Stručni članak

PROFESSIONAL ARTICLES

General Hospital “Đorđe Joanović” Zrenjanin
Department of Transfusiology
Department of Orthopedics and Traumatology
Department of Pediatrics

Stručni članak

Professional article

AUTOLOGOUS BLOOD TRANSFUSION IN PATIENTS UNDERGOING HIP REPLACEMENT SURGERY

PRIMENA AUTOLOGNE KRVI KOD PACIJENATA KOJI SU PODVRGNUTI OPERACIJI UGRADNJE VEŠTAČKOG KUKA

Ivana TEŠIĆ1, Jovan SEKULIĆ2, Vladimir ARBUTINOV2,
Dragana POPOV1 and Dušan VELISAVLJEV3

Summary

Introduction. Autologous blood transfusion is a set of procedures done in order to collect a patient’s blood and reinfuse it during or after a surgical intervention. The aim is to meet the patient’s need for blood products without allogeneic transfusion. By observing the hemoglobin and hematocrit values during blood donation in the pre-operative and post-operative period and by counting transfused blood units, the aim of this article was to detect whether there was any difference between the patients receiving autologous blood and those receiving only allogeneic blood. Material and Methods. This prospective study was performed at the General Hospital “Đorđe Joanović” Zrenjanin from October 24th, 2011 to January 24th, 2013. The study included 60 patients who were divided into the experimental group of 30 patients who had been transfused autologous blood and the control group of 30 patients who had been transfused only autologous blood. Results. The average values of hemoglobin and hematocrit in the first and the second donation were 148.9 g/l and 44.2%, and 138.7 g/l and 40.8%, respectively. Oral iron preparation was given to 12 patients for two weeks before the first donation. The level of hemoglobin and hematocrit in both groups of patients had approximately the same values in the pre-operative and post-operative period. In the post-operative period, 2.53 units were transfused per patient in the experimental group and 3.73 units were transfused per patient in the control group. Conclusion. Administration of pre-operatively donated autogenous blood reduces the number of transfused deplasmatised erythrocytes units in comparison to the number of units transfused to the patients receiving only allogeneic blood products. The pre-operative use of oral iron preparations increases hemoglobin values significantly.

Key words: Blood Transfusion, Autologous; Arthroplasty, Replacement, Hip; Blood Transfusion; Hemoglobin; Hematocrit; Iron

Sažetak


Ključne reči: Autologna transfuzija krvi; Ugradnja veštačkog kuka; Transfuzija krvi; Hemoglobin; Hematokrit; Gvožđe
Introduction

Autologous blood transfusion is a set of procedures performed in order to collect a patient’s blood and reinfuse it to the same patient during or after a surgical intervention. Autologous blood transfusion differs from allogeneic transfusion when the patient is transfused the blood received from other persons - blood donors. Its aim is to meet the patient’s need for blood products without allogeneic transfusion. The patients help themselves by using autologous blood and make chemotherapy more reliable. Thus, by means of using autologous transfusion, the risk of alloimmunization against erythrocyte antigens, leucocytes, thrombocytes and plasma proteins, as well as the risk of immunosuppression and the risk of transmitting the causes of infectious diseases are all eliminated. Hematopoietic system of the autologous blood “donor” is boosted for endogenous cytopoiesis via autologous blood transfusion. For all the above stated reasons autologous blood transfusion is considered the safest of all treatments with blood products [1]. When transfusion is planned for a surgical intervention, strategies for autologous blood accumulation are applied depending on the estimated blood losses. There are several ways of collecting autologous blood, such as: preoperative autologous blood donation (PAD), intraoperative blood salvation (IBS), postoperative blood salvation (PBS) and acute normovolemic hemodilution (ANH) [2]. Autologous blood donation is indicated in patients who are planned for surgical procedures that are usually followed by the demand for blood and blood products, or accompanied by pre-transfusion tests. Most of the health centers worldwide have protocols for various surgical procedures which are the basis for ordering the required number of blood or blood product units [3]. There is such a protocol in our hospital according to which four units of allogeneous deplasmatized erythrocytes are ordered for hip replacement surgery, and this protocol justifies preoperative autologous blood collection [4]. It is crucial to emphasize that blood collected in this way cannot totally eliminate the need for allogeneic blood transfusion; yet, the demand for it is reduced significantly. In those situations when the demand for transfusion is higher than estimated, i.e. the number of autologous blood units does not meet the needs of surgical procedure, it is justifiable to use allogeneic blood as well.

