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BronchialArteryEmbolizationasaLifeSavingProcedure-AnInterestingCaseReport

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1. Abstract

Haemoptysisisafairlycommonconditionwhichisencounteredin anemergencysetting.However,theexactcausemaynotbeeasily identifiable. In such scenarios, bronchial artery embolization can beconsideredtostopthebleeding.Thiscanbeperformedafter a detailed pre-procedure CT thoracic angiography, which would help in identifying the source of the bleeding (bronchial/pulmonary)aswellasdelineateanyanatomicvariationsofthebronchial arteryorigin.Knowingtheanatomyofthebronchialarteryorigin, both orthopic and ectopic, help in shorter procedure time, hence lesscontrastandradiationexposure.Here,wepresentaninterest- ing case of bronchial artery embolization.

2. Introduction

Bronchial artery embolization is a fitting minimally invasive procedureinanemergencysettingwhentheaetiologyofthehaemorrhageisn't identified.It,hence,servesasabridgetoamoredefin- itive intervention for haemoptysis [1].

Bronchialarteryembolizationofferssuccessrateof77-94%inan emergencysettingsinceitsintroductionasearlyas1973[2].However, it is vital to identify the origin of the bronchial artery that is tobeembolized,fortheproceduretobeeffective.Orthotopicoriginfromtheproximaldescendingthoracicaortaisfoundinavast majority. However, there can be ectopic origin in a small subset of this population, which would make the procedure that much challenging [3]. Contrast-enhanced computer tomography helpsinidentifyingtheoriginIrrespectiveofwhetheritisorthotopic or ectopic in nature. CECT, therefore, aids in treatment planning, shorted procedure time and reduced radiation exposure [4].

3. Case History

A59-year-old male came presented with complaints of recurrent hemoptysisonandofffor1year.Lastboutofhemoptysisformas- sive in nature. Patient had the history of anti-tubercular treatment for pulmonary tuberculosis 1 year back. On examination he was found to be anemic (Hemoglobin-9gm/dl) and despite medical managementtherewaspersistenthemoptysis.Laboratoryparametersrevealednormaltotalleucocytecount,plateletcount,PTINR, and APPT.CT thoracic angiogram was done localize the bleed and asses the bronchial artery anatomy for treatment planning.CT angiography revealed hypertrophied and tortuous, anomalous rightbronchialarteryfromtherightsubclavianartery(Figure1A). Left bronchial artery was orthotopic in origin and was not hypertrophied or tortuous. Fibro-atelectatic and fibro-bronchieatic changes were in right upper lobe (Figure 1B). No active contrast blush was noted. Patient was taken for the bronchial artery embolization via right transfemoral arterial route. Despite multiple attempts bronchial artery was not cannulated due to the tortuosity oftheaorta.Itwasdecidedtoperformembolizationviarighttrans brachialapproach.Theanomalousrightbronchialarterywascannulatedandembolizationby300–500-micronPolyVinylAlcohol (PVA) particle was done. Post procedure, patient was stable and no fresh complaints of hemoptysis.At 1 year follow up, no fresh complaints of hemoptysis were there.

Figure1:

4. Discussion

The lung parenchyma has a dual vascular supply—pulmonary arteries and bronchial arteries. The pulmonary arteries are responsible for almost 99% of the blood flow to the lungs, and are necessary for alveolar gas exchange [5]. The bronchial arteries carry oxygenated blood to the lung parenchyma at a pressure close to systematicpressure,whichismuchhigherthanthepulmonaryarteries. Hence, it can provide nourishment to the supporting lung structures [6]. The bronchial arteries traverse along these structurestothelevelofthe respiratorybronchus,wheretheirterminal branches achieve significant overlap with the pulmonary arterial circulation [1]. Angiographically, the orthotopic origin of bronchial arteries is noted to arise from the descending thoracic aorta between the upper T5 to the lower T6 vertebral bodies; seen in 70%ofthepopulation.Onangiography,1cmaboveorbelowthe level of the left main bronchus as the bronchial artery crosses the descendingthoracicaortaisanimportantlandmark[3].Bronchial arteries that originate elsewhere in the aorta, but outside of the T5–T6confinesorfromanothervasculatureareteremedasectopic [7-10].Among ectopic origin, 10% of them are found to be the first order branch of the thoracic aorta or the arch.The remaining 20% originate from a variety of structures including brachioce- phalic, subclavian, internal mammary, pericardiophrenic, or thyrocervical.Theymayalsooriginatefromabdominalaorta,inferior phrenicandceliacartery[11-13].Thefourmostprevalentpatterns of bronchial artery branching at origin.

TypeI:singlerightbronchialarteryviaintercostobronchialtrunk (ICBT),andpairedleftbronchialarteries (41%).

TypeII:singlerightbronchialarteryviaICBT,andsingleleft bronchial artery (21%).

TypeIII: pairedright bronchialarteries with onefrom ICBT,and pairedleftbronchialarteries (20%).

TypeIV:pairedrightbronchialarterieswithonefromICBT,and solitaryleftbronchialartery(10%)(Figure2)[11-13].

