



Post-vaccination CABG graft thrombosis-should the Anaesthesiologist be worried?

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ABSTRACT

Aim: Graft patency of venous conduit, in CABG is 40-50% at 10 years, radial artery is 88-92%. Covid vaccination caused graft thrombosis in two patients within six months of surgery.

We analysed the possible cause, consequences and relevance for anaesthesiologist.

Method: The surgeon, anaesthesiologist and team had standardised protocols since 15 years which were judiciously followed. Results were consistent over the years. Post vaccination, angina was observed within 48 hours. Check angiography was done in one patient while other did not consent so was managed medically.

Results: Angina occurred within 24-48 hours post-vaccination. Graft angioplasty was done for radial graft thrombus, while second patient was managed medically.

Discussion: WHO-approved vaccines in India are-Covid shield (AZD1222) and Covaxin (BBV152), with reports of vascular thromboembolism post vaccination with AstraZeneca vaccine [1, 2, 3].

Two studies, a German/Austrian/Canadian collaboration and a Norwegian group study published online in the New England Journal of Medicine, April 9, established a causal relationship between Astra-zenec Covid-19 vaccine and severe thrombotic complications caused by rogue antibodies directed against platelet factor 4(PF4) causing massive platelet aggregation and thrombosis with reduced platelet count elsewhere resulting in bleeding. This syndrome is named Vaccine-induced immune thrombotic thrombocytopenia.

Another mechanism is Kounis Syndrome, which can complicate anaesthesia, vaccination, medical therapy and stent implantation and seems associated with coronary allograft vasculopathy and Takotsubo syndrome.

Kounis syndrome's final trigger pathway is implicated in coronary artery spasm and plaque rupture, mediated by inflammatory cells like eosinophils and/or mast cells. It also affects cerebral and mesenteric arteries [9].

There is lack of knowledge regarding interactions of immunisation, anaesthesia and surgery. Since immune-modulatory effects of anaesthesia and surgical trauma may diminish immunisation, best timing of vaccination for optimal immune response against COVID-19 needs evaluation. Also side-effects of vaccine maybe aggravated through perioperative immunomodulation and its adverse effects misinterpreted as postoperative complications.

Presently, the Royal College of Surgeons of England recommends non-urgent elective surgery in adults soon after vaccination and both events shall not be separated for more than one week [11].

Keywords: CABG, Graft thrombus, Covid Vaccination

INTRODUCTION

Coronary revascularization is used to treat coronary artery disease in which progressive blockage of coronaries is observed as a result of atherosclerosis, thus compromising blood supply to the heart muscle. Coronary artery disease can be managed medically or by intervention. Intervention for revascularization includes implanting a stent in the area of blockage as in Angioplasty or to entirely bypass the blockage surgically as in CABG.

The conduits used in CABG are saphenous vein or artery which may be Left Internal Mammary (LIMA), Right Internal Mammary (RIMA) or radial artery. The graft patency of venous conduit is 40-50% at 10 years and radial artery is 88-92%. However, Covid vaccination has caused graft thrombosis in two patients within six months of surgery.

We analysed the possible cause, consequences and relevance for anaesthesiologist.

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METHODS

The same team of surgeon, anaesthesiologist and support staff had developed standardised protocols since 15 years which were judiciously followed.

Check angiography was done in one patient while other did not consent so was managed medically.

RESULTS

Angina occurred within 24-48 hours post-vaccination. Graft angioplasty was done for radial graft thrombus, resulting in reversal of symptoms and ECG changes while second patient was managed medically.

DISCUSSION

The advent of vaccines against COVID-19 has been a major stride forward towards quelling the pandemic. Amongst many approved by WHO, there are two vaccines available in India-Covid shield (AZD1222) and Covaxin (BBV152). There have been reports of vascular thromboembolic catastrophes post vaccination with AstraZeneca vaccine [1, 2, 3]. There is also a reported case of MI following Covid shield vaccination in a previously healthy, non-hypertensive, non-diabetic, non-smoker with no risk factors, within two days of vaccination.[4]



Figure 1: CT angiogram showing - Patent LIMA to LAD Graft - Complete Thrombotic occlusion of aorta and radial graft.