Our aim was to detect whether there was any difference between the patients who had been transfused autologous blood and those who had been transfused only allogeneic blood. This was achieved by following the values of hemoglobin and hematocrit in the preoperative and postoperative period, by recording the number of transfused blood units (autologous and allogeneic), by keeping the track of blood loss via a surgical drain during the postoperative period, by recording the frequency of posttransfusion reactions in patients who were transfused allogeneic blood and the ones who were transfused both autologous and allogeneic blood and blood products, as well as by observing the length of hospitalization. Allogeneic blood transfusion involves certain risks. It can lead to transmission of infectious causes, development of post-transfusion reactions and occurrence of immunomodulation. Autologous blood transfusion does not entail the above mentioned complications, it is actually believed to diminish the need for allogeneic blood and shorten the patient’s recovery period [1,2,5].

Autologous blood donation can significantly reduce the costs of treatment [2,5,6].

Material and Methods

This prospective study was performed at the Department of Transfusiology and the Department of Orthopedic and Traumatology of the General Hospital “Đorđe Joanović” in Zrenjanin from October 24th, 2011 to January 24th, 2013 (15 months of observation). Total hip replacement surgery was performed in 116 patients. This surgery had been planned in fifty-four patients and they were referred to the Department of Transfusiology. The study sample was divided into the experimental group, which included 30 hip replacement surgery patients who were transfused pre-operatively donated autologous blood, either during surgery or after it; and the control group, which consisted of 30 patients who were transfused only allogeneic blood. There were 17 women and 13 men in the experimental group; whereas the control group consisted of 19 women and 11 men. The average age of patients in the experimental and control group was 63.8 and 65, respectively, that being a statistically irrelevant difference (t=2.00, tc=1.77, p>0.05). To satisfy the important inclusion criterion the patients from both groups had to be operated on by the two surgeons who took part in this study; while the remaining 56 patients were operated on by other surgeons. Indications for autologous blood collecting were all elective surgical procedures where allogeneic blood transfusion was applied in 10% or more cases. The patients were referred to the Department of Transfusiology from the Department of Orthopedic and Traumatology for blood donation.

The authors of this study obtained the approval of Ethical and Scientific Board of General Hospital “Đorđe Joanović” in Zrenjanin.

The choice of patients for autologous blood donation depended on the patient’s general condition, age, level of hemoglobin and hematocrit as well as their weight. Autologous blood donation was not done in patients with one of the following conditions: unstable angina pectoris, cardiac decompensation, cyanosis or congenital heart defect, respiratory insufficiency, occlusions or severe defect of central nervous system (CNS), severe hemodynamic problems, active system infection (bacteremia, viremia, sepsis), blood disease and coag-
ulation disorder, disseminated neo process and body weight lower than 40 kg [1,7].

Each patient was explored the first favorable effects of autologous blood. The number of autologous blood units for each patient was planned according to the laboratory analysis (Hgb level not lower than 110 g/l and Hct not lower than 0.34%), voluntary blood donors’ form, medical examination, as well as the date of the planned surgery. The first blood collecting was planned two or three weeks before the patient was admitted to hospital, and every next collecting was repeated in seven days’ time. Prior to each blood donation, the concentration of hemoglobin and hematocrit was checked on hemoglobin meter Hemo Control. If the level of hemoglobin was lower than 135 g/l, Heferol iron capsules were administered orally along with vitamin C tablets [8]. When 450.0 ml of blood is lost, hemoglobin values falls by 10 g/l [1]. If two units of the whole blood are taken from the patient, the initial hemoglobin value falls by 20 g/l which would be approximately 115 g/l before surgery. According to the World Health Organization (WHO) criteria, anemia is defined as hemoglobin concentration lower than 130 g/l or hematocrit lower than 39% in adult males, i.e. hemoglobin concentration lower than 120 g/l or hematocrit lower than 37% in adult females [9,10]. In order not to bring the patient into the anemic condition before surgery, the value of 135 g/l for hemoglobin was taken as the border value when oral iron preparation was introduced.

The minimal period between the last autologous blood donation and surgery was 72 hours, that being the period needed for the organism to recover intravascular volume. Depending on the body weight of the patient, blood was collected in double layered bags of 350.0 ml and 450.0 ml by Macopharma. Having been collected, each blood unit was centrifuged. Plasma was separated into a transfer bag and frozen at -80 °C, while deplasmatised erythrocytes were deposed in the refrigerator at +4 °C. The deplasmatised erythrocytes and the frozen plasma were marked as autologous blood and deposed separately from allogeneic blood and were supposed to be donated only to the donor. The expiry date for deplasmatised erythrocytes is 35 days and for freshly frozen plasma one year. If the freshly frozen plasma was not used during the hospitalization period, it was discharged after the patient was released from the hospital and due to technical reasons was not kept till its expiry date.