Thenormalcaliberofthebronchialarteriesislessthan1.5mm neartheoriginandlessthan0.5mmdistally,astheybranchinthe hilum. When hypertrophy occurs, its diameter usually exceeds 2 mm,andbecometortuousinappearance[14].Bronchialarteryhypertrophy(BAH)anddilatationofthethin-walleddistalbronchial topulmonaryarteryanastomosismayoccur.However,thisrecruitmentincreasestheriskofbronchialarteryrupturewithsubsequent pulmonary hemorrhage [5]. Bronchial arterial system is the main source of bleeding in 90% of the cases of massive hemoptysis, followed by the pulmonary arteries (5%), and the non-bronchial systemic arteries (5%) [15]. CECT angiography is preferred tobe obtained from the supraclavicular regions upto the level of the renal arteries, depicting both orthotopic and ectopic bronchial arteries and possible collateral branches to the pulmonary arterial system. This is particularly helpful in cases of aberrant or ectopic bronchial arteries [16-18]. Digital subtraction arteriography is done prior to undergoing bronchial artery embolization. This allowsforexcellentdelineationofbothbronchialandnon-bronchial systemic arteries [1]. Generally accepted guidelines for abnormal bronchialarterydiameterare >3 mm, with normalvasculardiametertypically1.5mm.Apartfromthis,pleuralthickeningmeasur- ing 3 mm or greater adjacent to a parenchymal abnormality is an importantfinding,whennoted[19-21].Whenableedingsitecannotbeidentified,findingssensitiveforlocalizationofhemoptysis arevascularhypertrophyandtortuosity,neovascularity,hypervascularity, aneurysm formation, and shunting (bronchial artery to pulmonaryveinorbronchialarterytopulmonaryartery)[19].Venousreturnfromthebronchialarterialcirculationismostoftenvia thepulmonaryveins,withsmallercontributionsfromthesuperior vena cava, azygos, and hemiazygos systems. This venous system is well visualized during bronchial angiography and the interventionist must determine if direct arteriovenous shunting is present [1].EmbolizationofthevesselwasdonebyusingPVAparticlesof size300-350microns.ThesePVA(Polyvinylalcohol)particles do not undergoabsorptionandthereforetheoretically provideamore

durable vascular occlusion. Small particles (< 200 μm) should be avoidedbecauseoftheincreasedriskofspinalarteryembolization compared with larger particles (> 300 μm) [8, 22]. After embolization of the aimed vascular territory to stasis or near stasis, a reduction in size and enhancement of the bronchial arteries are commonfindings.Bronchialarteryembolizationhasproventobe effective in controlling the potential hazardous hemoptysis, with success rates between 73 and 100%.

ConclusionBronchialarteryembolizationwasintroducedin1974. Itisnowconsideredbymanytobefirstlinetherapy[19].Prepro- cedurecontrastCTallowsmakingtimelydiagnosisfeasibleincritically ill patients. In addition, bronchial and nonbronchial systemic feedervesselscanbedetected.Awarenessofanomalousbronchial arteries, especially in the absence of significant arterial supply to abnormal pulmonary parenchyma can be made during thoracic aortography.Pre procedural CTandAortography helps in reducing the duration of procedure, thereby protects the patient from radiation exposure and excessive contrast administration.Anomalous originofbronchialarterymustkeptinmindinpatientwithhemop- tysis and should be differentiated from hypertrophied collaterals.

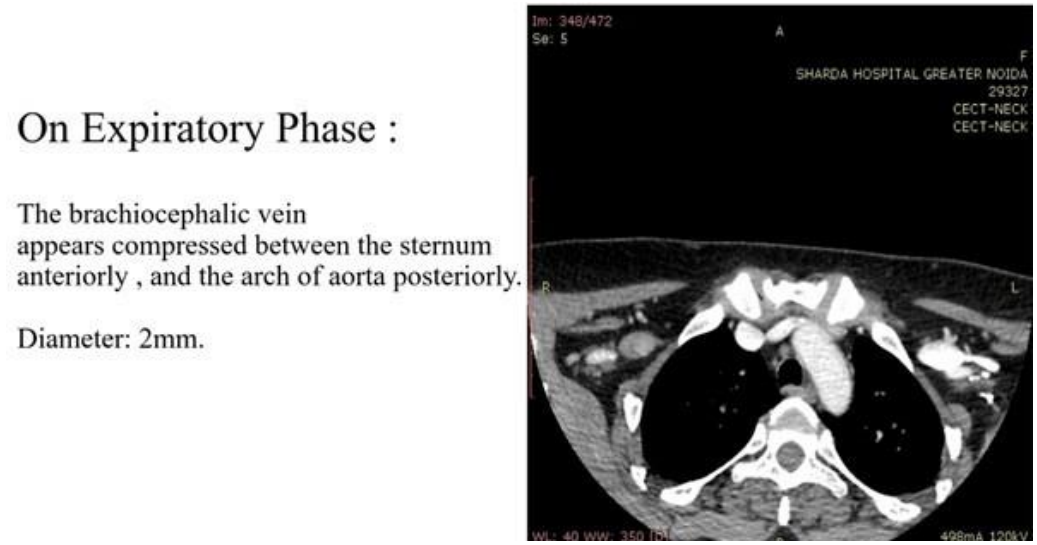

Figure2:

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