Preparative Haemapheresis and Donor Safety

The need of blood components has increased continuously within the last decades. While in the USA the number of transfused RBCs nearly doubled from 6.3 to 12.4 millions between 1971 and 1999, the usage of platelets increased 22-fold from 0.4 to 9.1 units within this period [1]. Thus, the percentage of platelet concentrates increased from 5 to 37% of the total blood use while the percentage of RBCs decreased from 92 to 50%. There are no data documenting this development for Germany or the European Union. However there are two investigations on blood use in Germany published by the Paul-Ehrlich-Institut for 1998 [2] as well as for 1999 to 2000 [3] and two investigations from the University Hospital Erlangen [4, 5] which should be representative for the utilisation of blood components in hospitals of maximum medical care. These data show that in Germany the percentage of platelet concentrates rose continuously from 22% of the total utilisation of blood components in 1998 to 26% in 2000 [3]. Depending on the clinical department, platelet concentrates represent 25–56% of the total utilisation of blood components in the university hospital [4, 5].

On the one hand there is an increasing need for blood components, specifically platelet concentrates, and on the other hand a decrease of the number of available blood donors, which is caused by a decreasing willingness for blood donation and by donor exclusion criteria becoming more and more stringent [6]. The resulting increase of the number of donations per donor forces us to critically analyse the potential risks for a donor caused by whole blood or apheresis donation. This analysis is supported by a review given by Popovsky in this issue of TRANSFUSION MEDICINE AND HEMOTHERAPY [7]. Popovsky demonstrates that whole blood donation as well as apheresis donations may bear serious risks for donors. This applies particularly for events such as haematoma, arterial puncture, nerve injury and vasovagal reaction caused by the phlebotomy. Such events less frequently occur during aphere-

sis donation than during whole blood donation [8, 9]. Data from 1997 to 1999 compiled by the DGTI-section 'Preparative and Therapeutical Haemapheresis' demonstrate that the incidence of vasovagal reactions during plateletapheresis is 0.1–0.3% [10].

However citrate toxicity is an event that only occurs during apheresis donation, requiring a very careful donor selection and care. As shown by Laspina et al. [11], citrate caused changes of the donors' electrocardiogram (ECG) during apheresis. It is therefore recommended to identify all donors carrying cardiological risk factors before the first donation. Despite the costs of the additional examination, this selection procedure should be based not only on the medical history but also on an additional ECG examination because it was shown by Glaser et al. [6] that, even in a group of 770 donors without detectable anamnestic risk factors, pathological changes of the ECG occurred in 1.7% of the donors.

Describing RBC apheresis, Popowsky points to a new issue opened by multi-component donation. However the term 'multi-component donation' is not clearly specified so far. It is used either for donation procedures leading to at least 2 different products (e.g. 1 unit of RBCs and 1 unit of platelets) or for all procedures leading to more than one product (e.g. 2 units of RBCs or 2 units of platelets). Thus, the term requires a standardised definition.

The intensified use of donation procedures in which more than one blood product is collected bears new potential risks for the donors. Obviously, the iron loss is significantly higher when collecting 2 units of RBCs instead of 1 unit [12, 13]. Even if RBCs regenerated completely after 2 months, the donors' ferritin levels remained reduced for 4 months [12, 13]. Thus it has to be concluded that the withdrawal of 2 units of RBCs influences the donors' iron metabolism, necessitating an intensive monitoring of these donors. Long-term decreased ferritin levels and increased erythropoietin and transferrin lev-

els after one single collection of 2 units of RBCs are other indicators for modifications of the donors' metabolism. Moreover, it was shown by Dettke et al. [14] that citrate effects the bone metabolism in plateletapheresis donors.

Using apheresis techniques, increasing numbers of blood components can be collected in spite of a decreasing donor population [15]. This results in a higher number of collected components per donor and a potentially higher likelihood for the individual donor to experience adverse effects during or after the donation. This and especially possible long-term adverse effects requires our attendance. The German and European

Guidelines [16, 17] however focus much more on the recipients' than on the donors' safety so far. This might be caused by the scarce data, especially with respect to long-term adverse effects of multi-component donations.

New definitions of donor selection criteria, donor safety controls as well as donation intervals are needed for the different blood component combinations to be collected. The scientific associations are obliged to perform a survey of current data on long-term tolerance of multi-component donation for updating the existing recommendations for preparative cytapheresis [18].

