CASE REPORT

Septic shock during platelet transfusion in a patient with acute myeloid leukaemia

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SUMMARY

Although rare, transfusion-associated bacterial contamination (TABC) is nowadays the main risk associated with platelet concentrate (PC) transfusion. Consequences vary from spontaneously resolving symptoms to severe sepsis and death. In this report we have summarised a case of bacterial contamination and sepsis during PC transfusion in a patient with acute myeloid leukaemia. Fifteen minutes after the PC transfusion began, she developed chills and rapidly worsened to septic shock. The episode was managed appropriately. The patient's blood cultures and PC unit cultures grew *Escherichia coli*. The microbiological susceptibilities of isolates from the patient and platelet bag were identical. No other source of *E coli* was found. Donor and blood products issued from the same donation investigations were negative. The causality between sepsis and PC transfusion might be difficult to confirm. As no method is available in daily practice to eliminate TABC risk, physicians should always consider TABC by immediately stopping the transfusion and conducting appropriate investigations.

BACKGROUND

Blood product transfusion has become safer mainly because of improvements in viral transmission prevention, but bacterial contamination is still a common risk during transfusion, especially after platelet component transfusion.^{1–2} The reported incidence of contamination of platelet concentrate (PC) unit and of clinical features of contaminated transfusion varies in the literature. Incidence of contamination is estimated to be about 1/1000 to 1/2000 PC,³ clinical sepsis is estimated to occur in 1 of 10 contaminated PC transfusions, that is 1/20 000 PC transfusions, and the death rate is 1/60 000 PC transfusions.^{4–5} The consequences of transfusion-associated bacterial contamination (TABC) are very heterogeneous. The factors associated with clinical presentation are inoculum's size, germ virulence and underlying recipient condition.⁶ Moderate sepsis, severe sepsis and death after multiorgan failure have been reported. In some cases, the recipient develops non-specific symptoms with spontaneous resolution. The underlying medical conditions of transfusion patients, such as febrile neutropenia, or drugs (frequent use of antimicrobial or anti-inflammatory agents) contribute to mask symptoms.^{5–7} TABC might thus remain undiagnosed, which may explain variation in incidence estimates and sparse case reports.^{8–9} Here, we reported a case of bacterial contamination with sepsis during PC transfusion.

CASE PRESENTATION

A woman in her early 40s presenting a relapse of type M1 acute myeloid leukaemia was admitted to a 1-day clinic for PC transfusion for thrombopenia in 2008. Figure 1 provides a synoptic table of this case. PC transfusion by peripheral venous catheter began at 14:00. She received single donor apheresis-derived platelet components that issued from a donation performed 48 h before the transfusion. Approximately 15 min after the start of transfusion, the patient had chills (rigors) and a temperature of 39.7°C. She became hypotensive, with her blood pressure dropping rapidly from 170/120 to 80/40 mm Hg. She developed signs of septic shock, vomiting and diarrhoea. She was immediately hospitalised in the haematology department. The patient recovered from the episode with vascular filling and intravenous antibiotic treatment. As described in figure 1, she was treated successively with an association of vancomycin, tazocillin and orbenin for 1 day, then imipenem/cilastatin and amikacin for 2 days; and, finally, amikacin and ceftazidime for 8 days. She was discharged 10 days later.

INVESTIGATIONS

Transfusion was stopped immediately at the symptom onset. The PC unit was disconnected after clamping and transmitted to a laboratory for investigation and culture. During the episode, two blood samples were collected from the patient. Her blood cultures grew *Escherichia coli* at 15:00 and 18:00. *E coli* was also cultured from the leftover platelet unit bag. The microbiological susceptibilities were identical for both. Donor investigations were undertaken with donor interview and sampling (blood, nasal and urinary); other transfusion products from the same donation were cultured. All results were negative. The donation had been performed after an arm cleansing according to the available protocol, the first 15 mL of the donation were diverted and the unit was stored only 48 h before the transfusion.

