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Case Report

Stenting of Aortic Coarctation and contrast agent induced autoimmune hemolytic anemia- An unusual combination!

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Summary

Over the past few years, percutaneous stent implantation has emerged as an alternative to surgical repair in the management of both native and recurrent coarctation of aorta in adolescents and adults .We report a case of coarctation of aorta stenting using a covered mounted stent in a 21 year old female who was diagnosed with autoimmune hemolytic anemia diagnosed during the routine pre-procedural evaluation ,which complicated the planned endovascular intervention. Prompt diagnosis and treatment of the associated disease led to a successful and uneventful procedure. (Indian J Cardiol 2022;25 (1-2):48-53)

Key words: Aortic Coarctation, Autoimmune Hemolytic anemia, Contrast agent

Introduction

Coarctation of aorta accounts for 5% to 8% of all congenital heart defects and is frequently associated with other congenital heart disease such as bicuspid aortic valve disease[1]. Hemodynamically significant coarctation of aorta requires surgical or endovascular intervention. If left untreated, most patients with significant CoA will have varying degrees of morbidity and may not survive beyond the fourth decade of life[2]. Compared to balloon angioplasty, stent implantation has a reduced risk of aortic tears, and results in a lower residual gradient[3,4]. Stent implantation also improves luminal diameter, sustaining the procedure's hemodynamic benefit, though hypertension may persist in some patients.

Case report

We report a case of 21-year-old female who was incidentally diagnosed to have coarctation of aorta during her routineantenatal evaluation. She was referred to our institution for further management after medical termination of pregnancy. Patient was asymptomatic. Radio-femoral delay was appreciable and femoral pulse was feeble. Systolic blood pressure gradient between the upper and lower limbs was 40 mm of Hg (140/80 in both upper limbs and 100/70 mm of Hg in lower limb). She had a crescendo - decrescendo short systolic murmur of grade 2/6 intensity in the precordium and a soft continuous murmur over the 4th and 5th thoracic spine. She was on treatment for hypothyroidism with 25 micrograms per day of levothyroxine. Her biochemical and hematological profiles were normal.

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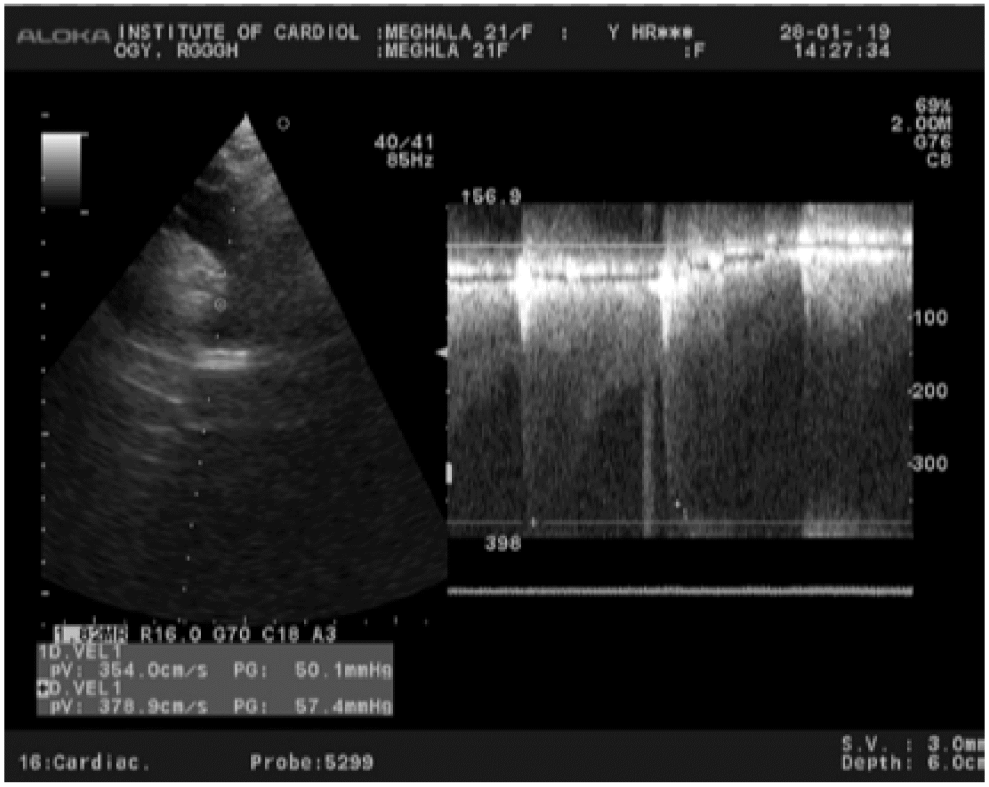

