

Original article:

A COMPARATIVE STUDY BETWEEN USE OF AUTOLOGOUS PERICARDIUM AND DACRON PATCH CLOSURE OF VENTRICULAR SEPTAL DEFECT

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Abstract:

Background: Conventionally, ventricular septal defects are closed with Dacron patch or Goretex and also pericardium treated and untreated. In our study, we compared Dacron patch closure and also pericardium both treated and untreated.

Objectives: We are comparing VSDs closed using pericardium and Dacron patch

Materials and methods: Between May 2019 JANUARY 2023, 100 children had their ventricular septal defects closed with Dacron patch and also pericardium which had both treated (glutaraldehyde) and untreated pericardium. There were 42 females and 58 males aged between 2 to 26 years. The diagnosis was isolated VSDs were 90 and 7 patients had multiple VSDs. All patients with ToF complexes were excluded and 3 patients had rare Gerbode defects. All patients had undergone median sternotomy and taken on cardiopulmonary bypass either a Dacron patch of appropriate size or harvested pericardium using either treated with glutaraldehyde or plain 0.9 %normal saline the defect was closed using a 4-0 prolene in continuous fashion.

Results : all the patients survived and 6 months follow up done. no patient had any leak and no patient required no exploration and all the patients underwent immediate post op tee

Conclusion : autologous pericardium either treated or untreated is as good as a dacron synthetic patch for closure of ventricular septal defect

Key words : ventricular septal defect , Dacron patch , pericardium

Introduction

Ventricular septal defect is one of the commonest of congenital cardiac abnormalities and vsd closure is one of the commonest operative procedure done . there are a few prosthesis used to close a vsd . popularly used are goretex and dacron patch for vsd closure . autologous pericardium is is used and is attractive because its freely available and is sterile a little difficult to use though .experience with bovine pericardium is limited . we in our institute use both pericardium and Dacron patch and we tried to compare both of them and tried to find if the results varied

Aim of the study

We are comparing the ventricular septal defect closure using either pericardium or Dacron patch closure and evaluating the results in comparison to each other and determine if one is superior to the other or both are same .

Materials and methods

Between May 2019 and february2023 we had operated 100 patients of pure vsd at G.B. Pant hospital (GIPMER) NEW DELHI. Total of 100 patients were operated with vsd closure but we had excluded tof complex in it. ie . ventricular septal defect with pulmonary stenosis, tetralogy of Fallot , dtga vsd ps.,but we included Ventricular septal defect and atrial septal defect together also multiple ventricular septal defects .all patients were aged between 2 to 24 and median age being 10 and we had 42 females and 54 male patients average weight being 16.8 kilos . Clinical profile in table 1.

Results:

Table 1

Diagnosis	No. of patients	Percentage
Perimembranous VSD	70	70%
Gerbode defect	3	3%
VSD with ASD	7	7%
Muscular VSD	12	12%
Subpulmonic VSD	1	1%
Multiple VSD	7	7%

All the diagnosis were established by 2 dimensional echo and 5 patients required Computerized tomographic angiogram 1 patient needed cath study and 2 patients underwent tee

After median sternotomy the thymus was carefully dissected from pericardium and partially removed . a free graft of pericardium was harvested taking care not to injure the phrenic nerve . it was steched out on the back of the kidney tray (sterile) and carefully wrinkles and tissues removed it was treated with 0.6 % glutaraldehyde in about 46 patients for 25 mins and rinsed in 0.9 % normal saline for 5 mins .cardiopulmonary by pass established with aorto bicaval cannulation. Under moderate hypothermia and cold blood cardioplegia arrest ,the right atrium was then opened and the inspection of ventricular septal defect done .the pericardium of trimmed and sized to match the ventricular septal defects . The defect was closed with pericardial patch using 4-0 polypropelene with continuous suture technique . Starting from inferior margin and proceeding towards the anterosuperior margin and superiorly towards aortic valve , avoiding injury to the aortic valve . With second arm of the suture , the posteroinferior margin was closed up to the septal leaflet of the tricuspid valve . The tricuspid margin of the defect was closed with a reinforcing strip of pericardium

Ventricular septal defects closure with Dacron patch steps of sternotomy and aorto bicaval cannulation for establishment of cardio pulmonary bypass are same and then rt atrial approach is taken by taking an incision parallel And 2 to 3 mm from tricuspid annulus because of the presence of chordae tendinae obscuring the ventricular septal defects . Then three sutures ts are taken through the septal leaflet while care is always taken to avoid taking the penetrating bundle branch . 3 mattress sutures are taken 3 to 5 mm from the edge of the defect on the inlet to avoid

taking the bundle branch . Then interrupted sutures were taken on the Dacron graft occasionally pledged which was lowered into position and were tied . the Ventricular septal defect is closed and the tricuspid valve repaired taking continuous sutures then in both the procedures aorta is un clamped and aortic root vented and ra-tomy closed with 6-0 polypropelene and rewarming taken to 36 degrees .after MUF complete pump perfusion stopped and aortic cannula removed and temporary pacemaker is placed at the right atrium and the wound closed in layers with drains in situ