Each unit of autologous blood was tested in the serological laboratory. The blood type was determined by Bio-Rad ID-Card DiaClon ABO/D + Reverse Grouping cards at the first donation and by Bio-Rad ID-Card DiaClon ABD-Confirmation for Donors at the second donation. Each donation underwent antibody screening by Bio-Rad ID-Card Liss/Coombs with Test cell reagents for the ID-System-ID-DiaCell Pool cards. Autologous blood units were tested for communicable diseases – the presence of chronic hepatitis C-associated thrombocytopenia (HCVaT), Hepatitis B Surface Antigen (HBsAg), human immunodeficiency virus (HIVAg/Al), TPA by Biomérieux tests applying the Elisa technique. According to the decision of the hospital transfusion committee, if the test result for the communicable diseases turned out reactive, the blood unit was discharged and was not donated to the patient.

The control group, consisting of patients who did not donate autologous blood and who received only allogeneic blood, also included the patients who had contraindications for autologous blood donation and the patients who were unable to come and donate blood for some other reasons. The hemoglobin level in the control group patients was aprox. 130 g/l.

The patients from both groups underwent total hip replacement surgery. Both cemented and un-cemented Zimmer prostheses were used depending on the patient’s age. The cemented prostheses were used in patients older than 70 years of age, while the un-cemented ones were used in younger patients. All the surgical procedures were done by anterolateral approach.

During the postoperative period, the number of transfused units of blood and blood products (autologous and allogeneic blood), hemoglobin and hematocrit values, value of blood loss via a medi-cal drain, post-transfusion reactions occurrence and the length of hospitalization were observed and recorded.

Nonparametric, χ² tests and parametric, Student’s t-test were used for the statistical data processing.

**Results**

Hip replacement surgery was performed in 116 patient at the Department of Orthopedics and Traumatology of the General Hospital “Dorđe Joanović” in Zrenjanin. Out of fifty-four (46.5%) patients who were referred to the Department of Transfusiology, 46 patients donated blood and eight of them were denied autologous donation because they did not satisfy the criteria; thus, 89 autologous blood units were collected, forty-two patients donated two units, each, and 4 patients donated one unit, each. Of 46 patients who had donated blood, three were not operated and their blood was discharged.

The experimental, autologous group consisted of 30 patients who were randomly chosen among 46 patients who had donated autologous blood before surgery. They donated 58 whole blood units in total. Prior to autologous blood donation, the level of hemoglobin and hematocrit was measured in all the patients from the experimental group. The average value for hemoglobin and hematocrit in the first and the second donation was 148.9 g/l and 44.2%, and 138.7 g/l and 40.8%, respectively.
The hemoglobin value was reduced by 10 g/l after each donation, which is to be expected after blood loss of 450 ml (Table 1).

Oral iron preparation had been given to 12 patients for two weeks before the first donation and to 6 more patients after the second donation. The patients had been using the iron preparation before they were admitted to hospital. The average value of hemoglobin had been 127.4 g/l in 12 patients before the oral iron preparation was introduced, and after two weeks, i.e. before the first donation it was 136.9 g/l, that being a statistically significant difference (t= 3.06, te = 3.305, p < 0.01).

The level of hemoglobin and hematocrit was measured in both groups of patients before surgery. The average value of hemoglobin and hematocrit for the experimental group was 129.8 g/l and 39.2%, and for control group it was 130.1 g/l and 44.1%, which implies that both groups of patients had approximately the same values (Table 2). The statistical analysis of the hemoglobin values showed that the difference was not statistically significant (t= 2.00, te = 0.26, p > 0.05).

The final hemogram showed that the average values of hemoglobin and hematocrit for the experimental and the control group were 101.2 g/l and 30.9%, and 101.5 g/l and 34.7%, respectively, in the post-operative period when there were no transfusions. The data indicate that both groups of patients were transfused approximately to the same values of hemogram. Transfusion of blood and blood products was indicated when hemoglobin values were lower than 90 g/l in both studied groups; however, when these values were higher, transfusion was not considered justifiable (Table 3). Student’s t test showed that the difference was not statistically significant (t= 2.00, te = 0.43, p > 0.05).

