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RESEARCH ARTICLE

CLOSURE OF AN AGED OSTIUM SECUNDUM ATRIAL SEPTAL DEFECT: WHICH PROCEDURE TO CHOOSE? CASE REPORT AND REVIEW OF THE LITERATURE

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Abstract

Ostium secundum atrial septal defect (OS ASD) is the mostfrequentlydiagnosedcardiac malformation in adulthood. The presence of an ASD iscompletely compatible with a normal life and evenpregnancy. It issometimesdiagnosedduring a work-up for a stroke or at the onset of atrial fibrillation(1). Percutaneousclosureappears to be the preferredapproach for ostium secundum ASD with a favourableanatomicalshape, but surgicalclosureshouldbeconsidered in cases of contraindication, following a detailedpreoperativeassessment (2). The latestrecommendations are strict with regard to establishing the acceptable threshold of pulmonaryarterial pressure (PAP) and pulmonaryvascularresistance (PVR) for closure of the ASD in cases of pulmonaryarterial hypertension (PAH) (3). We report the case of a 61-year-old female patient diagnosedwith an atrial septal defectcomplicated by PAH during a work-up for exertionaldyspnoea. The somaticexaminationwasunremarkable. The ECG showed atrial fibrillation (AF) with a meanventricular rate of 77bpm and complete right bundle branch block. A diagnosis of large (26mm) ostium secondum ASDwas made on transthoracicultrasound (TTU), and transoesophagalultrasound (TOU) ruled out a venous return abnormality. Right heart catheterization revealed a mixed Pulmonary hypertension (PH) withpredominant flow and PVRs of 3-5 WU, allowingpercutaneousclosure. However, the presence of non-ablatable atrial fibrillation and moderatetricuspidinsufficiencycontraindicated the procedure, whichled to surgicalclosureusing an autologouspericardial patch combinedwith a DE VEGA-type tricuspidannuloplasty, with a simple postoperative course.

Introduction:-

Atrial septal defect (ASD) is the mostcommoncongenitalheartdiseaseafterbicuspid aortic valve, with an incidence of 5-10% in children and 30-40% in adults. It accounts for 6-10% of congenitalheartdiseasewith septal defects (4,5). Percutaneousclosure of ostium secondum atrial septal defects (OS ASD) is part of the spectaculardevelopment of non-surgicaltreatmentmethods for congenitalheartdisease, but this technique depends on the presence of sufficientmargins to allow insertion of the prosthesis. (4)We report the case of a 61-year-old female patient diagnosedwith an atrial septal defectcomplicated by PAH during a work-up for exertionaldyspnea.

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Patient Information:
The patient is Mrs MM, aged 61, with a history of pre-diabetes on dietary and hygienemeasures and atrial fibrillation since 2019 on anti-vitamin K and beta-blockers. Shealsoreportedhavingtakendiureticssince 2001 for dyspnea due to undocumentedheartdisease. The patient wasadmitted to ourdepartment for a worsening of herdyspneafrom NYHA stage II to stage III, associatedwith palpitations. The somaticexaminationwasunremarkable; in particular, therewere no signs of left or right heartfailure, and rhythmically the patient waswellcontrolled on beta-blockers.

The ECG showed AF with a meanventricular rate of 77bpm, complete right bundle-branch block and right ventricularhypertrophy.

Transthoracicultrasoundrevealed an ostium secondum septal defectmeasuring 26 mm (seepicture 1)withleft-to-right shunting and repercussions on the right cavities (dilatation of the pulmonaryarterytrunk and right cavitieswith a paradoxical septum, moderatetricuspidinsufficiency (see picture2)with a high probability of PH), a dilatedleft atrium and a leftventriclewith normal echostructure and systolicfunction. The ejection fraction was 60% (SBP) and the leftfilling pressures wereundetermined.

A transoesophagealultrasoundwasperformed, confirming the TTU findings, with no pulmonaryvenous return abnormalities. Biological tests, in particular BNP, were normal, and the INR waswithin the therapeutic range.

