AnnalsofClinicalandMedical Case Reports

CaseReport ISSN2639-8109Volume7

CardiopulmonaryBypassGraftina PostCOVI-19Thalassemic Patient

GuilleminLaureen[1],RigalJeanChristophe[1*],BoukhariRachida[2],LacostePhilippe[3],MorinHelene[1],BoissierElodie[4]andRozec Bertrand[1]

[1]Serviced'anesthesieetdereanimationchirurgicale,HopitalGuillaumeetReneLaennec,CentreHospitalierUniversitairedeNantes,5 allee de l'ile Gloriette, 44093 Nantes Cedex 1, France

[2]Unitedesecuritetransfusionnelle,HopitalGuillaumeetReneLaennec,CHUdeNantes,5alléedel'îleGloriette,44093NantesCedex 1, France

[3]Servicedechirurgiethoraciqueetcardio-vasculaire,HopitalGuillaumeetReneLaennec,CentreHospitalierUniversitairedeNantes,5 allée de l'île Gloriette, 44093 Nantes Cedex 1, France

[4]Laboratoire d'hematologie, Hopital Guillaume et Rene Laennec, CHU de Nantes, 5 allée de l'île Gloriette, 44093 Nantes Cedex 1,France

***Correspondingauthor:**

Jean-Christophe Rigal,
Service d'anesthésie et de réanimation chirurgicale, HopitalGuillaumeetRenéLaennec,CHUdeNantes, Boulevard jacques Monod, 44093 Nantes Cedex 1, France,Tel:0033240165304;Fax:0033240165294,
E-mail: jeanchristophe.rigal@chu-nantes.fr

Received: 28 Oct 2021
Accepted: 10 Nov 2021
Published:19Nov2021
JShort Name:ACMCR

Citation:

RigalJean-Christophe,CardiopulmonaryBypassGraft in a Post COVI-19 Thalassemic Patient. AnnClinMedCaseRep.2021;V7(15):1-4

1. Abstarct

Thalassemia is of the most frequent haemoglobinopathy that includes a heterogeneous group of inherited autosomal recessive pathologies caused by defective synthesis of globin subunit that comprise haemoglobin production. In β-thalassemia, insufficient quantities of β-globin chains are produced, causing ineffective erythropoiesisandmicrocytichypochromicanaemia.Theclinical severityofthedisease,rangingfromminor(ortrait),intermediato majorforms(alsoknownasCooleyanaemia),dependingonthese-verityofthereductioninβ-globinsynthesisandtheconsequences of hyper haemolysis leading to iron overload and extramedullary erythropoiesis[1,2].Theβ-thalassemiaaremainlywidespreadin populationsoriginatingfromtheMediterraneanrim,MiddleEast, AsiaandAfrica.InFrance,only350peoplepresentsevereforms, the prevalence is estimated of 1/200000 [3-5]. Thalassemia intermedia presents commonly with asymptomatic mild anaemia but some particular clinical conditions, such as cardiopulmonary bypass(CPB)forcardiacsurgery,mayraiseaparticularriskofperi-operative haemolysis and its related complications [6].

2. Case Report

We report here the case of a 72-year-old patient originated from Caucasusregionwithapersonalhistoryofsmokingandtype2diabetestreatedbyMetformin.Hepresentedwithstableanginapectorisclinicallycontrolledwithmedicaltreatment(Acetylsalicylic acid 75mg/day,Amlodipine 5mg/d, bisoprolol 2.5mg x 2/d). Preoperativecoronaryangiographyshowedsignificantstenosis(70to 90%)ofthefirstdiagonal,thebisectingartery,morethan90%ste- nosis of the middle circumflex artery and the first segment of the right coronary artery. Ischemic heart disease requiring multi-vesselcoronaryrevascularisationbyelectivesurgicalcoronarybypass graft with cardio-pulmonary bypass (CPB) was scheduled. The preoperative echocardiographic evaluation revealed normal ventriculardimensionsandfunction(leftventricularejectionfraction LVEF=55%)withoutanysignificantvalvulopathyorsignsofpulmonaryhypertension(SystolicPulmonaryArterialPressurePAPS =21mmHg),thatwasconfirmedbyper-operativerightheartcatheterisation.Theidentificationonsystematicpreoperativebiological examsofamildmicrocyticanaemiawithHaemoglobin(Hb)115

