

Role of Autologous Blood Transfusion and Off - Pump Bypass in a Patient with Cold Agglutinin Disease for Coronary Artery Bypass Grafting: A Case Report

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Abstract: Cold agglutinin disease is known to cause serious complications like haemolysis or agglutination of red cells compromising perfusion of organs. The risk of complications increases significantly during major cardiac surgeries due to exposure to lower temperatures, blood transfusion perioperatively and use of cardiopulmonary bypass and cold cardioplegic solutions. In our patient, we have done successful coronary artery bypass grafting (CABG) in a patient with cold reactive autoimmune haemolytic anaemia by using off - pump CABG (OPCAB) and autologous blood transfusion along with routine measures to prevent hypothermia.

Keywords: Cold agglutinin disease, autoimmune haemolytic anaemia, autologous blood donation, OPCAB.

1. Introduction

In cold agglutinin disease (CAD), cold reactive antibodies are found commonly at low body temperatures but sometimes even at higher temperatures. This may cause serious haemolysis, myocardial infarction and microvascular occlusion compromising various organ perfusion especially during cardiac surgeries. In our patient with CAD, apart from the routine preventive measures of avoiding hypothermia, we tried to further minimize the risks by performing off - pump CABG (OPCAB) and by using autologous blood transfusion - the benefits of which have not been clearly reported previously in such cases.

2. Case Report

56 years old, 110 kilograms heavy, 163 centimetres tall, with BMI 41.4, male patient with coronary artery disease, diabetes mellitus, hypertension, liver cirrhosis was posted for CABG. He had undergone coronary angioplasty to proximal left anterior descending (LAD) artery in 2005. He was detected with autoimmune haemolytic anaemia with cold agglutinins five years back. His echocardiography showed left ventricular ejection fraction 55% with mild pulmonary hypertension. Coronary angiography showed double vessel disease with 60 - 70% and 70 - 75% lesion beyond the stent in LAD, an 80% lesion followed by ectasia followed by 40% lesion in right coronary artery (RCA), large posterior left ventricular artery with 60% lesion, small posterior descending artery (PDA) with 70% lesion and normal left circumflex.

His haemoglobin was 12.1 mg/dl with normal leucocyte and platelet counts, serum creatinine, serum electrolytes, liver function tests and coagulation profile. Abdominal ultrasound showed hepatomegaly with mild splenomegaly. ANA and anti - smooth muscle antibodies were negative. Direct coombs test was positive.

Moderate risk of liver decompensation was explained to the patient. Four allogenic blood units and one autologous blood

unit, four fresh frozen plasma and four random donor platelets were arranged in advance. For surgery, a wide bore peripheral intravenous catheter, radial arterial line, right internal jugular central line and pulmonary artery catheter were inserted under local anaesthesia.

After routine cardiac induction, 350ml blood was collected in CPD bag for autologous blood donation and replaced with 1000ml of plasmalyte. Patient was hemodynamically stable throughout. Arterial blood gas (ABG) done few minutes later showed haemoglobin of 9.5g%.

With left and right internal mammary artery, four coronary vessels were grafted off pump. Surgery time was about four hours. Total intraoperative blood loss was approximately 800ml. Cell saver was used and 165ml cell saver blood was transfused. Tablet azathioprine 50mg was given intraoperatively through ryles tube. 350ml autologous blood was transfused slowly after grafting. Postoperative ABG showed haemoglobin of 10.5g%. One autologous blood was transfused later in ICU.

Patient was shifted to ICU on ventilator with low dose of noradrenaline infusion.

Patient was extubated next day and discharged on postoperative day seven.

3. Discussion

Cold agglutinin disease (CAD) belongs to a spectrum of diseases known as autoimmune haemolytic anaemia (AIHA). They are characterized by antibody/complement mediated haemolysis of red blood cells (RBCs).¹

In CAD, haemolysis occurs at lower body temperatures in the presence of significant titre levels of cold agglutinins (CA). CA are autoantibodies, usually of the IgM subtype, that react against the antigen on the RBCs, at lower body temperatures resulting in agglutination of RBCs and complement - mediated haemolysis.

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Patients may be asymptomatic or present with chronic anaemia, ischemic necrosis of digits and ear lobes, acrocyanosis or acute haemolytic anaemia in rare severe cases.²

Mild forms of CAD do not need treatment, especially with haemoglobin more than 10g/dl. However, patients with coexisting cardiopulmonary diseases or having symptoms of hypoxia may require treatment even with higher levels of haemoglobin. Prevention of cooling of distal parts reduces haemolysis. Pharmacological treatment includes Rituximab alone or in combination with other drugs, especially bendamustine, for severe CAD.¹

Some cases of glucocorticoid responsive CAD have also been reported.³

Perioperative management of patients with CAD can be challenging due to increased risk of haemolysis in the perioperative period. Haemolysis can be reduced by maintaining body temperature and by decreasing complement levels. Measures like appropriate blood investigations, plasmapheresis to reduce cold agglutinin titre, arrangement of cross matched blood, autologous blood donation may be needed preoperatively. Maintaining warm body temperature of the patient with blankets and forced warm air devices, warm operating room, warm intravenous fluids and blood transfusion with temperature monitoring is essential throughout the perioperative period.⁴

Cardiac surgeries can further add to the existing problems. Use of cardiopulmonary bypass (CPB) with cold cardioplegia and induced hypothermia may result in body temperatures that can cause agglutination and haemolysis.⁵