In the post-operative period, all units of autologous deplasmatised erythrocytes (58 units) were transfused to the patients who had donated them. Twenty patients (66.7%) from this group received only their own pre-operatively donated blood, and 10 patients (33.3%) had to receive allogeneic blood in addition to their own. Eighteen units of deplasmatised allogeneic erythrocytes were transfused in total, that being 1.8 allogeneic blood units per

<table>
<thead>
<tr>
<th>Mean value of parameters/Srednja vrednost parametara</th>
<th>Hgb (g/l)</th>
<th>Hct (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood donation/Doniranje krvi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First donation/Prvo doniranje</td>
<td>148.9</td>
<td>44.2</td>
</tr>
<tr>
<td>Second donation/Drugo doniranje</td>
<td>138.7</td>
<td>40.8</td>
</tr>
</tbody>
</table>

### Table 1

Mean value of hemoglobin (Hgb) and hematocrit (Hct) before autologous blood donation

<table>
<thead>
<tr>
<th>Mean value of parameters/Srednja vrednost parametara</th>
<th>Hgb (g/l)</th>
<th>Hct (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group/Grupa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autologus/Autologna</td>
<td></td>
<td></td>
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<tr>
<td>Allogeneic/Alogena</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 2

Mean value of haemoglobin (Hgb) and hematocrit (Hct) in pre-operative period in both groups of patients

<table>
<thead>
<tr>
<th>Mean value of parameters/Srednje vrednosti parametara</th>
<th>Hgb (g/l)</th>
<th>Hct (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group/Grupa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autologus/Autologia</td>
<td>129.8</td>
<td>39.2</td>
</tr>
<tr>
<td>Allogeneic/Alogena</td>
<td>130.1</td>
<td>44.1</td>
</tr>
</tbody>
</table>

### Table 3

Mean value of haemoglobin (Hgb) and hematocrit (Hct) in post-operative period in both groups of patients

<table>
<thead>
<tr>
<th>Mean value of parameters/Srednje vrednosti parametara</th>
<th>Hgb (g/l)</th>
<th>Hct (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group/Grupa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autologus/Autologia</td>
<td>101.2</td>
<td>30.9</td>
</tr>
<tr>
<td>Allogeneic/Alogena</td>
<td>101.5</td>
<td>34.7</td>
</tr>
</tbody>
</table>

### Table 4

The number of transfused units of deplasmatised erythrocytes in both groups of patients

<table>
<thead>
<tr>
<th>Group/Grupa</th>
<th>Deplasmatised erythrocytes/Deplazmatisani eritrociti</th>
<th>Autologus Autologna</th>
<th>Allogeneic Alogena</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autologus</td>
<td>58 (1.93)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Allogeneic</td>
<td>18 (0.6)</td>
<td>112 (3.73)</td>
<td></td>
</tr>
<tr>
<td>Total/Ukupno</td>
<td>76 (2.53)</td>
<td>112 (3.73)</td>
<td></td>
</tr>
</tbody>
</table>
The average value of blood loss via a drain was 602.1 ml and 639.6 ml in the experimental and the control group, respectively, that being statistically insignificant \((t=2.02, \text{te}=0.03, p>0.05)\). A post-transfusion reaction occurred only in one patient (3.3%) from the control group, while there were no reactions to donated blood in the experimental group.

The average length of hospitalization in the experimental group was 20.3 days, and in the control group it was 21.5 days, that being statistically significant \((t=2.00, \text{te}=2.45, p<0.05)\).

**Discussion**

Osteoarthritis is a widely spread, chronic process impossible to be cured completely. Practically, any elderly man has medical problems associated with degenerative changes in joints.\(^{[11]}\)

According to the frequency of occurrence, osteoarthritis takes the fourth place among diseases in the contemporary world; right after cardiovascular, cerebrovascular and lung diseases.\(^{[12]}\)