g/L, MCV (mean corpuscular volume) 61fL, MCH (Mean Corpuscular Haemoglobin) 29.6g/dL. This led to further assessment bytheanaemiaclinicteam.Otherstandardbiologicaltests(serum creatinineandhaemostasistests)werenormal.Patienthadnopersonal history of transfusion, thrombotic disorder or known familial haematological disorder. Clinical assessment did not identify anysignofchronichaemolysissuchassplenomegalyorjaundice, nor signs of extramedullary erythropoiesis such as bones or face deformities. Further biological explorations included reticulocyte countof16/1000(9710^9/L)definingregenerativeanemia.There wasn't any biological signs of haemolysis (normal total bilirubin, haptoglobin and LDH) and iron status was normal with a ferritin concentration of 181 µg/L, iron 14.5 µmol/L, transferrin 2.44 g/L and Transferrin Saturation of 24%. The haemoglobinA2 (HbA2) concentrationwas4.6%onhaemoglobinelectrophoresis[7].Such clinicalandbiologicalexplorationsleadedtodiagnosisofminoror intermediaformofβ-thalassemia.Thepatientwasinformedofthis previouslyunidentifieddiagnosisandofthepotentialincreasedrisk of perioperative complications such as haemolysis or transfusion. Surgeryhadtobepostponedbecausehedevelopeda SARS-CoV-2 pneumoniaofintermediateseverity,Thatwasassociatedwithlight anaemiaworsening(haemoglobinlevelof98g/Lhaematocrit(Ht) of32%andMCVof59fL)attributedtomixedinflammatorystate and relative iron deficiency that led to oral iron supplementation. Four weeks after the COVID diagnosis, clinical evaluation revealed a persistent dyspnoea (staged NYHA3) with abnormal bilateral pulmonary auscultation. Dyspnoea was attributed to a persistent hypoxemia with SpO2 92% and 66mmHg partial oxygen pressuremeasuredonroomair.Chestradiogrampresenteddiffuse interstitial syndrome and, on chest CT-scan, bilateral condensing areas,frostedglassappearancewithcrazypavingaspectestimated at 25% of the lung but no signs of pulmonary embolism. Cardiac pathologywasconsideredclinicallystablewithoutanyassociated Electrocardiographic(ECG)orbiologicalchanges(TROPONINE Tchs12ng/LImmuno-electro-chemo-luminescence,STATmeth- od Roche Cobas) and considering the risk of perioperative worsening of respiratory function, the intervention was, once again, postponeduntilbetterrecoveryofpulmonarydisease.Duringthis waiting period, the patient experienced several relapses of chest painrespondingtofirstlinesublingualnitroglycerintreatmentand without any identified biological changes. Repeated assessment showedrespiratorysymptomsimprovementwithanearnormal 6 minutes walking test, free of significant desaturation (measured at 420m, i.e. 91% of the theoretical value, lower SpO2 of 93% and mean SpO2 of 94% on room air).On the other hand, pul- monary functional tests were still altered with diminished forced vital capacity (FVC) of 2.67Land forced expired volume (FEV1) of 2.56 L(respectively 77% and 79% of normal), compared with supra-normalresultsobtainedatthefirstpreoperativeevaluation 