibrinogen, fibrin degradation, D-dimer, C1 esterase inhibitor and interleukin-8. It was then demonstrated that there is no evidence that autotransfusion influences the development of amniotic fluid embolism since there are no significant changes in the investigated markers.(16)

In a similar study by Liu, et al, involving cesarean sections, the occurrence of Amniotic Fluid Embolism and other complications such as sepsis, disseminated intravascular coagulation and pulmonary embolism were observed. Serum hemoglobin concentrations were also analyzed, coagulation factors, performed blood antibody screening and compared hospitalization time, costs and need for allogeneic transfusion. Thus, the study reported, in the

group of patients undergoing autotransfusion, a lower incidence of surgical wound infection, adverse cardiovascular events and hypoproteinemia, as well as a shorter hospital stay. (17)

During the search strategy, it was possible to perceive a significant amount of studies related to orthopedic surgeries, mainly in total hip arthroplasty and total knee arthroplasty. That's because these procedures usually lead to massive blood loss.(18) However, most of the studies were directly related to the safety of the "cell saver" equipment.

Therefore, a randomized controlled clinical trial was conducted comparing laboratory parameters of blood clotting: platelets, prothrombin time, INR, activated partial thromboplastin time and D-Dimer in patients who underwent intraoperative autologous transfusion and patients who had only blood. operative collected. The results showed that there are no significant discrepancies in these markers in the two groups studied, with the exception of D-Dimer, which showed a slight increase in the group of patients undergoing blood transfusion ($p < 0.05$). Thus, the study concludes that intraoperative blood transfusion is a safe method, but it may increase the risk of developing postoperative thrombosis.(19)

The retrospective cohort study by Ma et al (2016) advocates the indication of autotransfusion in critically ill patients with massive acute bleeding induced by chest trauma and associated with hemorrhagic shock and hemothorax, who require emergent blood transfusion, in situations where the waiting for blood preparation is not possible and where compatible blood is lacking. This research analyzed 19 cases in which patients underwent thoracic surgery with postoperative autologous blood collection and transfusion and did not present any case of blood reactions subsequent to transfusion, sepsis and development of hemorrhagic diseases.(20)

This study demonstrated that intraoperative autologous blood transfusion can add time to patient treatment, achieving high success rates, being able to avoid 60 to 70% of allogeneic transfusions. Added to this, it points out that it is more convenient and safer than stored blood transfusion, avoids wasting blood lost during surgery and ensures fresh red blood cells, with better cell viability and greater ability to transport oxygen, allowing a rapid increase in volume. blood without adverse transfusion reactions.(20)

According to the study by Ma et al, autologous transfusion should be the choice in situations where the bleeding is acute and massive to the point of making it impossible to wait for the preparation of stored blood, and in those where there is no blood compatible with the patient, being in these cases a key factor for the success of the rescue. It defends the absence of transfusion reactions in its 19 patients undergoing autologous transfusions, demonstrating its safety and efficacy, in addition to avoiding the waste of blood lost during the surgical procedure

and ensuring better oxygenation compared to heterologous transfusion. However, it reinforces the need to pay attention to the indications and contraindications of each type of transfusion. It also alerts to the need to investigate the place of origin of the blood and the time it is out of the blood vessels, since if it is longer than 6 hours or suspected of contamination and/or the presence of cancer cells, it should not be transfused again.(20)

Among the risks observed in this review of studies, elevation of the D-dimer indicating an increased risk of thromboembolic events in total knee or hip arthroplasty surgeries was observed in only one study, but no thromboembolic effect was recorded.(19) However, in pregnant women undergoing cesarean sections, the same phenomenon of significant increase in D-dimer was not observed.(16)

The analyzed studies did not report complications related to the execution of autologous transfusion, much less transfusion reactions. No adverse events such as sepsis, amniotic fluid embolism or metastatic proliferation related to the autologous transfusion procedure were observed. Regarding oncological surgeries, there was fear that autotransfusion could influence the metastatic process, but this fact was not confirmed in the study.

The advantages described were: lower risk/absence of transfusion reactions, treatment of victims who require blood at the point of injury, ability to reduce the need for donors for transfusion, lower incidence of surgical wound infection and cardiovascular events, as well as reduced of the period of hospitalization when compared with patients who underwent heterologous transfusion or who did not undergo blood transfusion in the procedures.

5 CONCLUSION

In order to maintain adequate tissue perfusion of oxygen in the body, blood transfusion is the ideal method for controlling bleeding during elective or emergency surgeries. However, the most used transfusion today is heterologous transfusion, which generates a demand for blood product donation, a limited resource and entails considerable costs for the procedure.

As a strategy to reduce the need to use heterologous blood, blood autotransfusion has been analyzed as a viable option that may present lower risks and greater benefits to patients and health services.

This review identified that the application of autologous blood transfusion in the intra and/or postoperative period can be beneficial in invasive procedures where there is significant bleeding, such as cesarean sections and orthopedic surgeries, or in trauma with extravasation of blood into cavities. such as massive hemothorax, presenting itself as a safe procedure to be applied in these scenarios. However, further studies are needed to compare the benefits and

risks of autotransfusion and heterologous transfusion, as well as the cost derived from each modality.

DISCLOSURE

- Approval of the research protocol: N/A
- Informed Consent: N/A
- Registry and the Registration No. of the study/Trial: N/A
- Animal Studies: N/A
- Conflict of Interest: N/A

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ANNEX

STUDY	SPECIALTY	SAMPLE	KIND OF STUDY
IVANICS et al, 2021[13]	Oncology	110	randomized controlled clinical trial
HAYATA et al, 2021[14]	Obstetrics	37	prospective case-control study
LIU et al, 2020[15]	Obstetrics	116	prospective case-control study
LUO et al, 2016[17]	Orthopedics	91	randomized controlled clinical trial
MA et al, 2016[18]	trauma surgery	19	retrospective clinical trial