Results

This prospective, single center study included 20 patients from postoperative infants &children after open heart surgery for congenital heart disease (CHD), with age range (2-31months). It was performed at Cairo University Children's Hospital (CUCH) during the period from December 2009 till June 2010.

All patients underwent three modes of cardiac pacing (Atrial, conventional and biventricular pacing modes), while SBP measurement, ECG recording and Tissue Doppler echocardiography were done.

Baseline demographic data (Table 1"& figure1", 2"&3"):

Data were obtained from 20 postoperative patients (10 male; 50%), their age ranged from 2 to 31 months, with mean age (12 ± 9) months of whom 11 patients were younger than 1 year (55%) and 9 patients were older than 1year (45%).

The weight of the patients ranged from (4-13 Kg) with mean weight 7.5 ± 3 Kg with biventricular anatomy, All patients had a systemic morphologic LV without any residual shunts, None of the patients was in heart failure or had underwent pacing before the study.

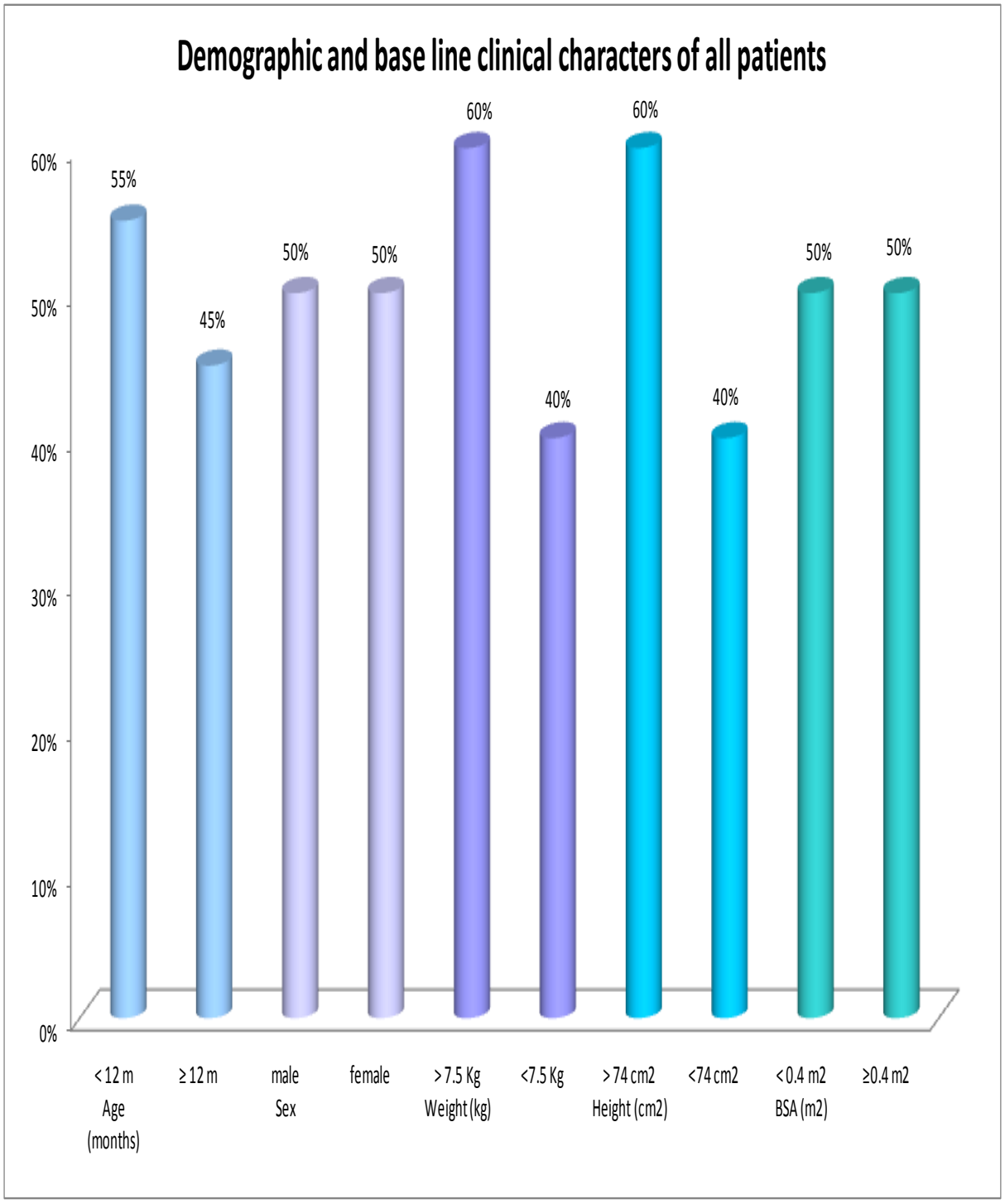
The height ranged from (60-88 cm2) with mean height 74 ± 9 cm2, and their Body surface area (BSA) ranged from (0.3-0.5 m2) with median area 0.4m2.

