

Comparative Outcomes of Left Anterior Thoracotomy Versus Resternotomy for Pulmonic Valve Replacement After Tetralogy of Fallot Repair

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Background: Reoperative PVR after TOF repair presents significant surgical challenges. This study compares the clinical outcomes of left anterior thoracotomy (LAT) versus resternotomy approaches to PVR.

Methods: A retrospective analysis LAT (n=20) vs. resternotomy (n=18)

Exclusion: residual intracardiac shunts, concomitant valvular surgeries One conversion due to an abnormal valve position in TOF with absent pulmonic valve (APV) was also excluded.

Results: LAT group showed....

- Significantly higher proportion of males
75% vs. 38.89%, p=0.047
- Significantly higher proportion of beating heart operation
100% vs. 38.89%, p>0.005
- Non-significantly shorter operative times
157.05 ± 49.42 vs. 178.06 ± 58.69 minutes, p=0.239
- Non-significantly shorter postoperative hospital stays
4.75 ± 1.21 vs. 6.17 ± 4.38 days, p=0.173
- Non-significantly lower drain outputs on postoperative day 1 and 2
184.4 ± 272.43 vs. 397.22 ± 411.19, p=0.066; 105.5 ± 86.78 vs. 355.56 ± 581.52, p=0.065
- Significantly lower inotropic score on postoperative day 0 and 1
0.05 ± 0.22 vs. 4.36 ± 6.95, p=0.009; 0 vs. 2.17 ± 4.52, p=0.039
- More intraoperative extubation
15% vs. 5.56%, p=0.606
- Non-significantly shorter intubation time
6.97 ± 4.18 vs. 10.26 ± 9.35, p=0.195
- Similar complication rates without mortality in either cohort

Demographic data	LAT (n = 20)	Resternotomy (n = 18)	p-value
Age (yr)	26.7 ± 12.24	29.61 ± 11.51	0.456
Sex (M:F), n(%)	15:5 (75)	7:11 (38.89)	0.047
Weight (kg)	51.45 ± 9.95	51.07 ± 11.26	0.912
Height (cm.)	163.13 ± 7.89	158.89 ± 10.45	0.164
BMI (kg/m2)	19.29 ± 3.23	20.26 ± 4.06	0.418
Number mBT shunt	2 (10%)	4 (22.22%)	0.395
Age at total correction (yr)	9.25 ± 12.56	8.72 ± 7.50	0.878
Time interval from total correction to PVR (yr)	16.95 ± 6.50	20.44 ± 7.15	0.123
Underlying diseases			
- VCFS	1 (5%)	0 (0%)	1.000
- Down's syndrome	1 (5%)	0 (0%)	1.000
- Radiolunar synostosis	1 (5%)	0 (0%)	1.000
- History of VT/VF	1 (5%)	1 (5.56%)	1.000
- CHB	0 (0%)	1 (5.56%)	1.000
- HCV infection	1 (5%)	0 (0%)	1.000
- DLP	0 (0%)	1 (5.56%)	1.000
- Psychiatric problem	0 (0%)	1 (5.56%)	1.000
Cardiac parameters			
- LVEF (%)	55.18 ± 10.11	60.11 ± 8.85	0.120
- RVEF (%)	42.03 ± 8.49	44.93 ± 12.42	0.413
- PR Fraction (%)	42.15 ± 22.45	52.55 ± 9.43	0.215
- PS max PG	16.63 ± 11.77	23.71 ± 15.15	0.125
- RVEDVI	195.04 ± 36.98	206.64 ± 57.49	0.468
- RVESVI	113.46 ± 31.75	118.27 ± 54.64	0.743
- QRS duration	158.3 ± 49.22	151.5 ± 32.13	0.622
Additional cardiac finding			
- Residual PDA	3 (15%)	1 (5.56%)	0.606
- Residual RVOTO	1 (5%)	4 (22.22%)	0.170
- LPA stenosis	2 (10%)	1 (5.56%)	1.000
- Calcified patch	2 (10%)	0 (0%)	0.488
- LPA stenting	0 (0%)	1 (5.56%)	1.000
Laboratory results			
- Hematocrit (%)	42.95 ± 4.99	43.11 ± 6.23	0.930
- WBC	7689 ± 2190.37	7067 ± 1592.58	0.329
- Platelets	234,500 ± 57,501.95	229,166.7 ± 49,514.41	0.762
- Creatinine	0.87 ± 0.19	0.80 ± 0.16	0.213
Intraoperative parameters	LAT PVR (n=20)	Resternotomy PVR (n=18)	p-value
Wound length (cm.)	4.75 ± 0.16	NA	
Beating heart operation (n;%)	20 (100%)	7 (38.89%)	>0.005
Aortic cross clamp time (min)	NA	46.45 ± 5.71	NA
CPB time (min)	69.15 ± 32.61	81.89 ± 42.78	0.306
Operative time (min)	157.05 ± 49.42	178.06 ± 58.69	0.239
Mean prosthesis size (median; IQR)	25 (23,25)	25 (23,25)	0.770
Total mPA patch plasty	11 (55%)	18 (88.89%)	0.033
mPA patch augmentation (n;%)			0.273
- Autologous	0 (0%)	1 (6.25%)	
- Bovine	8 (72.73%)	14 (87.5%)	
- PTFE	3 (27.27%)	1 (6.25%)	
Additional operation			
- PDA closure	2 (10%)	1 (5.56%)	1.000
- LPA stent removal	0	1 (5.56%)	0.474
- LPA plasty	2 (10%)	2 (11.11%)	1.000
- MPA patch plication	0	1 (5.56%)	0.474
- Infundibulectomy	0	3 (16.67%)	0.097
- AICD lead placement	1 (5%)	0	1.000

