

Platelet apheresis in a deployed maritime environment: experiences from Operation GRITROCK

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Abstract

When the Primary Casualty Receiving Facility (PCRf) on Royal Fleet Auxiliary (RFA) ARGUS deployed to Operation GRITROCK in October 2014, platelet apheresis had yet to be proven as a sustainable and usable capability for improving provision of blood products on a maritime platform. This paper explores the difficulties encountered by nurses tasked with setting up this capability once deployed and the requirements needed to ensure that this capability is maintained for future operations.

Introduction

The Primary Casualty Receiving Facility (PCRf) deployed in October 2014 as part of the United Kingdom's (UK) response to the Ebola crisis in Sierra Leone. Its role was to provide a Role Two (enhanced) R2(E) medical treatment facility for Disease Non-Battle Injury (DNBI) casualties with non-Ebola related disease. The R2(E) capability meant that PCRf was equipped, staffed and able to run two Emergency Department bays, an Operating Theatre bed, two Critical Care beds and ten Ward beds. The enhanced aspect of this configuration was full laboratory diagnostics along with x-ray and Computerised Tomography (CT) facilities.

The PCRf holds blood components to treat casualties, and platelets are one component of that capability. Platelets have been used on a number of recent operations as part of the management of massive haemorrhage, including blood component transfusion as part of damage control resuscitation. Platelets are used proactively in the treatment of coagulopathy, which may be caused either by injury or disease, and have been used in the treatment of a small number of patients with Ebola as they became thrombocytopenic (1).

The aim of this paper is to describe the development of an Emergency Donor Panel (EDP) and the ability to provide platelets from the process of apheresis in the maritime environment.

Platelet apheresis

Apheresis is the automated collection of blood from a donor using a cell separator machine. The process separates and retains the platelets from the donor by centrifugation,

while returning all other blood elements back to the donor's circulation. Apheresis can be used for the collection of other blood components, but the only current Defence use is for the collection of platelets.

The procedure requires the donor to have a single 16 French Gauge cannula inserted into a vein in the antecubital fossa, which remains in situ throughout the procedure. This connects the donor to the apheresis equipment (Haemonetics Mobile Collection System+ (MCS+)) using a single-use collection harness. Two nurses trained in the process of operating the machine, and the venepuncture required for the donation, supervise the process. The collection of a whole unit of platelets is an automated repetition of the cycle whereby whole blood is drawn from the patient, platelets are separated and then the plasma and red blood cells are returned via the same needle. The whole procedure takes between 40 and 70 minutes, comprising between four and six cycles, depending on the individual donor's platelet count, height and weight.

It is a relatively safe procedure, but there are a number of possible complications. Problems include reaction to the anti-coagulant (Acid Citrate Dextrose – Formula A); failed venepuncture with associated haematoma; infection; arterial puncture; and vasovagal events. Red blood cell loss is minimal unless there is failure to return the red cells to the donor (2).

Platelet apheresis was first introduced into Defence in 2008, to both Operations TELIC and HERRICK, as a resilience measure to supplement the provision of platelets from the United Kingdom (UK). The development was in response to the UK Defence Medical Services use of platelets in the

management of major trauma casualties (3, 4). Some of the platelets used in these land operations were generated in theatre by apheresis. Registered nurses were trained in apheresis specifically for the deployed line, as an additional role (3).

Platelet apheresis was introduced to RFA ARGUS and was trialled under exercise conditions during Exercise MEDICAL ENDEAVOUR in 2012. During this exercise, the Haemonetics MSC+ equipment was tested to see how the motion of the ship would affect the function of the machine. Whilst live training took place with donors, no units of platelets were taken, as all the donated blood components were returned to the donor.

Apheresis nurse validation

Following on from these trials and on the back of Ops TELIC and HERRICK, apheresis nurses were added to the Force Element Table (FET) for the PCRf. When RFA ARGUS deployed on Op GRITROCK, two nurses were deployed who had recent experience of apheresis from Op HERRICK. Unfortunately, given the speed at which RFA ARGUS was activated and personnel nominated, there was no time to establish the currency of both these nurses prior to sailing. Although the PCRf command team had initially envisaged only requiring an EDP for the provision of whole blood, a procedure that requires minimal validation, both nurses deployed for this role, very early on, identified the potential to also utilise the EDP for apheresis of platelets.

The PCRf already had the facilities for whole blood to be donated. Authorisation for the transfusion of whole blood has to be granted by the Deployed Clinical Director, and would only be used in an emergency situation. The logistical advantage of whole blood donation is that a unit takes only approximately fifteen minutes to donate, and can be transfused after point of care testing has been completed. The patient receives Fresh Whole Blood, addressing issues with oxygen carrying capacity and coagulation.