Cardiac defects included atrioventricular septal defect (4 cases), tetralogy of Fallot (4 cases), double-outlet RV with pulmonary stenosis (4 cases), atrial septal defect (ASD) with patent ductus arteriosus (PDA) (2 cases), transposition of the great arteries (2 cases), VSD with pulmonary stenosis (2 cases), and double-outlet RV (2 cases).

The pacing study was performed in the pediatric intensive care unit at a mean of 9.4 ± 3 d (range, 7 - 15 d) after surgery was completed, Oral consent was taken from the parents after explaining the procedure .

Table (1○○○○○"). Demographic and base line clinical data of all patients

Demographic and baseline clinical data	Range	Mean value ±SD		NO Of cases	%
Age (month)	2-31	12. 9 **± 3**	< 12month	11	55
			≥ 12 month	9	45
Gender	**Male / Female**		Male	10	50
			Female	10	50
Weight (kg)	4-13	7.5 ± 3	< 7.5	12	60
			>7.5	8	40
Height (cm2)	60-88	74 ± 9	< 74	12	60
			>74	8	40
Body surface area (BSA)(m2)	0.3-0.5	0.4 ± 0.1	< 0.4	10	50
			≥0.4	10	50
Congenital heart disease defect	**Types**		ASD +PDA closure	2	10
			Atrioventricular septal defect	4	20
			DORV	2	10
			DORV +P.S	4	20
			Fallot's Tetralogy	4	20
			TGA	2	10
			VSD +P.S	2	10
Time of studying post-op. (days)	7-15	9.4 ± 3	<9.4	14	70
			>9.4	6	30