Agglutination can cause complications like haemolytic anaemia, microvascular occlusion hampering organ perfusion, renal failure, hepatic or cerebral insufficiency. Also, during cardiac surgery, distribution of cardioplegia solution may be impaired causing inadequate myocardial protection and perioperative myocardial infarction. Patients undergoing cardiac surgery are at increased risk of hypothermia. Cold cardioplegia solutions and cold systemic perfusion while on CPB were commonly used for myocardial and cerebral protection till recently and is still practiced in some institutes. However, now, use of warm cardioplegia and systemic perfusion have been shown to provide effective myocardial protection. Off - pump CABG is also associated with significant risk of hypothermia as there is no rewarming via the heat exchanger while on CPB. Prolonged surgery with open thorax in cold operating room increases radiant loss and risk of hypothermia. However, OPCAB surgery has reduced blood loss and transfusions. It also avoids CPB and cardioplegia. The perioperative management of patients with CAD undergoing cardiac surgery requires a multidisciplinary approach involving the surgeon, perfusionist, anaesthesiologist, haematologist, intensivist and the blood transfusion department. Early detection of the antibody is crucial so that the perioperative management can be planned. If OPCAB is not possible and emergency CPB is required then a safe strategy for CPB and myocardial protection should be ready. This involves use of appropriate type and temperature of the cardioplegia

solution and the core temperature achieved during CPB. Postoperatively also hypothermia should be avoided with active warming strategies and warm infusions.²

Transfusion is associated with some potential problems in AIHA patients.

Time consuming, specialized compatibility tests need to be performed to detect the presence or absence of RBC alloantibodies that can cause haemolytic transfusion reaction. Therefore, prompt evaluation and management are necessary to avoid the need of transfusing the patient on an emergency basis.⁶

However, allogenic RBC transfusions should be avoided or limited for two reasons in CAD. First, cold agglutinins cause serologic difficulties during the blood bank workup for cross matching requiring complex immunohaematological compatibility tests. Hence, the blood bank may have to release least incompatible blood units that may contain an undetected alloantibody. Second, transfused units can potentiate the haemolysis as I antigen - negative donor units are rare. Also, complement in donor can exacerbate haemolysis. Therefore, transfusions are reserved for patients with significant underlying cardiovascular or cerebrovascular disease. Exogenous complement load can be reduced by washing RBC units if required.^{7,8}

Hence, it is advisable to inform blood bank to keep adequate cross matched blood well in advance. The concerns with blood transfusion can also be minimized with autologous blood transfusion.

Acute normovolemic haemodilution (ANH) is useful in surgeries where autologous blood is preferable for transfusion. ANH involves collection of blood units in standard blood donation packs immediately before surgery in the operating room with simultaneous infusion of crystalloid or colloid fluids. The blood is stored in the operating theatre at room temperature and transfused at the end of surgery or when there is significant blood loss.⁹

In our patient, we had used this method to avoid allogenic transfusion and complications associated with it.

In this case, we have successfully managed CABG surgery in a patient with CAD by using OPCAB and autologous blood transfusion and the patient had an uneventful recovery despite the serious existing medical conditions.

References

- [1] Michalak SS, Olewicz - Gawlik A, Rupa - Matysek J, Wolny - Rokicka E, Nowakowska E, Gil L. Autoimmune hemolytic anemia: current knowledge and perspectives. *Immun Ageing*. 2020 Nov 20; 17 (1): 38. doi: 10.1186/s12979 - 020 - 00208 - 7. PMID: 33292368; PMCID: PMC7677104.
- [2] Bratkovic, K., & Fahy, C. (2008). Anesthesia for Off - Pump Coronary Artery Surgery in a Patient With Cold Agglutinin Disease. *Journal of Cardiothoracic and Vascular Anesthesia*, 22 (3), 449-452. doi: 10.1053/j.jvca.2007.03.015.

- [3] Honne K, Nagashima T, Iwamoto M, Kamesaki T, Minota S. Glucocorticoid - Responsive Cold Agglutinin Disease in a Patient with Rheumatoid Arthritis. *Case Rep Rheumatol.* 2015; 2015: 823563. doi: 10.1155/2015/823563.
- [4] Southern JB, Bhattacharya P, Clifton MM, Park A, Meissner MA, Mori RL. Perioperative management of cold agglutinin autoimmune hemolytic anemia in an older adult undergoing radical cystectomy for bladder cancer. *Urol Case Rep.* 2019 Aug 13; 27: 100998. doi: 10.1016/j. eucr.2019.100998. PMID: 31463200; PMCID: PMC6710374.
- [5] Barbara DW, Mauermann WJ, Neal JR, Abel MD, Schaff HV, Winters JL. Cold agglutinins in patients undergoing cardiac surgery requiring cardiopulmonary bypass. *J Thorac Cardiovasc Surg.* 2013 Sep; 146 (3): 668 - 80. doi: 10.1016/j. jtcvs.2013.03.009. Epub 2013 Apr 13. PMID: 23590925.
- [6] Petz, Lawrence D. . “Emergency Transfusion Guidelines for Autoimmune Hemolytic Anemia. ” *Labmedicine* 36 (2005): 45 - 48.
- [7] Gehrs BC, Friedberg RC. Autoimmune hemolytic anemia. *Am J Hematol.* 2002 Apr; 69 (4): 258 - 71. doi: 10.1002/ajh.10062. PMID: 11921020.
- [8] Barros MM, Langhi Jr DM, Bordin JO. Autoimmune hemolytic anemia: transfusion challenges and solutions. *International Journal of Clinical Transfusion Medicine.* 2017; 5: 9 - 18 <https://doi.org/10.2147/IJCTM.S81870>
- [9] *Handbook of Transfusion Medicine* Editor: Dr Derek Norfolk United Kingdom Blood Services 5th edition)