There are a number of disadvantages to emergency whole blood transfusions. Although point of care testing is done immediately before donation, full testing is completed retrospectively. The main disadvantage to the PCRf, however, would be that whole blood donation would deplete the EDP very quickly, as donors would not be able to donate again for three months, whereas donors who give platelets via apheresis can donate again after just two weeks.

Since apheresis had yet to be utilised as a viable procedure on a Royal Navy (RN) platform, no nurses are maintained in constant clinical competency for contingency Operations on PCRf and the RN does not, at time of writing, have a Specialist Nurse Adviser for apheresis. Therefore, advice

had to be taken from the Tri-Service Specialist Nurse Advisor, a Queen Alexandra Royal Army Nursing Corps Officer, on validating nurses for Op GRITROCK, and from the Defence Consultant Advisor (DCA) Transfusion. Evidence was required that the nurses were current and competent in apheresis. This was achieved by both nurses sitting an invigilated examination on board RFA ARGUS while in transit to Sierra Leone.

Emergency Donor Panel

Whilst transiting to Sierra Leone in October 2014 the EDP was established in preparation for Op GRITROCK. Blood samples were taken only from volunteer PCRf staff to establish an EDP, so as not to cause additional anxiety amongst the wider ship's company who were already anxious due to RFA ARGUS's destination and the associated press coverage. Thirty-two volunteers from the PCRf complement were pre-screened and bled prior to arrival in Gibraltar. This allowed samples to be landed, flown back to the UK and tested within five days, in accordance with guidelines produced by the National Health Service Blood and Transplant (NHSBT) national testing centre in Filton.

When the PCRf received the results, it was identified that four people were unable to donate, owing either to Human Leukocyte Antigen antibodies or to high titre haemolysins. This left an EDP of twenty-eight volunteers, sufficient to support platelet apheresis and routinely bleed one donor twice a week to ensure a unit was constantly available.

All donors are re-screened prior to donation to ensure they have a haemoglobin level above 12.5 g/dL for females or 13.5 g/dL for males, and also a platelet count above 180 109/L (2). Throughout the deployment, the EDP gradually reduced in size as volunteers had to be excluded from the panel due to the following factors: deployment off the ship to other areas within Sierra Leone; continuous low haemoglobin; medications which excluded them from being able to donate; being difficult to cannulate; and associated complications. This left a panel of nine donors by the end of the deployment. As of 13 March 2015, twenty units of platelets had been taken by apheresis by the EDP on board, although none had been transfused.

The creation of an EDP for future operations could be done when personnel are added to the PCRf FET with details for volunteering for the EDP added to the PCRf joining instructions. Personnel on the FET would need to be screened every six months, which would mean that as soon as RFA ARGUS deployed there would be no delay in the ability to produce platelets or whole blood. The EDP could also be extended to include other embarked and permanent elements of the ship's company, which for Op GRITROCK was over 300 people. This has the potential to generate a much larger EDP, which would be much more sustainable.

Supplying platelets to other medical facilities

Platelets collected in the UK only have a shelf life of seven days, which presents a significant re-supply challenge when providing blood components to overseas operations, including the financial cost of providing a continual supply.

This led to a successful trial of platelets obtained through apheresis from the EDP on board RFA ARGUS being used to supply medical units ashore. A unit of platelets was transferred to the Kerry Town Treatment Unit (KTTU) by helicopter, in a preconditioned platelet shipper box with temperature tag. The platelets survived the transfer with a flight time of fifteen minutes and additional road transfer of seven minutes. The temperature tag ensured the temperature of the platelets was continually monitored throughout the transfer to check they stayed within the permitted range. This proved for the first time that it is feasible for platelets donated on a maritime platform to be transferred to land units, which may enhance future joint operations.

Conclusion

This deployment was the first occasion that platelet apheresis had been carried out on a maritime platform to produce a unit of platelets, and the first time a unit has been transferred between a maritime medical treatment facility and another deployed medical unit, demonstrating this capability for future contingency operations. Apheresis in the maritime environment has now proven to be a feasible prospect, and could substantially reduce the costs and logistical burden on the supply chain of supplying platelets to operations. Two trained and competent apheresis nurses were needed to maintain this capability; two additional apheresis-trained nurses have therefore been added to the PCR FET to ensure this capability. In addition, to continue to drive this as a viable capability, it is important to ensure that the apheresis-trained nurses added to the FET can maintain clinical currency away from the deployed environment. A Royal Naval Specialist Nurse Advisor (Apheresis) working alongside the Tri-Service Specialist Nurse Advisor could continue to drive the lessons learned from establishing apheresis in a maritime environment and find a viable solution to establishing apheresis on contingency operations.

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