Fig(1"). Demographic and baseline clinical data of all patients

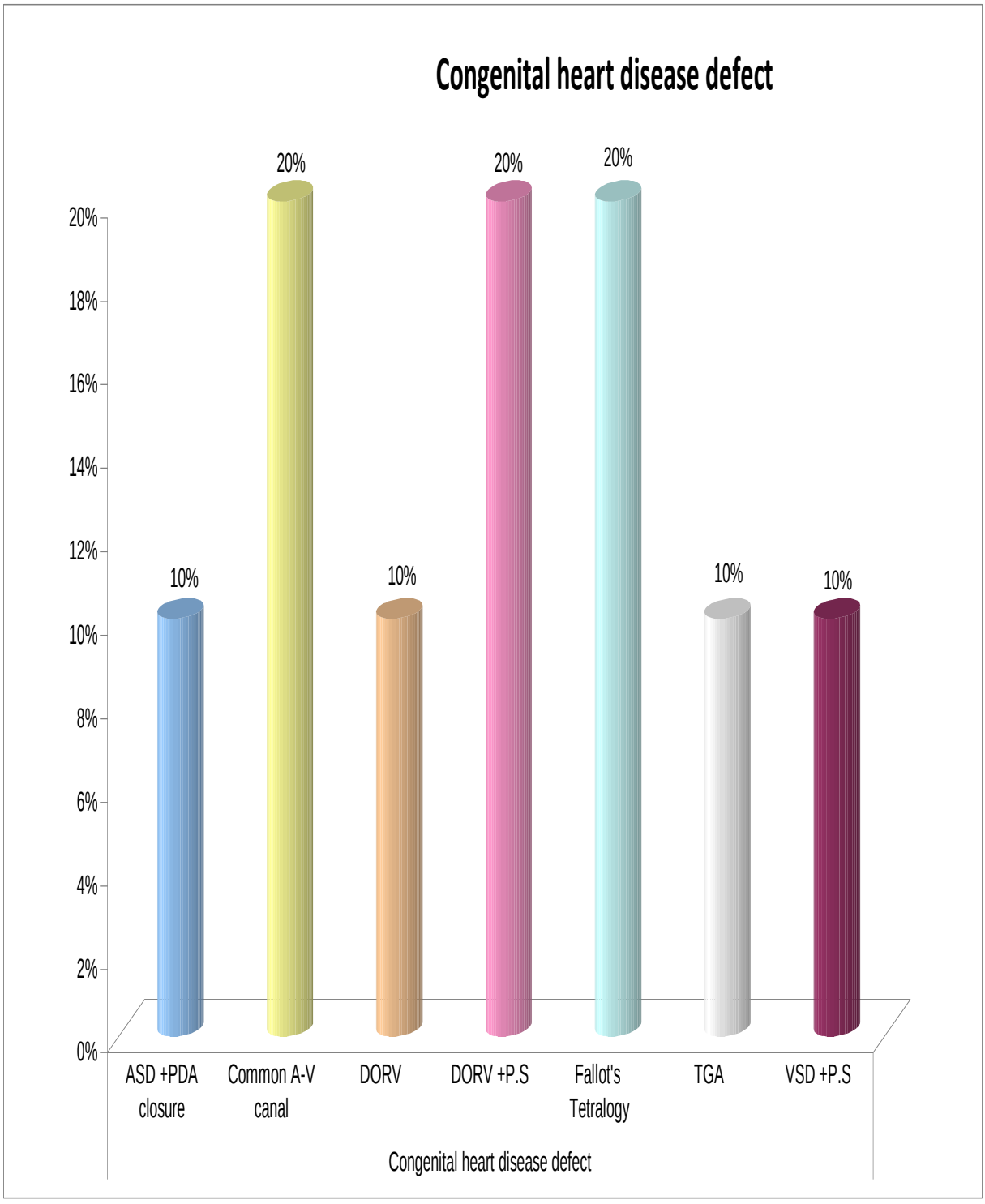


Fig (2") Incidence of different types of congenital heart disease defects among patients of the study

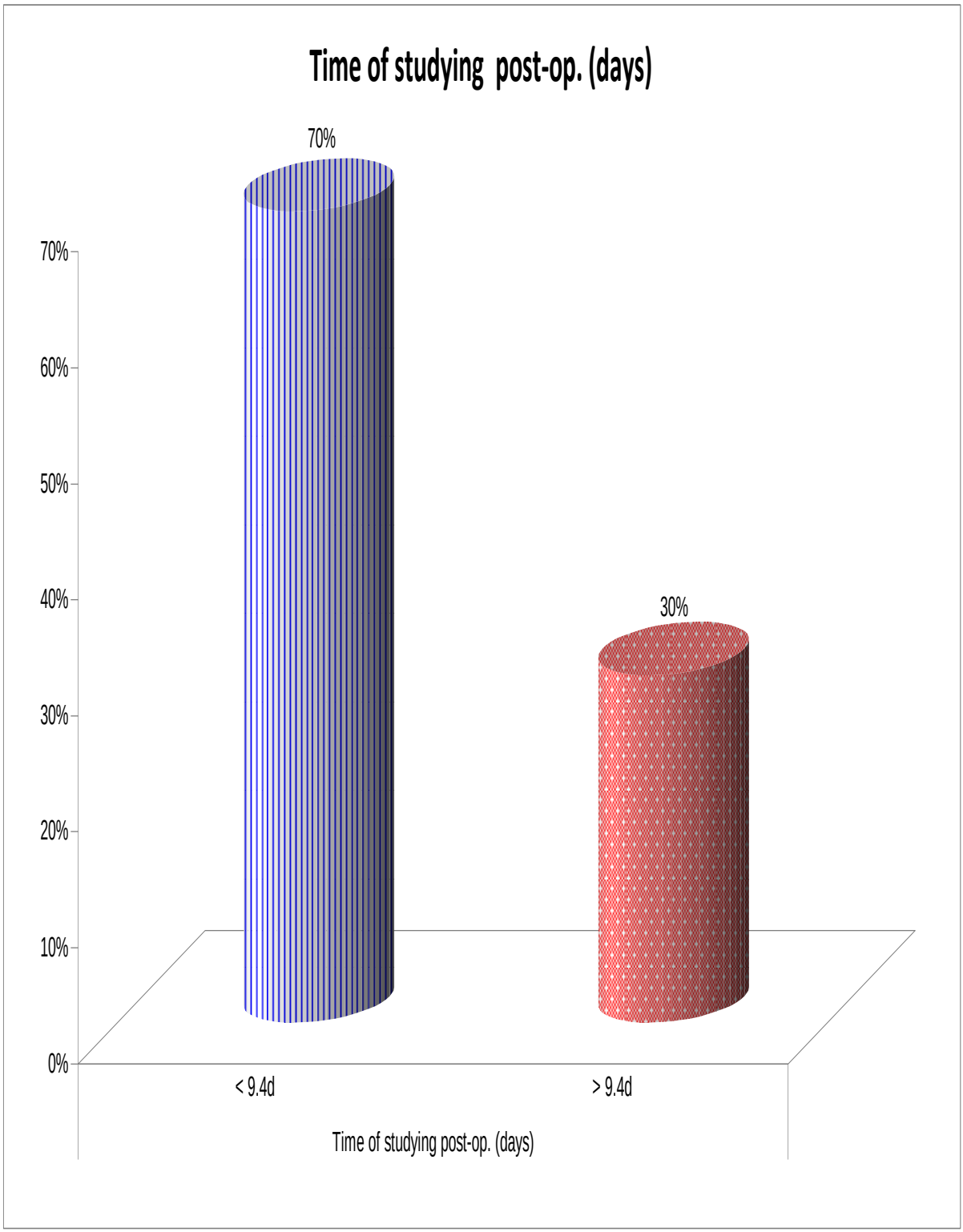


Fig (3").Time at which the study was performed postoperative-ly(days) .