Two studies, German/Austrian/Canadian collaboration and a Norwegian group study published online in the New England Journal of Medicine on April 9, established a causal relationship between AstraZeneca Covid-19 vaccine and severe thrombotic complications. The articles concluded that severe thrombotic events

accompanied by thrombocytopenia are caused by rogue antibodies directed against platelet factor [4] (PF4) causing massive platelet aggregations and thrombosis with reduced platelet count elsewhere resulting in bleeding. Hence patients have thrombosis and bleeding [5]. Like Heparin-induced Thrombocytopenia, It is treated with intravenous immune-globulins and anticoagulants. This syndrome is named Vaccine-induced immune thrombotic thrombocytopenia.

Another mechanism postulated is Kounis Syndrome, which can complicate anaesthesia, vaccination, medical therapy and stent implantation and seems associated with coronary allograft vasculopathy and Takotsubo syndrome. It's often confused with hypersensitivity myocarditis and causes sudden death [6]. Kounis syndrome is the concurrent occurrence of acute coronary syndromes with hypersensitivity reactions including anaphylaxis [7]. Two principal variants of the syndrome described are-Type 1 is allergy related angina caused by coronary spasm and type II, which is allergy related myocardial infarction due to plaque rupture and thrombus formation. Drug-eluting stent thrombosis secondary to hypersensitivity reactions is third type [8].

Kounis syndrome's final trigger pathway is implicated in cases of coronary artery spasm and plaque rupture, mediated by inflammatory cells such as eosinophils and/or mast cells. It also affects cerebral and mesenteric arteries [9].

There is lack of knowledge regarding interactions of immunisation, anaesthesia and surgery. Since immune-modulatory effects of anaesthesia and surgical trauma may diminish immunisation, best timing of vaccination for optimal immune response against COVID-19 needs evaluation. Also side-effects of vaccine maybe aggravated through perioperative immunomodulation and its adverse effects may be misinterpreted as postoperative complications [10]. Patients should be evaluated pre-operatively for all Covid and Vaccine associated complications.

Perioperative anaphylaxis has a mortality rate of 9%, which accounts for almost 9-19% anaesthesia associated complications and 5-7% deaths during anaesthesia. A French survey of anaphylaxis under anaesthesia showed that 73.6% had cardiovascular involvement. Treatment involves removal of causative agent, management of coronary spasm with vasodilators or stent implantation. Allergic response can be treated using anti-histaminic, corticosteroids, mast cell stabilizers, adrenaline or glucagon.

Presently, the Royal College of Surgeons of England recommend that non-urgent elective surgery in adults can take place soon after vaccination and both events shall not be separated for more than one week [11].

CONCLUSION

Whatever the mechanism and timing of cardiac involvement post-vaccination, prompt diagnosis, early initiation of treatment and diligent management ensures patient safety. Knowledge, anticipation and preparation will keep the anaesthesiologist safe and stress free.

Surgery	Graft details	LVEF	Creatinine clearance	Euro-score	Complications	BSA	Intra op-findings	Vaccination Date
Off pump CABG on 22-04-2021	LIMA- LAD,LT RADIAL(AORTA) OM1	60	92	0.97	Nil	1.89	CRITICAL LMCA WITH NORMAL LAD,LCX & RCA, GOOD LV,MILD LVH,ACS,UA,RWMA,LVEF-60	10-07-2021 Angina on 12-07-2021
Off pump CABG on 05-02-2021	LIMA-LAD,SVG-D1,SVG-OM1	55	66	2.21	Nil	1.58	CRITICAL TVD ,USA ,ACS ,RWMA,GOOD LV,MILD LVH,RCA CTO 100% NON DOMINANT,PDA NOT SEEN,HENCE NOT GRAFTED.	20-07-2021 Angina on 21-07-2021

Table 1: Showing data of patients with angina post-vaccination.

Age	Sex	Surgical Detail	DOS	Graft Details	Check CAG date	Result	Duration In years
68-M		CABG x2	18-02-2013	LIMA-LAD, Aorta-SVG-D1	26-12-2018	All graphs patent	5
62-F		CABG x3	30-10-2010	LIMA-LAD,Aorta-SVG- Ramus-OM.Sequential.	24-08-2015	All graphs patent	5
55-M		CABG x2	28-03-2013	LIMA-LAD-Y-Radial-PLVB	01-12-2020	All graphs patent	7
72-M		CABG x3	01-03-2010	LIMA-LAD-Y-Radial-OM-PDA sequential	05-02-2021	All graphs patent	11
56-M		CABG x2	10-12-2010	LIMA-LAD, Aorta-Radial-OM	28-06-2019	All graphs patent	9

Table 2: Showing graft patency study of operated patients.

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