Results

The mean cardio pulmonary by pass time and cross clamp time in pericardial group and Dacron patch group was 90 and 20 mins and 85 and 20 mins respectively relatively similar time . the mean icu stay was 4.5 days and elective ventilation was done for zero day to all the patients and 9 patients required ventilation for 48 hrs . mean hospital stay was 8 days and all the patients underwent tee during and immediately after the procedure 12 patients had rhythm disturbances and all of them settled within 5 days and none needed permanent pacemaker . Mean inotropic support needed was 2 days only 13 of them needed adrenaline and Cordarone (Amiodarone) for extended period of time .no patient developed any wound infection during the hospital stay 3 after the discharge in follow up in both the groups .no patient in either of the groups had needed re-exploration nor redo surgery .patients in both the groups about 12 in Dacron and 1 in pericardial group had fever owing to intra cath thrombosis .

Pacemaker wire removed on 4 th pod except in 12 patients with transient rhythm disturbances . Suture removal done on pod 14 on OUT PATIENT basis . Patients with pericardial patch group needed tab ecosprin 75 for six months period and all the patients in both the groups had received Lasilactone for a considerable period .ONE CHILD OF 1.5 YEARS OF age expired developing post op endocarditis even after given picu care

Follow up of the patients which was for a minimum period of six months and we haven't found either of the groups having residual shunts nor endocarditis nor Aneurysm . (Table 2)

Table 2:

	Pericardium group	Dacron group
CPB time	90+20 min	85+ 20 min
Inotropic support	48 hours (4, 3 days)	48hours (2, 3 days)
ICU support	4 days	4 days
Mechanical ventilation	Day 0 (1 patient 48 hours)	Day 0 (2 patients 48 hours)
Trans-esophageal echo	25	25
Re-exploration	0	0
Fever	4 (Intracath thrombosis)	6 (Intra cath thrombosis)
Wound infection	02	01
Stitch sinus	1	2
Suture removal	POD 14	POD 14
Low dose aspirin	3-6 months	0
Follow up (6 months)	54	46

Discussion

It is a commonality to close ventricular septal defects using synthetic materials like Goretex (expanded polytetrafluoroethylene) or Dacron (polyethylene terephthalate), in our case the synthetic material used was Dacron depending on the choice of the surgeon. It's an established fact that Dacron excites a fibrous reaction that is probably the reason for the closure of tiny residual vsd's that are seen during post operative 2 d echocardiogram(11). Autologous pericardium and also bovine and equine pericardium are used for vsd closure. It's believed and also experienced that fresh untreated pericardium is a bit difficult to handle and also shows either shrinkage or extra stretch, over period of time. Schoof et al reported that aneurysm formation can occur due to usage of fresh pericardium and also due to over sizing of the patch(3). It's a known fact that pericardium is used to make conduits owing to its enlargement properties. In our case we used both untreated and treated pericardium(4,5)

Alan Carpentier the father of modern valve repair surgery introduced glutaraldehyde in cardiac surgery. He treated fresh pericardium with 0.6 percent glutaraldehyde which causes a reaction and that results in cross linking of collagen molecules and strengthens pericardium and helps fixing the shape and decrease the elasticity(8). Many surgeons believe there are several benefits of treating the pericardium and fixing it. The patch can be cut and shaped with expectation that when it is exposed to high pressure and shall retain approximately same size and shape(12). The risk of aneurysmal dilatation is reduced by fixing the pericardium(6). Dacron patch as discussed earlier causes a fibrin reaction and helps bridge gaps in small residual Ventricular septal defects but they also carry a small but definitive risk of endocarditis(7). The bovine and equine pericardiums can cause strong immunological reactions and also is expensive.

In our institute we use Dacron patch and patients autologous pericardium both treated and untreated. We prefer to close the vsd using the continuous suture technique. Sometimes the vsd could be obscured by chordal tissue(9). Continuous sutures allow weaving the in and out between these chordal tissues. Detachment of the base of the tricuspid leaflet is advocated by some surgeons to improve the exposure in our institute we never used the technique(10). Patch sizing is most important to reduce aneurysmal dilation there by to prevent lvot and rvot obstruction(13). None of the patients had any residual shunt of significance in fact no shunt across the patch was noted. Three patients had extremely rare Gerbode defect and both were repaired with pericardium two were with treated pericardium and one was repaired with plain pericardium.

Conclusion

After having a comprehensive study of 54 and 46 patients in both the groups studied i.e. Dacron patch and autologous pericardium, we can conclude that use of pericardium which is readily, freely available the need for Dacron patch can be drastically brought down as it involves high cost and also risk of endocarditis. However we do not belittle the Dacron patch uses. Which is to suggest both autologous pericardium if used carefully is as good as Dacron patch if not superior. However we advise a long term follow up and also we would carefully follow them.

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