QRS complex Duration for the Three Different Pacing Modes

The mean QRS duration with AOO (baseline) pacing was 59±11 ms (range, 40 - 80 ms). Compared with AOO pacing, there was a prolongation of QRS duration with CDOO (104±16 ms, P < 0.001) but not BDOO (71±12 ms, p =NS). When CDOO pacing was compared with BDOO pacing, the QRS duration significantly decreased with BDOO (P < 0.001) **(Table 2"& figure 4").**

Table(2"). QRS Duration for the Three Different Pacing Modes.

Pacing Mode	QRS (ms)	p Value Compared With CDOO
AOO	59±11	< 0.001
CDOO	104±16	
BDOO	71±12	< 0.001

Data presented as mean values ±SD.

Statistically significant p value < 0.05.

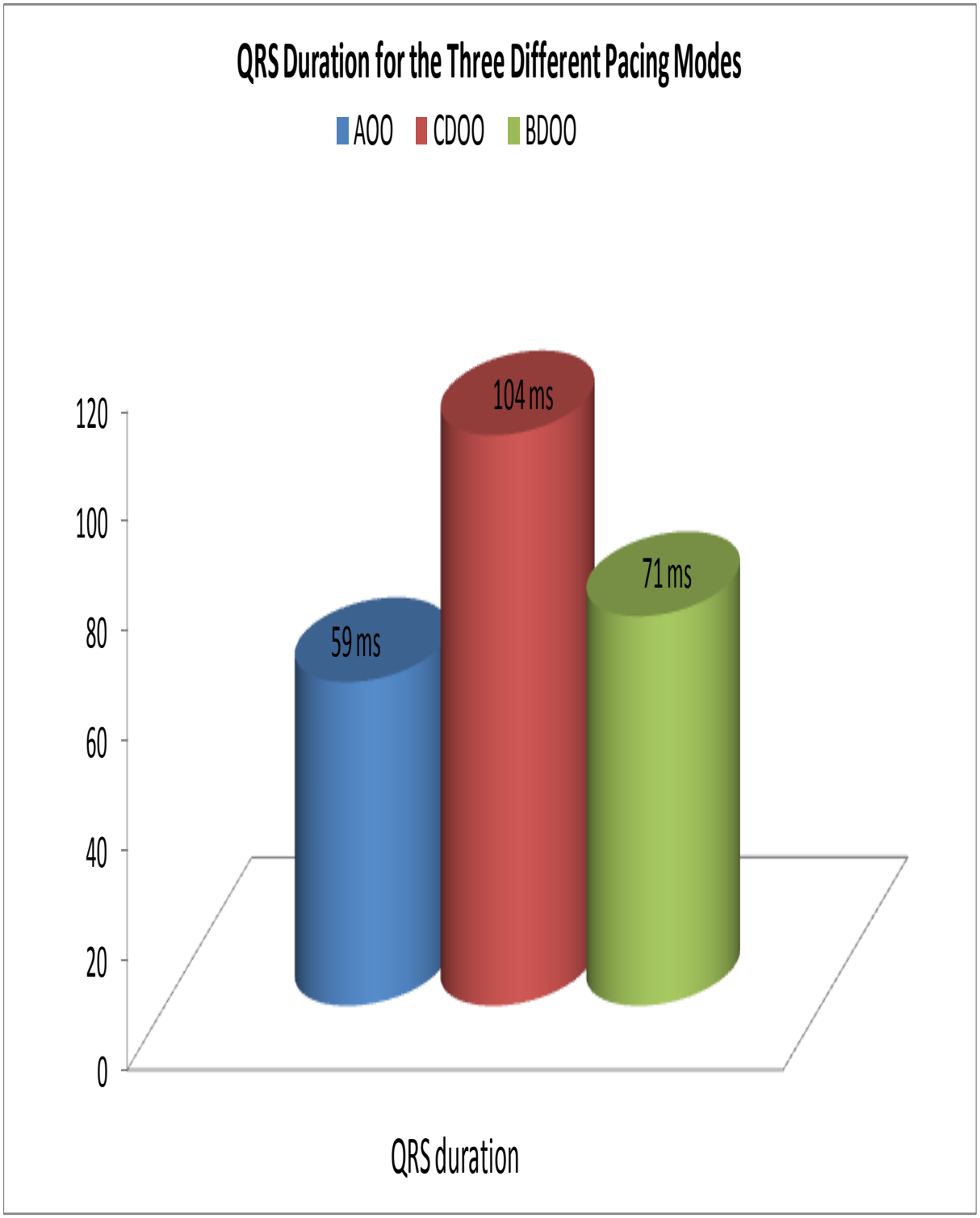


Fig (4"). QRS Duration for the three different pacing modes.