Fig. 1 : Echo Preprocedure

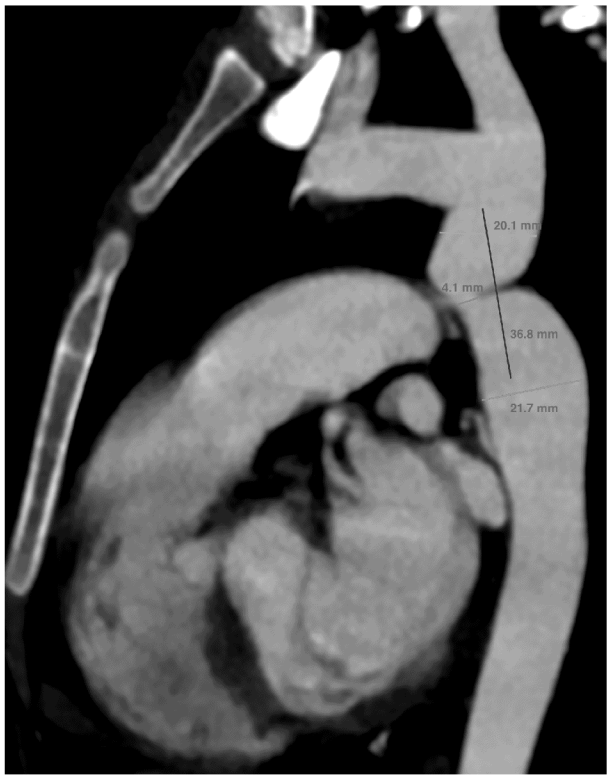

Fig. 2 : CT measurements

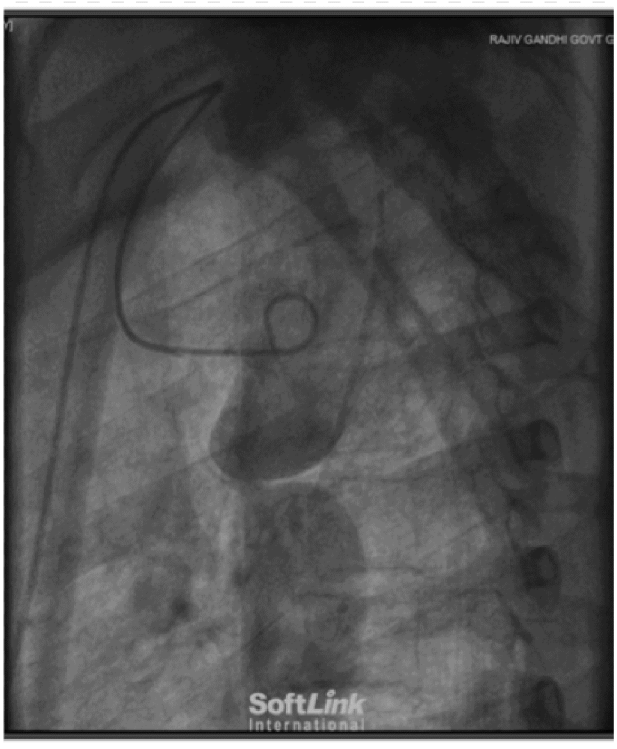

Fig. 3 : Preprocedure Aortogram

ECG showed no evidence of chamber enlargement with asymmetric T wave inversion in anterior precordial leads. Transthoracic echocardiogram showed concentric left ventricular hypertrophy and bicuspid aortic valve with mild aortic regurgitation and a post subclavian coarctation of aorta with a gradient of 57 mm of Hg across (Fig 1).In the contrast CT aortogram transverse arch of aorta measured 18 mm, descending aorta proximal to coarctation 20.1 mm, coarctation segment 4.1 mm and descending aorta at diaphragm measured 16 mm (Fig 2). She also underwent diagnostic cardiac catheterization and angiography which showed a 4.16 mm long and 3.6mm wide coarctation segment after the left subclavian artery (Fig 3) with a pullback gradient of 60 mm Hg across the coarctation segment. She was planned for a stenting of the coarctation.

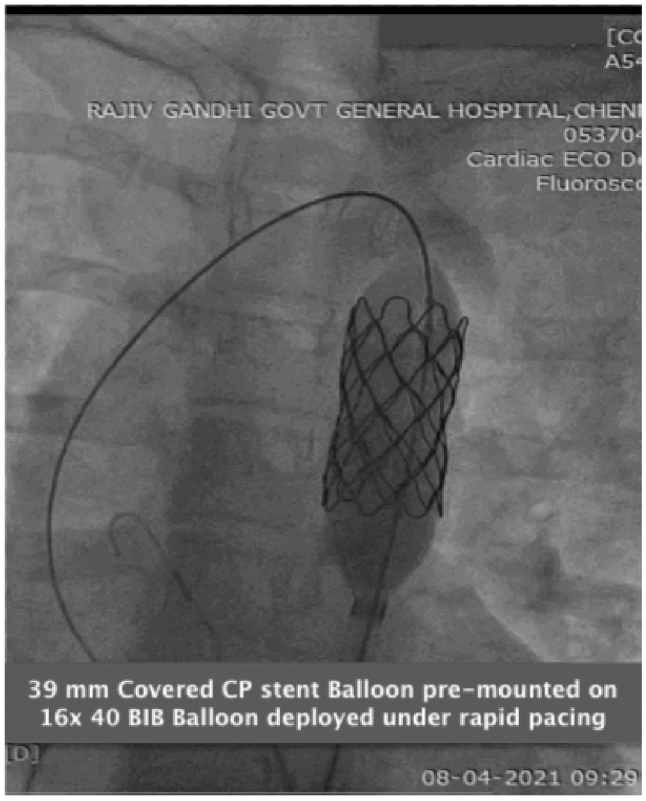

Fig. 4 : Stent deployment

During the hospital stay a serial fall in hemoglobin was noted following the diagnostic procedures, from initial hemoglobin of 10.1 gm% to 6.9 gm%, which prompted active evaluation of the cause of anemia. There was no prior history of hospitalization or blood transfusion. Peripheral smear showed microcytic hypochromic anemia and hemolytic picture with ovalocytes ,schistocytes and pencil shaped cells. Upper GI endoscopy was non-contributory. Liver function tests were normal. LDH was elevated and ANA was negative. Bone marrow aspiration and subsequent bone marrow biopsy showed erythroid predominance and erythroid hyperplasia. Direct Coombs test was positive. A possible diagnosis of autoimmune hemolytic anemia was made. One unit packed red blood cell transfusion was given and she was started on intravenous dexamethasone 8 mg once a day. As the hemoglobin improved she was switched over to oral prednisolone 30 mg per day. Haemoglobin improved from 6.9 to 11.8 grams % over a period of two weeks and it remained stable thereafter with oral prednisolone being maintained at a dose of 30 mg per day. Patient was taken up for the coarctation stenting after she maintained a stable hemoglobin level for 10 days.