3 month before FVC of 4.30L and FEV1 of 3.39L (respectively 124%and132%ofnormal).DLCOlevelwas4.72mmol/min.kPa (62% of normal but 91% if reported to alveolar volume). Surgery wasfinallyorganisedsixweekslater(10weeksafterCovidpneumoniae onset). Immediate preoperative biological tests showed haemoglobin of 107g/L, 36.9% haematocrit,normal bilirubin and liver enzymes tests. Per-operative management of general anaesthesiaassociatedradialarterialcatheterizationforsystemicarterial pressuremonitoring,rightheartcatheterizationforcentralvenous and pulmonary artery pressure monitoring, continuous cardiac output and mixed venous oxygen saturation (SvO2) monitoring (HemoSpheremonitorEdwardsLifescienceGuyancourt,France). Anesthesia was conducted using propofol and Sufentanil in aTotalintravenousanesthesia(TIVA)protocolusingtargetcontrolled infusion (Orchestra® base Primea device - Fresenius Vial SAS Brézins France). A single IV bolus of myorelaxant (atracurium 35mg) was used for tracheal intubation. Peroperative antibiotic prophylaxisused1.5gCefuroximIVbolusand0.75g/2hfollowed by0.75gevery6hfor48h.Thepatientbloodmanagementstrate- gy included preoperative administration of tranexamic acid (total dose of 35mg/kg, 0.9g in 30min and 0.4 g/h for 5 hours), cell salvage with Livanova Xtra auto-transfusion device and transfusion triggerwasset for Hb 75g/Lor Ht 25%.Anticoagulationfor CPB was obtained with unfractionated Heparin IV bolus of 300U/kg andmonitoredwithACT2pointofcaredevice(MedtronicMinnesotaUSA)withatargetactivatedclottingtimeover400s.Surgery consisted in a 5 fold coronary artery bypass (anterior, bisecting anddiagonalinterventriculararterieswerebypassedwithbilateral internal thoracic arteries, marginal and posterior interventricular arterywithsaphenousveingraft)usingarollerpumpdrivencardiopulmonarybypassandaorticcrossclamp.Myocardialprotection was carried out using antegrade sequential normothermic blood cardioplegia.The CPB priming solution used 500ml fluid gela- tin 40 mg/ml (Gelofusine B Braun Médical) and 1000ml Lactates ringer5000Uofunfractionatedheparin,0,5gtranexamicacidand 750mgofcefuroxim.BloodpressurewasmaintainedwithIVnorepinephrine continuous infusion up to 0.2µg/min begun 20 min beforeCPBstartedtomaintainMAPover65mmHg.DuringCPB, rapidloweringofSvO2(<55%)andlowvenousreservoirvolume causing low flow alarm associated with blood lactate rise (up to 2.8mmol/L)ledtogivevolumetherapy(RL500ml)causingHaemoglobin fall (nadir of 74g/L, Ht 23%).As CPB transfusion triggerwassetatHt25%,onehomologouspackedredbloodcellwas transfused,raisingHaemoglobinupto83g/LandSvO2from52to 75% (Figure 1).Afterward, SvO2 measures remained stable over 70% during and after CPB weaning (with pulmonary catheter). The bypass and aortic cross-clamping duration were respectively 105 and 92 minutes.Anticoagulation reversal was achieved with protamine administration of 100% of the initial heparin dose.