Systolic blood pressure data for all patients in the Three Different Pacing Modes.

There were no significant changes in systolic blood pressure among the three pacing modes. The systolic blood pressure for AOO was 92 ±10 mm Hg, and for CDOO and BDOO were 91±11 mm Hg and 94±11mm Hg, respectively.

The p Value for both AOO and BDOO Compared with CDOO was (>0.05) non significant **(Table 3"& figure 5").**

Table (3"). The mean Systolic Blood Pressure for the Three Different Pacing Modes

Pacing Mode	Mean Systolic Blood Pressure (mm Hg)	p Value Compared With CDOO
AOO	92±10	>0.05
CDOO	91±11	
BDOO	94±11	>0.05

Data presented as mean values ± SD. No statistical difference among the three pacing modes. AOO = atrial pacing; BDOO = biventricular pacing; CDOO = conventional dual-chamber pacing.

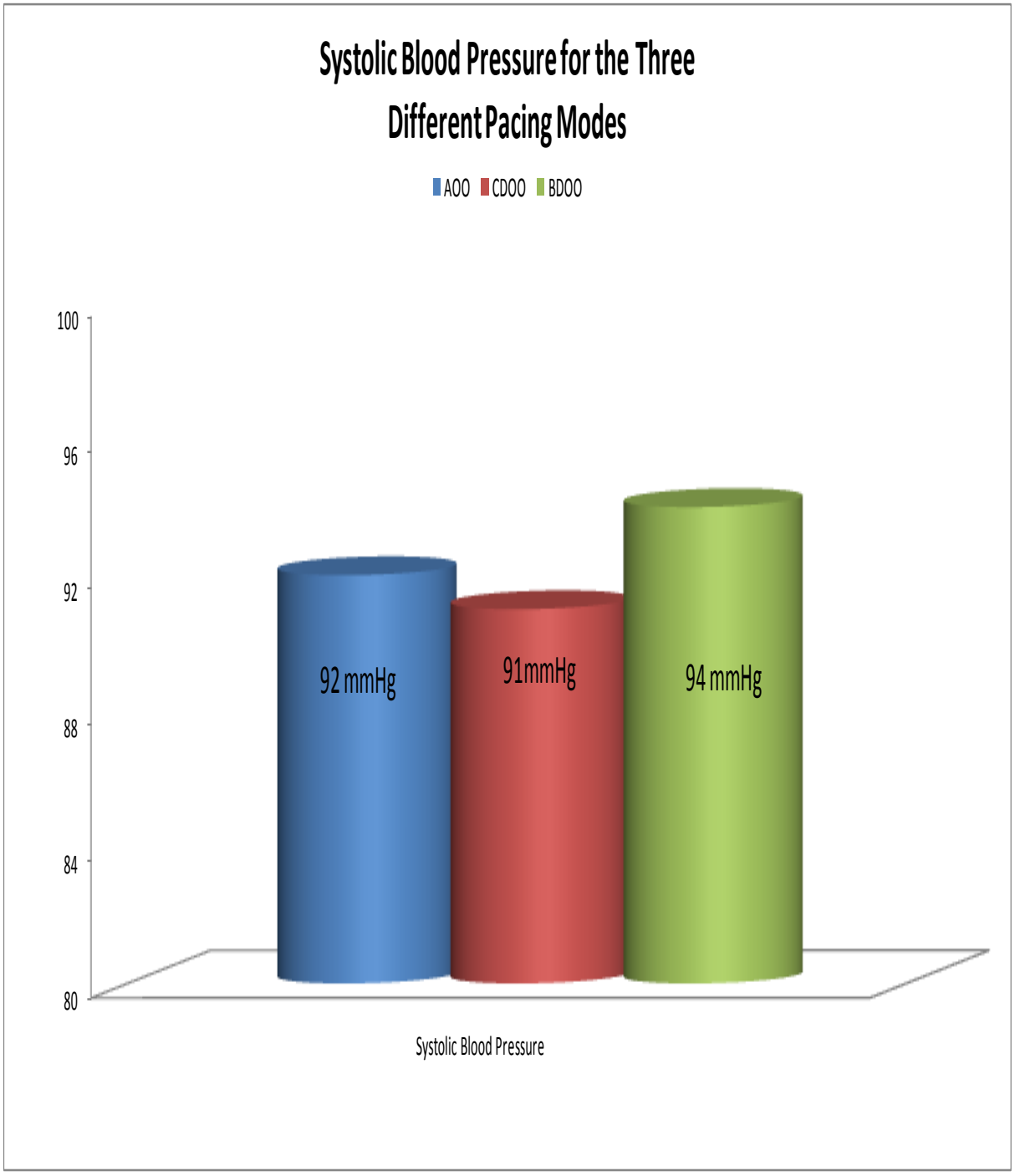


Fig (5"). The Mean systolic blood pressure measurement for the three different Pacing Modes

Cardiac Index for the Three Different Pacing Modes.