Under local anesthesia and intravenous sedation, through and fluoroscopy guided right femoral arteryaccess, the coarctation segment was crossed using a 0.032" straight tipped Terumo (Terumo corporation, Japan) guidewire. This was exchanged

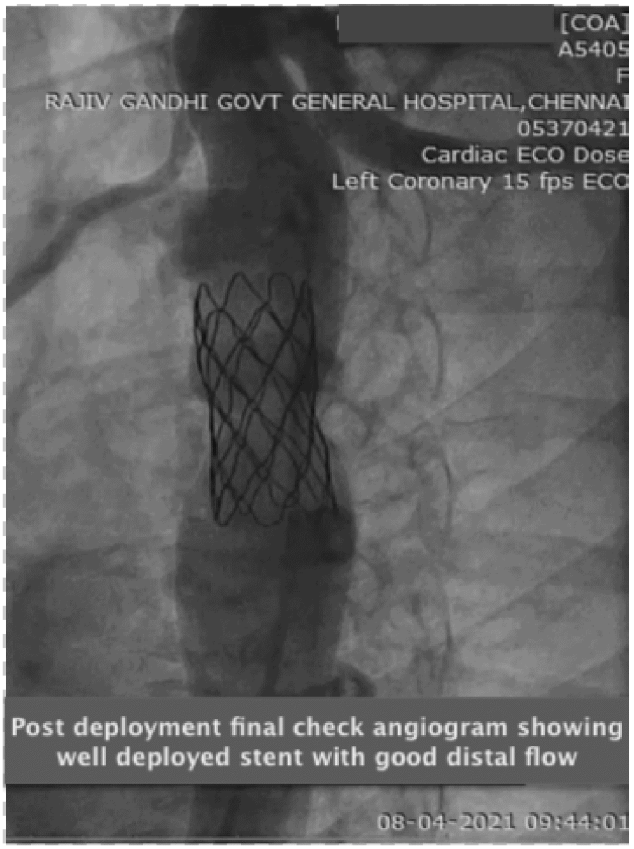

Fig. 5 : Post Deployment Angiogram

to a 260 cm long 0.035" Amplatz superstiff guidwire (Boston scientific, USA) which was parked in the ascending aorta. A 12 French Performer (Cook Inc, USA) Mullin guiding sheath was taken over the wire and positioned just distal to the left subclavian artery. A covered CP stent 39 mm pre-mounted on a 16 x 40 mm BIB (NuMed Inc) was taken through the sheath under fluoroscopy guidance till it reached the tip of the sheath. Once the stent position was confirmed by fluoroscopic bony landmarks and by contrast puffing through the sheath side arm, the sheath was pulled down just below the proximal end of the balloon. Rapid pacing at a rate of 200/minute was done from the right ventricle using a temporary pacing catheter to bring the systolic BP to around 50 mm of Hg. The stent was then deployed by inflating the BIB balloon using two separate indeflators at 4 atm (inner balloon first followed by the outer balloon) (Fig.4). Post procedural check angiogram showed proper deployment of stent with no residual waist and no obstruction of subclavian artery (Fig 5). Final pullback gradient across stented segment was < 5 mm Hg, with a post procedure echo gradient of 7.5 mm Hg. The femoral puncture site was closed with proglide (Abbott Vascular, USA). There was no intra or immediate post procedural complications, no significant blood loss and no puncture site complications.

Within 2 days of procedure, there was a fall in hemoglobin of 2 gm/dl again. Further investigations to look for bleed including contained rupture of aorta, retroperitoneal hematoma etc proved negative. LDH was elevated again with peripheral smear showing schistocytes suggesting a relapse of autoimmune hemolytic anemia. She was put back on intravenous dexamethasone 8 mg twice a day. Possibility of an autoimmune hemolytic anemia triggered by iodinated contrast agent was considered since both the episodes of hemolysis was following an angiographic procedure. Her hemoglobin level slowly improved back following intravenous steroids and remained stable subsequently. She was switched over to oral prednisolone 30 mg per day before discharge. Her hemoglobin remained stable around 10 gm/dl for the next 2 months. (Table-1) Steroid dose was tapered gradually over 6 months. At present she is on 5 mg oral prednisolone and she is maintaining a stable hemoglobin level. Patient is currently asymptomatic, normotensive without antihypertensive drugs with an echo gradient of 20 mm Hg across coarctation segment.