The patient presented a complex infectious condition. Sinus aspergillosis had been diagnosed and treated 1 month earlier. She incurred a urinary tract infection 4 weeks before the TABC with *E coli*, but the antibiogram was different from that of the TABC. She also underwent bilateral meatotomy for persistent sinusitis involving *Staphylococcus aureus* and *Streptococcus oralis*. A contaminated central venous catheter was withdrawn 4 days before the episode. Nevertheless, the last bacteriological examinations performed 14 days

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PLT: Platelets, Hb: haemoglobin, Leuco: Leucocyte count, PC: Platelet concentrate, RBC: red blood cell, GNR: gram negative rods, G: Giga, BC: Blood culture

Figure 1 Synoptic table of clinical, biological and treatment data.

before PC transfusion for urinalysis and 6 days before PC transfusion for blood culture were negative. No *E coli* infection entrance was found during exploration of the episode, other cultures performed were all negative. The patient was treated with amoxicillin–clavulanic acid, ofloxacin and posaconazole at admission.

A statement was delivered to the blood vigilance authorities to stop the distribution of other blood products issued from the same donation.

OUTCOME AND FOLLOW-UP

The patient recovered from the episode with vascular filling and intravenous antibiotic treatment. She was discharged 10 days later.

DISCUSSION

The chronological data, positive unit cultures and absence of currently identified *E coli* infection in the recipient argue in favour of TABC. Nevertheless, the patient presented neutropenia and a previous complex infectious state, so that a silent infection source was also suspected. Moreover, as donor investigation and culture of other blood products from the same donation were negative, confirmation of the infection source was difficult. An alternative hypothesis of retrograde PC bag contamination could be proposed.¹⁰

Other more frequent and spontaneous adverse events based on chills-rigors syndrome that could have been considered were: human leucocyte antigen immunisation or presence of leucocyte interleukin in the unit.¹¹ Morrow *et al*¹² showed that only 2% of chills-rigors syndromes during a transfusion were from

bacterial aetiology. However, microbial contamination should always be considered immediately, even if symptoms are limited to chills and hyperthermia, because of severe underlying conditions possibly favouring severe prognosis in case of TABC.

If bacterial contamination is suspected, an investigation should be conducted to ascertain or eliminate blood product accountability. The first and most important measure to be undertaken is to disconnect the transfusion as soon as possible, with particular attention being given to limiting the risk of retrograde contamination (clamping and no declivity). Then, the unit is seeded and cultured. Blood from the recipient should be cultured during symptom occurrence and results must be compared with the unit cultures. The accident should be reported to the authorities to prevent the distribution of other units from the same donation until data are obtained and a donor investigation undertaken. The donor investigations consist of culture of other products issued from the same donation, donor interview (health checkup) with search for infectious signs at the time of donation, and blood, nasal and urinary samples to screen for current infection.

Contamination could occur at each step of the process, from donation to transfusion and various methods are currently employed to limit contamination.^{1–13} Donors are interviewed and screened for running or incubating infection, arm skin of the donor is disinfected according to a specific protocol,¹⁴ and the first aliquot of the donation (15/30 mL) is diverted.¹⁵ PCs are more vulnerable to bacterial growth because they are stored at room temperature (20–24°C) to maximise their survival and efficacy after transfusion,¹² whereas other blood products are frozen or refrigerated. Short-term storage is also recommended

to limit this proliferation. It has been shown that sepsis incidence was five times higher with PC units stored for more than 5 days compared with those stored for 4 days or less.¹² The use of single donor apheresis-platelet components also reduced the risk of septic reactions compared to pooled platelet components.⁵ In this case, the donation followed all these recommendations: arm disinfection, diversion of the first aliquot, short-term storage and single donor apheresis platelet components. Cultures from the PC bag were nonetheless positive. New techniques have been developed to limit transfusion of contaminated PC, notably culture of blood from PC or pathogen inactivation. These techniques are currently used in several European countries but they are not deployed in daily French practice. Bacterial culture techniques present a risk of false-negative results attributed to time of incubation and period of sampling. Septic reactions after transfusion of PC unit despite this screening by culture have already been reported.^{16–17} Pathogen-inactivation techniques are new, promising methods that have demonstrated their efficacy in reducing unit contamination, and are progressively utilised in Europe.¹⁸

Learning points

- ▶ Appropriate measures have to be taken to limit the risk of bacterial contamination during donation, but no standardised method is validated worldwide to avoid transfusion-associated bacterial contamination (TABC).
- ▶ As the consequences of TABC could be serious or even fatal, increased medical team awareness of possible TABC when the patient develops febrile transfusion reactions can greatly improve patient prognosis.
- ▶ TABC is now a very important point of interest for medical researchers who are trying to improve quality and safety in transfusion practices.

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