The mean cardiac index for AOO, CDOO, and BDOO was 3.9, 4.2, 5.1 l/min/m2 respectively.

There was statistically significant increase in cardiac index with BDOO when compared with CDOO in relation to cardiac index value of AOO **(Table 4"& figure 6").**

Table(4"). Mean Cardiac Index for the Three Different Pacing Modes.

Pacing Mode	Mean Cardiac Index (l/min/m2)	p Value Compared With CDOO
AOO	3.9±0.7	> 0.05
CDOO	4.2±0.7	
BDOO	5.1±0.7	< 0.001

Data presented as mean values ±SD.

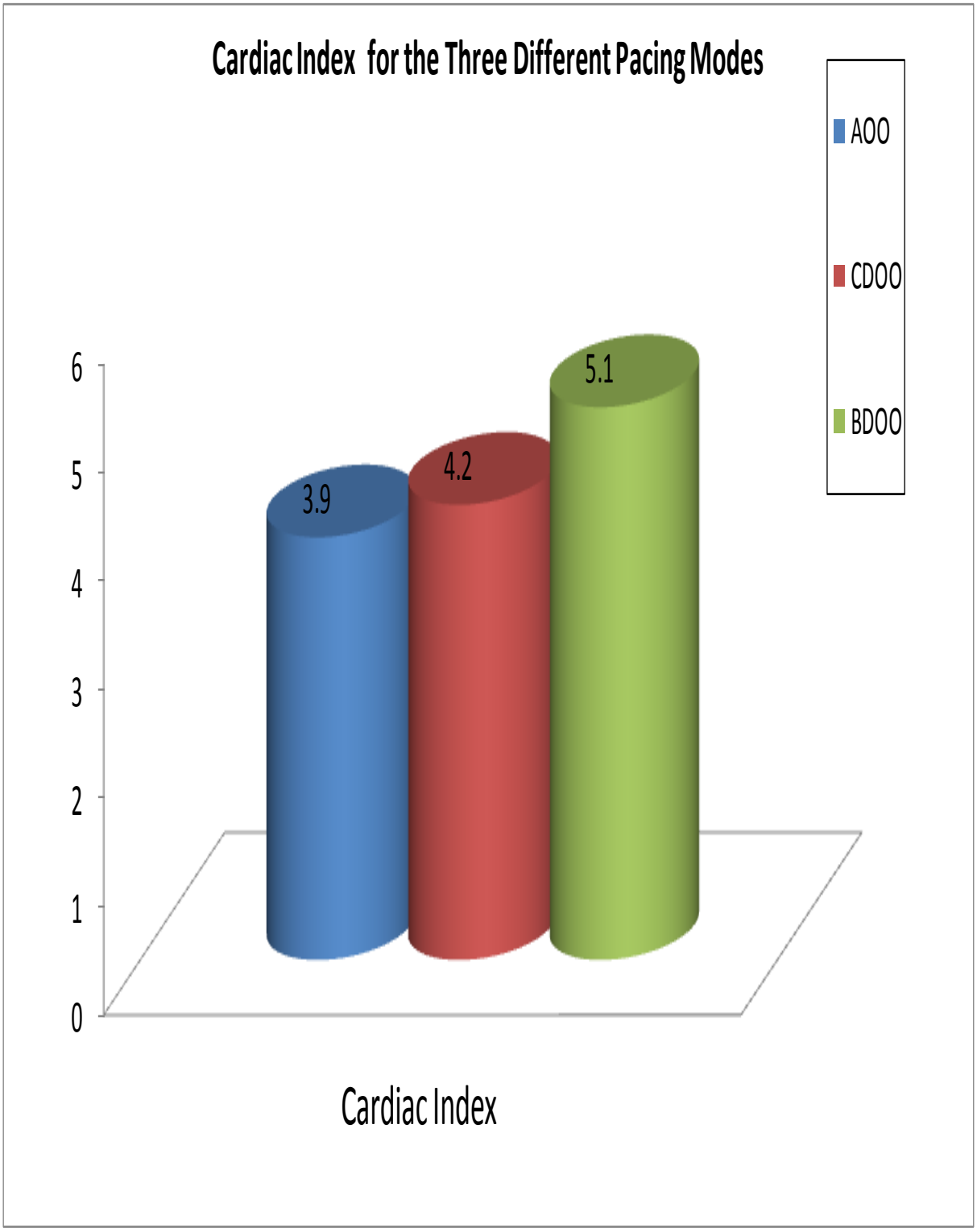


Fig (6"). Mean Cardiac Index for the three different pacing modes.