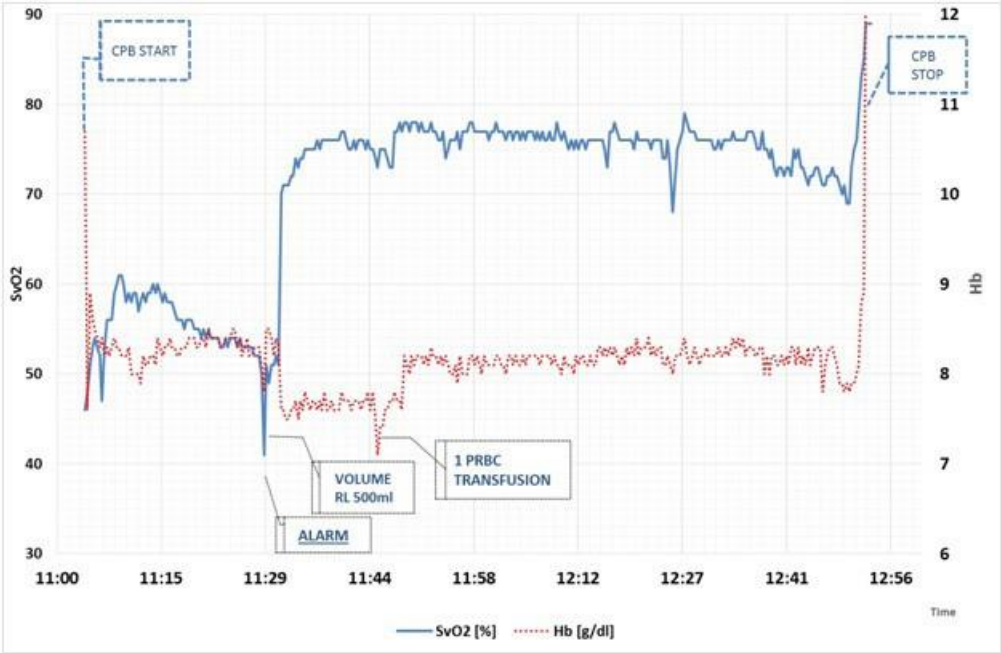

Figure1:Haemoglobin (Hb)andSvO2 monitoringdata duringcardio-pulmonarybypass(CPB).PRBC;packed redblood cell.

AfterCPBweaning,theremainingCPBcircuitbloodvolumewas treated with a cell salvage device (Sorin Xtra® Autotransfusion System – LivaNova SAS) for volume reduction and 480ml (Ht 48%) were returned to the patient, Hb concentration rose up to 89g/dL.Totalfluidbalancewas1000ml.Onthefirstpostoperative workup (4h after CPB termination) haemoglobin concentration was 94 g/L, haematocrit was 30.7%, Serum lactate concentration returned to normal (2,0 mmol/L). There wasn't any biological signs of haemolysis or disseminated intravascular coagulopathy (haemolysis index of 4 mg/dL, disseminated intravascular coagulation index of 0.16 mg/dL), and normal bilirubin of 8µmol/l[8]. Troponin rose up to 297 ng/L on day 1 and declined steadily thereafter and was considered as an acceptable value in this post CBAG context. Clinical Hemodynamic stability and absence of identifiedcomplicationauthorisedtheawakeningandmechanical ventilation weaning 4h after the end of surgery. A 3l/min nasal oxygenotherapy was maintained and definitively stopped on the secondpostoperativeday.Chestradiogrampresentedmilddiffuse interstitialsyndrome.Chestdrainvolumewas290mlonday1and theywereremovedonthe4thpostoperativeday.Thromboembol- ic prevention used subcutaneous enoxaparin 4000U/d.As clinical course and monitoring were uneventful, patient was discharged fromintensive careunit onday 1and transferredto surgery ward.

Hospital discharge was possible on 9th postoperative day, without residual dyspnoea at room air. Last haemoglobin measure was 10.4g/dL. Echocardiographic evaluation before discharge did not reveal any change in ventricular function and any sign of pericardialeffusion.Pulmonaryfunctionaltestperformed2monthaf- ter showed complete spirometric recovery with normal FVC and FEV1(respectively3Lor90%ofnormalvaluesand2.5Lor99% of normal values) but persistent DLCO impairment (4.23mmol/min i.e. 56% of normal).

3. Discussion

beta-thalassemia has variable clinical presentations and consequences ranging from simple asymptomatic microcytic anaemia for minor forms to chronic haemolysis in thalassemia intermedia and major that may be complicated by iron overload, hepato and splenomegaly, pulmonary arterial hypertension and cardiac vulnerability linked to volume overload and hypersiderosis [9, 10].

Few data exist on case of cardiac surgery using CPB for patients presentingminororintermediathalassemia.Somepublishedcases reports(e.g.valvereplacement)describeexacerbationofhaemolysisduringbypass[11-13].Ontheotherhand,uneventfulcoronary arterybypasssurgeryinapatientwithBeta-thalassemiahavebeen reported, suggesting that β-thalassemia erythrocytes do not seem to present higher mechanical fragility under CPB [14]. Criterions for specific CPB hemolysis risk evaluation are lacking.

As this pathology is rare in France, our experience was minimal soweconsideredandmanagedthecaseasahighriskpatient.The case we present here seems to be more a minor thalassemia than thalassemia intermedia. The pathology was detected early with standard biological screening performed at the first surgeon consultation. This strategy, recommended in PBM guidelines, gave time for further evaluation by referring the patient to the anaemia clinic team who completed clinical and biological screening that led to the diagnosis. The team also elaborated a patient centred blood management plan that comprised tranexamic acid administration, cell salvage use, hemodynamic monitoring and tissue oxygendeliverysurrogateparametersofanaemiatolerancetodiag-