Table 1 : Blood counts profile and radiographic contrast exposure / steroid therapy

Date	Total WBC count	Hemoglobin (gm/dL)	Plateletcount/mm3
24/01/21(D1)	7,900	10.1	6,64,000
Diagnostic cardiac catheterisation - 28/01/2021			
05/02/21	8,000	8.9	3,71,000
05/03/21	5,600	6.9	1,67,000
Blood Transfusion - 09/03/2021			
10/03/2021	10,000	9.4	3,09,000
I.V Steroids - 10/03/2021			
19/03/2021	11,300	11.5	2,05,000
31/03/2021	15,600	11.8	3,34,000
Coarctation Stenting- 08/04/2021			
10/04/2021	13,200	8.4	2.,74,000
IVSteroids - 10/04/2021			
13/04/2021	9,700	8.7	3,10,000
17/04/2021	10,400	10.1	2,65,000

Discussion

Untreated CoA has a poor prognosis, with most patients suffering from significant morbidity and mortality before the age of 40 years owing to heart failure, endocarditis, cerebral vascular accidents or premature coronary artery disease[5]. Endovascular management of coarctation of aorta by balloon dilation or stenting is a preferred modality of treatment in adolescent and adult patients presenting with native or recurrent coarctation.

Our case was challenging in view of an unexplained drop in hemoglobin, observed after radiographic contrast exposure during diagnostic aortogram and subsequently during stenting of the aortic coarctation. There are very few reports on the association of anemia with coarctation of aorta in the literature. Low-grade hemolysis has also been reported in two patients with coarctation of the aorta[9,10]. However, these were associated with iron deficiency, which could exaggerate the susceptibility of red blood cells to mechanical stresses[11] and the biochemical and hematological indices failed to return to normal after corrective surgery. Most of the earlier reported cases of hemolytic anemia in congenital heart disease have been associated with mechanical hemolysis, related to high-velocity jet with turbulence. Intravascular hemolysis may follow the insertion of prosthetic valves and patches at cardiac surgery[6,7] and in acquired valvular heart disease[8].

The rapid fall in hemoglobin levels associated with elevated LDH and a hemolytic picture in the peripheral smear suggested the possibility of hemolytic anemia in our case. A positive direct coombs test confirmed the diagnosis and enabled us to start therapy with steroids, to which the patient responded well. The second episode of fall in hemoglobin following stenting, prompted us to search for potential triggers for hemolysis, especially drugs since she was hospitalized. Drug-induced autoimmune hemolytic anemia is a relatively rare complication which may go undiagnosed in many cases, and also the magnitude of hemolysis can vary widely[12]. Drugs may induce the formation of antibodies against red blood cell membrane or intrinsic antigen, which may induce immune-mediated hemolysis. The incidence is approximately 1 per million/year[13]. The most commonly reported drugs associated with hemolytic anemia include cephalosporins, diclofenac, rifampicin, oxaliplatin, and fludarabine[14]. This could be potentially serious as the degree of hemolysis can vary widely.

Our patient did not receive any of the known medications which are commonly responsible for hemolysis. Since both the hemolytic episodes occurred after catheterization procedure, the possibility of radiographic contrast agent being the culprit was strong. Nonimmune hyperosmolar contrast-induced sickling and hemolysis were described in a patient with sickle cell disease following coronary angiography[15]. Only few cases of contrast medium induced immune intravascular hemolysis were reported in medical literature[16,17, 18,19,20]. To our knowledge this is the first case of stenting of coarctation of aorta being associated with radiographic contrast induced autoimmune hemolytic anemia. Though very rare, prompt suspicion and meticulous investigations with multi-speciality involvement helped us in timely diagnosis and management of the condition and led to a successful outcome.

Conclusion

We report an uncommon occurrence of auto immune hemolytic anemia in a coarctation of aorta patient, which was probably triggered by iodinated contrast medium. This highlights the importance of recognizing this very rare and potentially serious but treatable complication of contrast medium exposure. Cases of incidentally diagnosed anemia should not be overlooked, especially in patients who are undergoing complex interventions. Treating physicians should be aware of this rare condition and should consider this in the differential diagnosis of unexplained hemolysis after administration of contrast media

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