Spectral pulsed tissue Doppler imaging Data for the Three Different Modes of Pacing

Tissue Doppler data were available for 20 patients The IVT of the RV and LV in AOO occurred at 47±13 ms and 51±14 ms, respectively, with a **Δ**IVT (4±9ms) suggesting synchronous contraction of the two ventricles during AOO. In CDOO, there was a significant increase in **Δ** IVT (22±21ms), suggesting loss of synchrony compared with BDOO (7±6 ms, p =0.007).Likewise, the **Δ** PSC during AOO was short (6±8 ms).With CDOO, the **Δ** PSC (32±31ms) was significantly longer suggesting loss of synchrony compared with BDOO (8±8ms, p = 0.003) **(Table 5"& figure 7", 8" & 9").**

Table (5"). Spectral pulsed tissue Doppler imaging Data for the Three Different Modes of Pacing.

Pacing Mode	RV-IVT (ms)	LV-IVT (ms)	Δ IVT (ms)	p Value Compared With CDOO	RV-PSC (ms)	LV-PSC (ms)	Δ PSC (ms)	p Value Compared With CDOO
AOO	47±13	51±14	4±9	0.001	132±26	129±24	6±8	< 0.001
CDOO	66±17	78±30	22±21		151±17	183±34	32±31	
BDOO	53±16	61±19	7±6	0.007	139±26	140 ± 45	8±8	0.003

Data presented as mean values ± SD.

IVT = isovolumic tensing; LV = left ventricular; PSC = peak systolic contraction; RV = right ventricle; Δ: Difference