nose promptly adverse events. The need PRBC transfusion could be discussed as observed SvO2 rose (+20%) mainly after volume administration,theriseafterPRBCtransfusionwasonly+3to5%, that can be considered as futile, but the decision was guided by the need for tissue oxygenation improvement, witnessed by lac- tate rise, and the pre-established transfusion trigger at 75g/L.The contextofcoronaviruspneumopathyledtopostponefor10weeks the surgical management of coronary artery disease regarding the benefitandriskbalance.Ourchoicecouldbecriticisedinviewof the severity of coronary artery disease but, as little was known at thetimeonCOVIDpneumopathy,themostcautiousapproachwas chosen through close clinical follow-up. A limitation in our case maybetheabsenceofanyadverseevent.However,thalassemiais a rare disease in our country and the association with coronavirus infectionledustotakethemaximumpossiblemeasurestomanage suchanunusualclinicalsituation.Inconclusion,uneventfulsurgi- calcoronaryrevascularizationusingcardio-pulmonarybypasshas beenperformedinapatientwithminorbeta-thalassemiaconvales- cent of COVID19 pneumopathy. The perioperative patient blood management strategy associating careful preoperative evaluation, tailoredpatientcentredperioperativecaremayhavebeenessential in the case management.

References

1. GalanelloR,OrigaR.Beta-thalassemia.OrphanetJRareDis.2010; 5: 11.
2. Muncie HL Jr, Campbell J. Alpha and beta thalassemia. Am Fam Physician. 2009; 80(4): 339-44.
3. Thuret I. Prise en charge actuelle des thalassémies intermédiaires [Current management of thalassemia intermedia]. Transfus Clin Biol. 2014; 21(4-5): 143-9.
4. Peters M, Heijboer H, Smiers F, Giordano PC. Diagnosis and management of thalassaemia. BMJ. 2012; 344: e228.
5. HAde Sante,Syndromes thalassémiques majeurs et intermédiaires. Protocole national de diagnostic et de soins pour une maladie rare. Bio Trib Mag. 2009; 31(1): 25-43.
6. Staikou C, Stavroulakis E, Karmaniolou I. A narrative review of peri-operativemanagementofpatientswiththalassaemia.Anaesthe- sia. 2014; 69(5): 494-510.
7. Smith MM, Renew JR, Nelson JA, Barbara DW. Red Blood Cell Disorders: Perioperative Considerations for Patients Undergoing CardiacSurgery.JCardiothorac Vasc Anesth.2019;33(5):1393-1406.
8. BoissierE,LakhalK,SenageT,BizouarnP,LepoivreT.Haemoly- sisindex:validationforhaemolysisdetectionduringextracorporeal membrane oxygenation. Br J Anaesth. 2020; 125(2): e218-e220.
9. AessoposA,FarmakisD,KaragiorgaM,VoskaridouE,LoutradiA. Cardiacinvolvementinthalassemiaintermedia:amulticenterstudy. Blood. 2001; 97(11): 3411-6.
10. Steinberg MH, Forget BG, Higgs DR, Weatherall DJ. Disorders of Hemoglobin:Genetics,Pathophysiology,andClinicalManagement (2nd ed.). Cambridge University Press. 2009.
11. RaffaGM,MularoniA,DiGesaroG,VizziniG,CipollaT,PilatoM. ThalassemiaandHeartSurgery:AorticValveRepairAfterEndocar- ditis. Ann Thorac Surg. 2015; 99(1): e1-2.
12. Farmakis D, Polonifi A, Deftereos S, Tsironi M, Papaioannou I, Aessopos A. Aortic Valve Replacement in a Patient with Thalas- semia Intermedia. Ann Thorac Surg. févr 2006; 81(2): 737-9.
13. Botta L, Savini C, Martin-Suarez S, Amore AD, Camurri N, Arp- esella G, et al. Successful mitral valve replacement in a patientwith a severe form of beta-thalassaemia. Heart Lung Circ. 2008 Feb;17(1):77-9.
14. Horai T, Tanaka K, Takeda M. Coronary Artery Bypass Grafting UnderCardiopulmonaryBypassinaPatientwithbeta-thalassemia: report of a case. Surg Today. 2006; 36(6): 538-40.