The main symptom of arthritis is the pain that is increased with age and physical strain, which is the reason why the patients demand long-lasting medical and physical therapy.\(^{[11]}\) The main aim when treating arthritis is to decrease the pain, i.e. to mitigate the quality of life and working ability of the patient.\(^{[13]}\) In cases of exceptionally advanced forms of disease, when there are prominent destructive changes in bone-joint system, a surgical treatment is needed. The chosen surgery in these cases is arthroplasty, i.e. the prosthetic replacement of the affected joint.\(^{[14]}\) Surgeries on larger joints, such as the hip joint, are accompanied by numerous problems and potential complications.\(^{[13]}\) One of the most difficult complications is the acute loss of blood in the perioperative period, when it is essential to compensate blood loss timely and adequately. In this study we reported the findings gathered while monitoring blood loss via a drain in the postoperative period. Blood loss was found to be larger in the control group of patients than in the experimental group. However, when statistically processed, these data appear insignificant. In order to determine the exact blood loss, it is necessary to measure the intra-operative loss as well as the coagulation parameter values (partial thromboplastin time, i.e. PT, activated partial thromboplastin time, i.e. aPTT) in addition to the postoperative loss. We were unable to analyze all these parameters while doing this study, thus we failed to obtain these relevant data. Having analyzed autologous blood use in the revision hip replacement surgeries, Award et al. explained a smaller postoperative blood loss by the stimulation of hematopoiesis in the group of patients who were transfused autologous blood because preoperative autologous blood transfusion was combined with preoperative autologous blood donation in their study. They came to the conclusion that autologous blood transfusion completely eliminates the need for allogeneic blood transfusion; however, they also performed perioperative blood salvation in addition to preoperative blood donation in their research.\(^{[15]}\) Lisander et al. found out that the administration of autologous blood diminishes the usage of allogeneic blood by 35-40% during the perioperative period in total hip replacement surgery.\(^{[16]}\)

According to the results of our study, autologous blood transfusion is an efficient method that reduces allogeneic blood usage significantly in our circumstances as well. Our choice was preoperative autologous blood collection because its application does not require any additional financial investment. It is considered that intraoperative and postoperative autologous blood collection is not financially justified in primary prosthesis surgery, it is justifiable only in revision prosthesis surgery.\(^{[17,18]}\)

In our study, we found that 66.7% of the patients who had donated two blood units before surgery did not need allogeneic blood after their own blood was reinfused. The remaining 33.3% of patients received 18 units of allogeneic erythrocytes, i.e. 1.8 units per patient in addition to their own blood. The patients from the experimental group received 2.53 units of deplasmatised erythrocytes, on average. The results of our study show that the amount of transfused deplasmatised erythrocytes units was reduced due preoperative autologous blood donation.

Nowadays, various, more complex surgical operations are performed with the resulting higher demands for allogeneic blood; however, this increased demand is not followed by the increased number of voluntary blood donors which results in ever more frequent short supplies of allogeneic blood. The only logical solution is to opt for alternatives in order to preserve allogeneic blood supply. Autologous transfusion (predeposit autologous blood, acute normovolaemic hemodilution, intraoperative and postoperative blood salvation) is an economically justifiable and safe alternative. It neither requires pretransfusion tests nor does it cause immunization to alien antigens; it is indicated in patients with rare blood groups and in those with multiple alloantibodies; and it can be performed even in some sects, such as the Jehovah’s Witnesses. Autologous transfusion enhances microcirculation, postoperative tissue perfusion and lowers the risk of thromboembolism.\(^{[5]}\) We have neither had patients with rare blood diseases in our

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Patient. The patients from the experimental group were transfused 76 units of deplasmatised erythrocytes in total, i.e. 2.53 units per patient. In the post-operative period, 30 patients from the control group were transfused 112 units of allogeneic deplasmatised erythrocytes, i.e. 3.73 units per patient (Table 4).

Statistic data processing showed that there was a significant difference between the experimental and control group regarding the number of transfused blood units \((p<0.005)\).

In the post-operative period, 30 patients from the control group, while one patient (3.3%) from the control group, were transfused 76 units of deplasmatised erythrocytes, i.e. 3.73 units per patient. The patients from the experimental group received 2.53 units of deplasmatised erythrocytes, i.e. 3.73 units per patient (Table 4).

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**Table 4**

<table>
<thead>
<tr>
<th></th>
<th>Average Blood Loss (ml)</th>
</tr>
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<tbody>
<tr>
<td>Control Group</td>
<td>602.1 ml</td>
</tr>
<tr>
<td>Experimental Group</td>
<td>639.6 ml</td>
</tr>
</tbody>
</table>
hospital, nor have we had patients with multiple al-
loantibodies for whom predeposit autologous transfu-
sion is the only option in chemotherapy.