Giventhisdiagnosis and the existence of a high probability of PH, the patient underwent right heartcatheterisation, whichrevealed mixed pulmonary hypertension, with predominance of flow, withPVRsbetween 3-5 UW. The patient wastherefore a good candidate for interventionalcatheterisation. However, given the presence of moderate IT and atrial fibrillation, the indication for surgicalclosurewasgiven. Preoperativecoronaryangiographywasunremarkable.

The patient underwentclosure of the ASD using an autologouspericardial patch and a DE VEGA tricuspidannuloplasty, with a simple post-operative course. Clinical and echocardiographic follow-up after one yearwassatisfactory.

Discussion:-

The revelation of ASD at an advancedageisbecomingincreasinglyfrequentwith the improvement in life expectancy in the general population. ASD ostium secundum (OS)is a defect in the central part of the fossa ovale, or the middle part of the atrial septum. It is the mostcommon type of ASD and ispredominantlyfemale. There are a number of circumstances in which an ASD isdiscovered in adults, dominated by dyspnea and palpitations, as illustrated by our case. (2) Dyspneaoftenappearsaround the age of forty or more, but isunderestimatedbecause the patient getsused to doinglessexercise; palpitations and rhythmdisorderssuch as flutter or paroxysmal or permanent atrial fibrillation are oftenrevealingsigns. A Stroke or paradoxicalembolismis not uncommon. On the other hand, peripheraldesaturationismuchrarer. The clinicalsigns are a systolicmurmur in the 2nd left intercostal space, whichislessobviousthan in children, duplication of the second heartsound and diastolicrolling in the tricuspid focus when the left-right shunt issignificant. The somaticexamination, in particular the auscultation of ourpatient'sheart, wasstrictly normal. On ECG, apartfrom atrial rhythmdisorders, therewascomplete right bundle-branch block and right ventricularhypertrophy.

Chest X-rayssometimesshowedcardiomegalywithpulmonary hypervascularisation, as in ourcase, but wereusually normal.

Transthoracicultrasound
TTUcoupledwith Doppler is the key examination for making the diagnosis, assessing the size of the septal defect, noting the direction of the shunt, assessing pulmonary artery systolic pressureand LV function, detectingassociatedcongenitalheartdisease (leftsuperior vena cava draininginto the coronary sinus, partial abnormalpulmonaryvenous return), calculating the dimensions of the right ventricle and quantifyinganytricuspidleak. In our case, the TTU showed a large 26 mm ostium secondum ASD, shuntingleft to right, with good LV systolicfunction and a high probability of PH.

Transoesophagealultrasound

(TOU) isuseful if the patient has lowechogenicity or to determine the topography and otherabnormalities. It is essential to determinewhether the ASD can beclosed with percutaneous method, based on the maximum diameter of the ASD, the existence of sufficientborders and the absence of abnormalpulmonaryvenous return. Our patient's TOUconfirmed the diagnosis and showed no abnormalpulmonaryvenous return.

Finally, **right-sidedcardiac catheterization** assesses the stretcheddiameter of the ASD using a balloncatheter, and under TTU or TOU, wewilljudgewhether the OS ASD, whosestretcheddiameteris 40 mm or more, can beoccluded by a percutaneousprocedure. Closure of ASD isindicated in cases of significantshunting, right ventricular dilatation and the appearance of symptoms;closuremayalsobediscussed in the event of an embolicevent (1). The method of choice for closuredepends on the severity of PAH, the extent of tricuspidinsufficiency and the presence of atrial fibrillation.