Postoperative parameters	LAT PVR (20)	Resternotomy PVR (18)	p-value
Intraoperative extubation (n;%)	3 (15%)	1 (5.56%)	0.606
Intubation time (hour)	6.97 ± 4.18	10.26 ± 9.35	0.195
Length of ICU time (hour)	21.48 ± 2.81	20.84 ± 7.66	0.731
Length of postop. hospital stay (day)	4.75 ± 1.21	6.17 ± 4.38	0.173
Inotropic score			
- Immediate postoperation	0.05 ± 0.22	4.36 ± 6.95	0.009
- Postoperative day 1	0	2.17 ± 4.52	0.039
PRC transfusion (unit; median (IQR))	0 (0,0)	0 (0,1)	0.327
Drain amount			
- Post operative day 1	184.4 ± 272.43	397.22 ± 411.19	0.066
- Post operative day 2	105.5 ± 86.78	355.56 ± 581.52	0.065
Complications			
- AF/AFL	1 (5.00%)	0	1.000
- VT	0	1 (5.56%)	0.474
- Pleural effusion required drainage	1 (5.00%)	0	1.000
- Chylothorax	0	1 (5.56%)	0.474
- Bleeding required retransfusion	1 (5.00%)	1 (5.56%)	1.000
- Bleeding + chest reexploration	0	1 (5.56%)	0.475
- Delirium	0	1 (5.56%)	0.475
Mortality (n;%)	0	0	1.000

Discussion:

LAT supports previous findings¹ showing better hemodynamics and myocardial preservation with beating heart techniques which may cause by beating heart operation.

Trends toward shorter CPB and operative times contrast with prior reports of longer durations in MICS².

Trends toward faster recovery and shorter length of stay.

Similar morbidities without mortality.

One excluded case (TOF with APV) required conversion due to distorted anatomy, highlighting limitations of LAT in complex anatomy.

Reference

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- Thornton S, Kang L, Nellis J, Andersen ND, Haney J, Turek J. Comparison of median sternotomy and left anterior mini-incision for pulmonary valve replacement following primary tetralogy of Fallot repair. Cardiol Young. 2023;33(1):21-5 DOI: 10.1017/S1047951122000105.

CONCLUSIONS:

LAT for PVR after TOF repair...

Safe alternative approach

Similar morbidities without mortality

Potential advantages in operative and recovery parameters

Shorter CPB and operative times

Significantly reduced inotropic usage

Shorter hospital stays

Lower drain outputs

Careful preoperative imaging evaluation is crucial.

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