While performing preoperative blood donation there is a risk of postponing the surgery in some patients due to various reasons, and in such cases the units of deplazmatized erythrocytes have to be disposed of due to expiry date. In order to avoid this unwanted situation, we collected two blood units from each of our patients, because the period between the first donation and surgery was shorter (approximately two weeks), thus making the period when the blood could be used longer, in case we had to postpone surgery. The application of such a protocol made it possible to postpone surgery for the period of two weeks maximum, i.e. until the expiry date of autologous erythrocytes in case the patient did not undergo surgery as planned. Billote and his associates have concluded that financial loses are extremely high if all collected autologous blood is not transfused. They believe that it is unjustified to collect autologous blood unless the patient is anemic [17].

In the last decades, the need for diagnosis and treatment of preoperative anemia is emphasized in order to make the patients well prepared for possible complications which may be caused by surgery. The recommendations are given in the NATA (Network for the Advancement of Transfu-
sion Alternatives) guidelines [10,19,20]. When do-
ing his research, Goodnough concluded that 35% of patients undergoing elective orthopedic surger-
ies had hemoglobin values less than 130 g/l. Most of the patients were women and the most common cause of anemia was iron deficiency [20]. Having considered all the previous results, we opted for the administration of oral preparation of iron, combined with vitamin C in all patients who, prior to autologous blood donation, had hemoglobin values less than 135 g/l. After two weeks’ admin-
istration of this preparation, the hemoglobin values increased, which resulted in the same or even higher hemoglobin values than those prior to the donation of two blood units. In this way, we managed to make the hemoglobin values in the experimental and control group even.

According to the recommendations given in the national guides, the recommended value of he-
moglobin and hematocrit is ≤70 g/l and ≤21%, re-
spectively, when allogeneic blood is to be trans-
fused. This standing point supports the restrictive approach to allogeneic blood transfusion [21]. In our study, we transfused blood when hemoglobin values were ≤90 g/l because the patients were eld-
ery people with chronic diseases. Therefore, the hemoglobin values determined in the last hemo-
gram were approximately the same for both the experimental and control group.

Based on the obtained results, we have conclud-
ed that preoperative hemoglobin correction by ad-
ministering oral iron preparations along with preop-
ervative autologous blood donation can significantly reduce the need for allogeneic blood transfusion.

Our Department does not have protocols or ex-
act recommendations for how long the patient should stay in hospital after certain surgical inter-
ventions when the postoperative course is un-
ventful. In cases of hip replacement surgery, the patients stay in hospital for two weeks at least, un-
til the sutures are removed. Since most patients are referred to a stationary rehabilitation institu-
tion for physical treatment immediately after the hospitalization, they frequently stay in hospital for a longer period of time until a place in a rehabili-
tation institution becomes vacant. Therefore, the data on the length of hospitalization in our study cannot be considered relevant in spite of the statis-
tically significant difference, because they are not the result of the quicker recovery but depend on external factors, which cannot be influenced.

Conclusion

Transfusion of allogeneic blood and blood prod-
ucts is a part of everyday clinical practice, particu-
larly at surgical departments for treating severe blood losses during surgical procedures. Although it has become a routine procedure, it must be done with ut-
ter caution not only in order to avoid technical and administrative errors, but also because of constant threat of problems that may occur during and after any transfusion. Blood testing is nowadays done in transfusion services at a much higher level, thus making the process of blood and blood products transfusion much safer. Yet, transfusion related com-
plications may still occur. The only real alternative to allogeneic blood transfusion is autologous dona-
tion. Considering the fact that the blood donor and the receiver is actually the same person, the possible complications related to allogeneic blood transfusion are eliminated.

According to the above mentioned results, we have concluded that the administration of pre-opera-
tively donated autologous blood reduces the number of transfused deplasmatised erythrocytes units when compared to the number of units transfused to the patients receiving only allogeneic blood products. Pre-operative administration of oral iron prepara-
tions significantly increases the hemoglobin values, thus enabling us to take two blood units from the pa-
tient before surgery without causing anemia.

Autologous blood collection should be an inte-
gral part of the National Program for Blood Dona-
tion of every country, as recommended by the World Health Organization and the International Society of Blood Transfusion. According to the Law on Blood, Blood Donation and Blood Transfu-
sion passed on in 2010, each doctor is obliged to in-
form the patient about the possibility of autologous donation according to the criteria for autologous donation if planning a surgery which usually re-
quires blood or blood products transfusion. In our
hospital all the patients who are about to undergo hip replacement surgery are informed about autologous donation by their orthopedist and referred to the Department of Transfusiology for further medical examination. In General Hospital "Dorde Joanović" in Zrenjanin, predeposit of autologous donation has become a standard procedure in patients who undergo hip replacement surgery.

References