As pulmonary hypertension is a lateonset condition, cardiac catheterization isrecommended to check pulmonary pressures and resistanceswhenclosure of the ASDisbeingconsidered (1). The 2020 recommendations of the European Society of Cardiology on the management of congenitalheartdiseaserecommend the following in cases of ASD (6):
-In patients with a shunt and non-invasive signs of elevated PAP, invasive measurement of PVR (Fick method) isrecommended.
-Regarding shunt closure (whenQp/Qs> 1.5) according to PVR calculation:
- <3UW:closure (class I)
-3-5UW:closure (class IIa)
- ≥ to 5UW but <5UW aftertreatment of PH:fenestratedclosure (class IIb)
- ≥ to 5UW: ASD closureis not recommended (class III).

The existence of a tricuspidinsufficiency (TI)associatedwith an ASD poses the problem of itsmanagement:shouldsurgicalclosurebeenvisaged in order to perform a tricuspidplasty at the same time, or can wehope for a favourableevolution of the leakafterpercutaneous occlusion of the shunt? The persistence of an TIpostoperativelyis a factor in morbidity and mortality. It isgenerallyaccepted in the literaturethat occlusion of the septal defect leads to regression of the tricuspidleak. Predictors of non-regression of TI includeage at closure and the presence of PAH. In Toyono'swork, itwasshownthat the presence of systolicpulmonary pressures of more than 60 mmHgis a risk factor for non-regression of the TI. According to the authors, in the case of a high-grade tricuspidleak, the presence of pulmonary pressures in excess of 60 mmHgshould lead to a preference for surgicalclosure of the shunt combinedwithtricuspidplasty, withpercutaneousclosurebeingreserved for patients with PAPS of lessthan 50 mmHg (2).Atrial fibrillation is a classic complication of "aged" ASD. It is not completelyprevented by closure of the ASD, and occurs in 21% of patients operatedbefore the age of 25 (8,9). Age and PAH are tworiskfactors for persistence of atrial arrhythmiaafter correction of the shunt. Finally, itshouldbepointed out that in elderly patients, who are at risk of atrial arrhythmia, percutaneous occlusion of the ASDmakesitdifficult or impossible to perform a trans-septal puncture for an anti-arrhythmic intervention. It isthereforenecessary to have a prior discussion on the appropriateness of an antiarrhythmicprocedurebefore occlusion, or to use a prosthesisthatallowssubsequent trans-septal puncture (2).

In addition, surgicalclosurewithtricuspidannuloplastywouldprevent or slow future worsening of tricuspidinsufficiency by AF and PAH.

In the case of our patient, despite PH with PVR between 3-5 UW, the indication for surgicalclosurewasbased on the presence of moderateTI and the presence of factorspredicting non-regression, notably the patient'sage and PAH. In addition, the presence of non-ablatable AF, given the size of the left atrium, alsoconstituted a contraindication to the percutaneousprocedure.

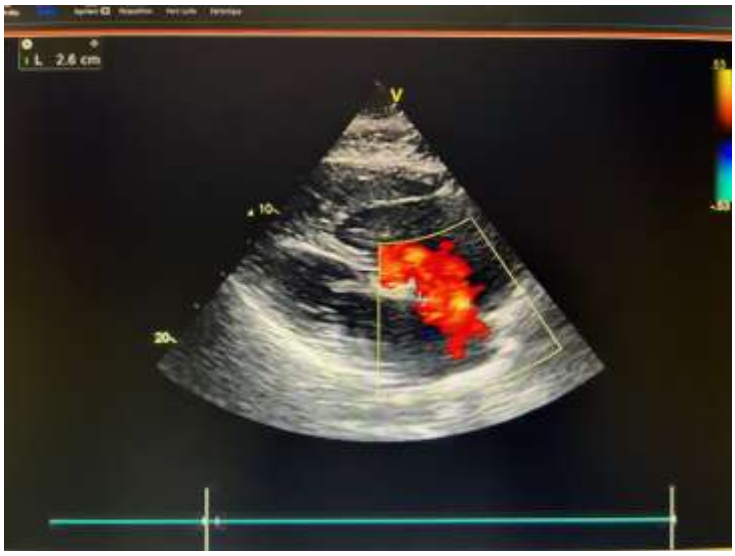
It isaccepted in the literaturethatafter occlusion of an ASD in adults, the clinicalsymptomsregress and the right ventricle’sdecrease. Rhythmdisordersbecomelessfrequent and mayneverappear if the patient hadneverhadthemprior to closure. In this populationbeware of small ASD associatedwith increasedleftfilling pressures, whichact like a "valve". Closingthem can lead to pulmonaryoedema. If thereisanydoubt, an occlusion test shouldbeperformed and closure of the ASD shouldberejected if thereis a significantrise in left atrial pressure (9).