J. Zingsem, Erlangen, R. Moog, Essen

References

- Rossi EC, Simon TL: Transfusion in the new millennium; in Simon TL, Dzik WH, Stowell CP, Snyder EL, Strauss R (eds): *Rossi's Principles of Transfusion Medicine*, 3rd ed. Philadelphia, Lippincott Williams and Wilkins, 2002, pp 1–12.
- Bekanntmachung des Paul-Ehrlich-Instituts. Bericht zur Meldung nach §21 TFG für das Jahr 1998. Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz 2001;33:238–245.
- Bekanntmachung des Paul-Ehrlich-Instituts. Bericht zur Meldung nach §21 TFG für die Jahre 1999 und 2000. Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz 2003;46:1016–1032.
- Zimmermann R, Buscher M, Linhardt C, Handtrack D, Zingsem J, Weisbach V, Eckstein R: A survey of blood component use in a German university hospital. *Transfusion* 1997;37:1075–1083.
- Zimmermann R, Handtrack D, Zingsem J, Weisbach V, Neidhardt B, Glaser A, Eckstein R: A survey of blood utilization in children and adolescents in a German university hospital. *Transfus Med* 1998;8:185–194.
- Glaser A, Zimmermann R, Zingsem J, Weisbach V, Neidhardt B, Eckstein R: Veränderung der Spenderausschlußrate bei der Gewinnung von Apheresespendern durch die Neufassung der «Richtlinien zur Blutgruppenbestimmung und Bluttransfusion (Hämotherapie)». *Infusionsther Transfusionsmed* 1999;26:300–305.
- Popvosky MA: Complications of blood donation: Manual and automated collection procedures. *Transfus Med Hemother* 2004;31:49–53.
- Despotis GJ, Goodnough LT, Dynis M, Baorto D, Spitznagel E: Adverse events in platelet apheresis donors: A multivariate analysis in a hospital-based program. *Vox Sang* 1999;77:24–32.
- McLeod BC, Price TH, Owen H, Ciavarella D, Sniecinski I, Randels MJ, Smith JW: Frequency of immediate adverse effects associated with apheresis donation. *Transfusion* 1998;38:938–943.
- Moog R: Mitteilungen über unerwünschte Störungen und Nebenwirkungen der präparativen Hämapherese in den Jahren 1997–1999. *Infus Ther Transfus Med* 2001;28:51–53.
- Laspina SJ, Browne MA, McSweeney EN, Lawlor J, Whelan DM, Kinsella AL, Murphy WG: QTc prolongation in apheresis platelet donors. *Transfusion* 2002;42:899–903.
- Valeri CR, Ragno G, Srey R: Restoration of red blood cell volume following 2-unit red blood cell apheresis. *Vox Sang* 2003;85:85–87.
- Högler W, Mayer W, Messmer C, Eibl G, Innerhofer P, Schonitzer D, Nussbaumer W: Prolonged iron depletion after allogeneic 2-unit RBC apheresis. *Transfusion* 2001;41:602–605.
- Dettke M, Buchta C, Bieglmaier C, Kainberger F, Macher M, Höcker P: Effects of citrate anticoagulation on bone metabolism and bone morphology in plateletapheresis donors. 14th Congress of the European Society for Haemapheresis and Haemotherapy (ESFH), Prague, 2003. Book of Abstracts, p 24.
- Gilcher RO: It's time to end RBC shortages. *Transfusion* 2003;43:1658–1660.
- Wissenschaftlicher Beirat der Bundesärztekammer und Paul-Ehrlich-Institut: Richtlinien zur Gewinnung von Blut und Blutbestandteilen und zur Anwendung von Blutprodukten (Hämotherapie). Köln, Deutscher Ärzte-Verlag, 2000.
- Council of Europe: Guide to the Preparation, Use and Quality Assurance of Blood Components. 9th ed. Strasbourg, Council of Europe Publishing, 2003.
- Burkhardt T, Kadar JG, Matthes G, Moog R, Müller V, Pachmann U, Zingsem J: Durchführung präparativer zellulärer Hämapheresen zur Gewinnung von Blutbestandteilkonzentraten. II. Empfehlungen zur präparativen Leuko- und Thrombozytapherese der Deutschen Gesellschaft für Transfusionsmedizin und Immunhämatologie (DGTI). *Infusionsther Transfusionsmed* 1998;25:376–382.