Complications withouttreatment are not uncommon. Arrhythmiassuch as atrial fibrillation, as in ourpatient's case, and atrial flutter, paradoxicalembolisms, right heartfailure due to dilatation of the right ventricle and

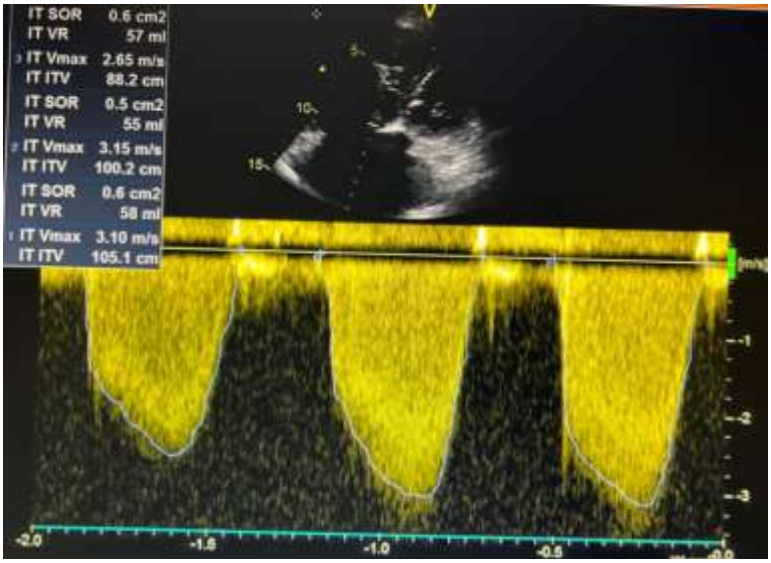
pulmonaryartery, and in particular the development of an unfortunateEisenmenger syndrome whichisbeyondanytherapeuticresources.
Finally, closure of septal defects in elderly patients, particularlyelderlywomen, must becarried out after strict control of blood volume to avoiddecompensation of leftheartfailurewithpreservedsystolicfunction (2).

Conclusion:-

Age is not a contraindication to closure of an atrial septal defect. Closure of the shunt willoftenimprove an elderly patient complaining of breathlessness. However, itseffectiveness in treatingarrhythmias and palpitations is more questionable, particularly in patients with high pulmonary pressures. The type of ASD, itsanatomy, and whetheritisassociatedwithelevatedpulmonary pressures, tricuspidinsufficiency or atrial fibrillation are the factorsthatwillmakeit possible, following a preoperativeassessment, to decide on the closure mode. Vigilance must bemaintained facing the risk of revealing post-procedureheartfailurewithpreservedsystolic function.



Picture 1:- Ostium secondum Atrial septal defectseenon parasternal left main axis.



Picture 2: Moderatetricuspidinsufficiency.

Patient's consent :
Afterexplaining to the patient the interest of publishingher case for the scientificcommunity, she gave her agreement

Authors' contribution :
Fatimatou Zahra Coulibaly:principal author, whomanaged the patient. Nuance Divine TchiloembaTchibinda:co-authorwhoanalysed patient data. KITIHOUN Willer Chimène : co-authorwhotook part in drafting the manuscript, Nadia Fellat, Rajaa Benani, RokyaFellatsupervised the patient's management. All authors have read and accepted the final manuscript.

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