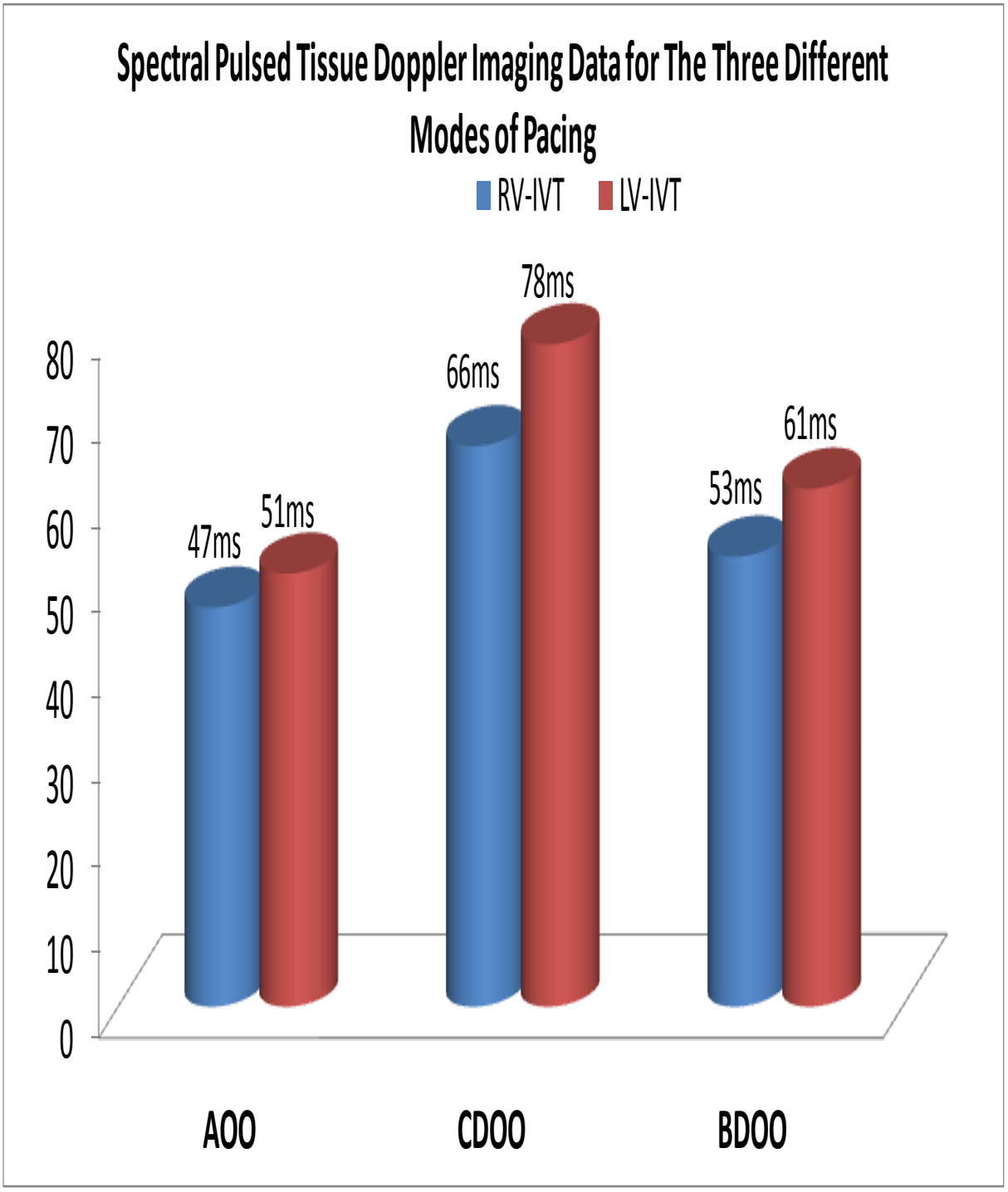


Fig (7"). The mean IVC of RV and LV for the Three Different Modes of cardiac Pacing.

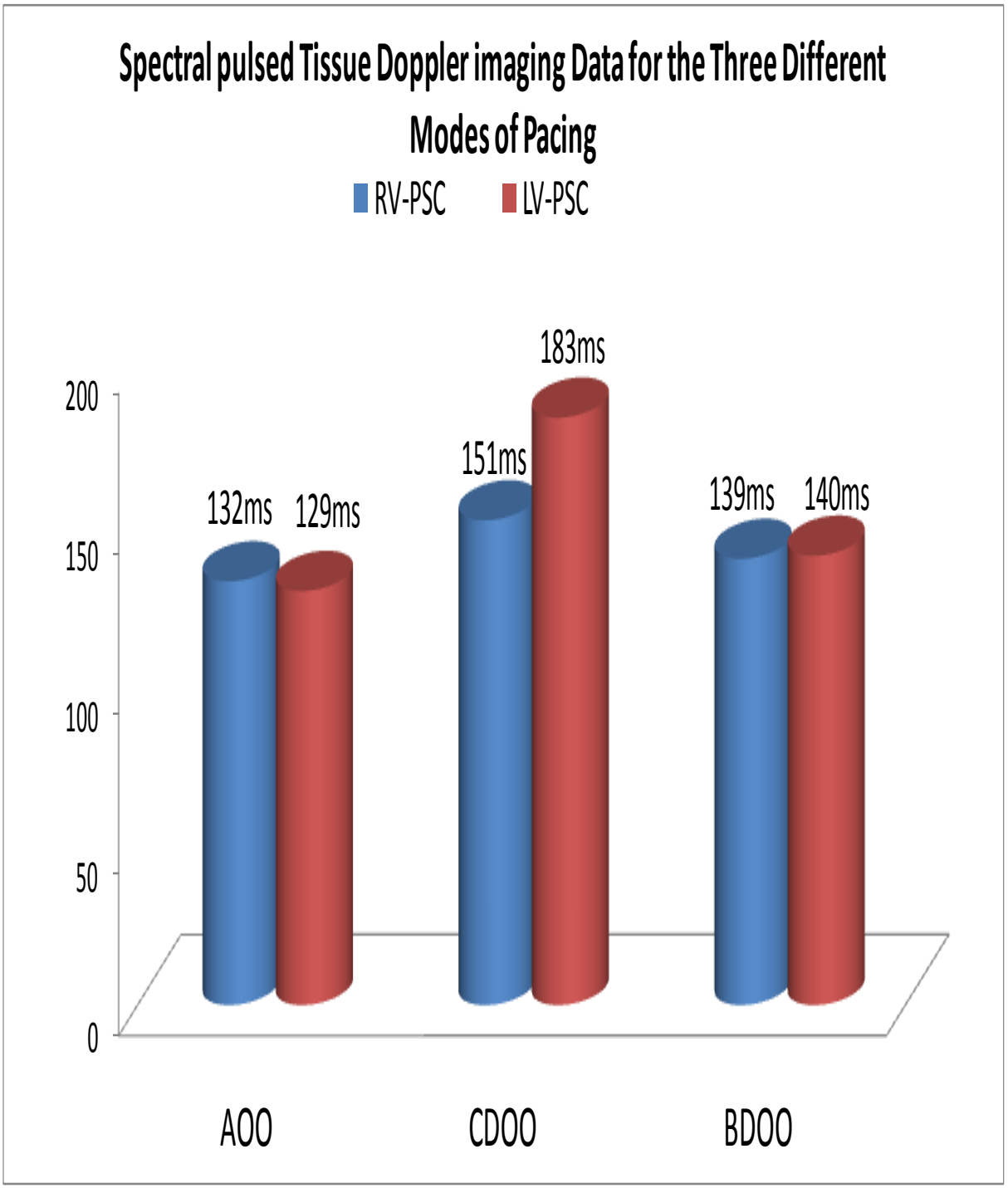


Fig (8"). The mean PSC of RV and LV for the Three Different Modes of cardiac Pacing.

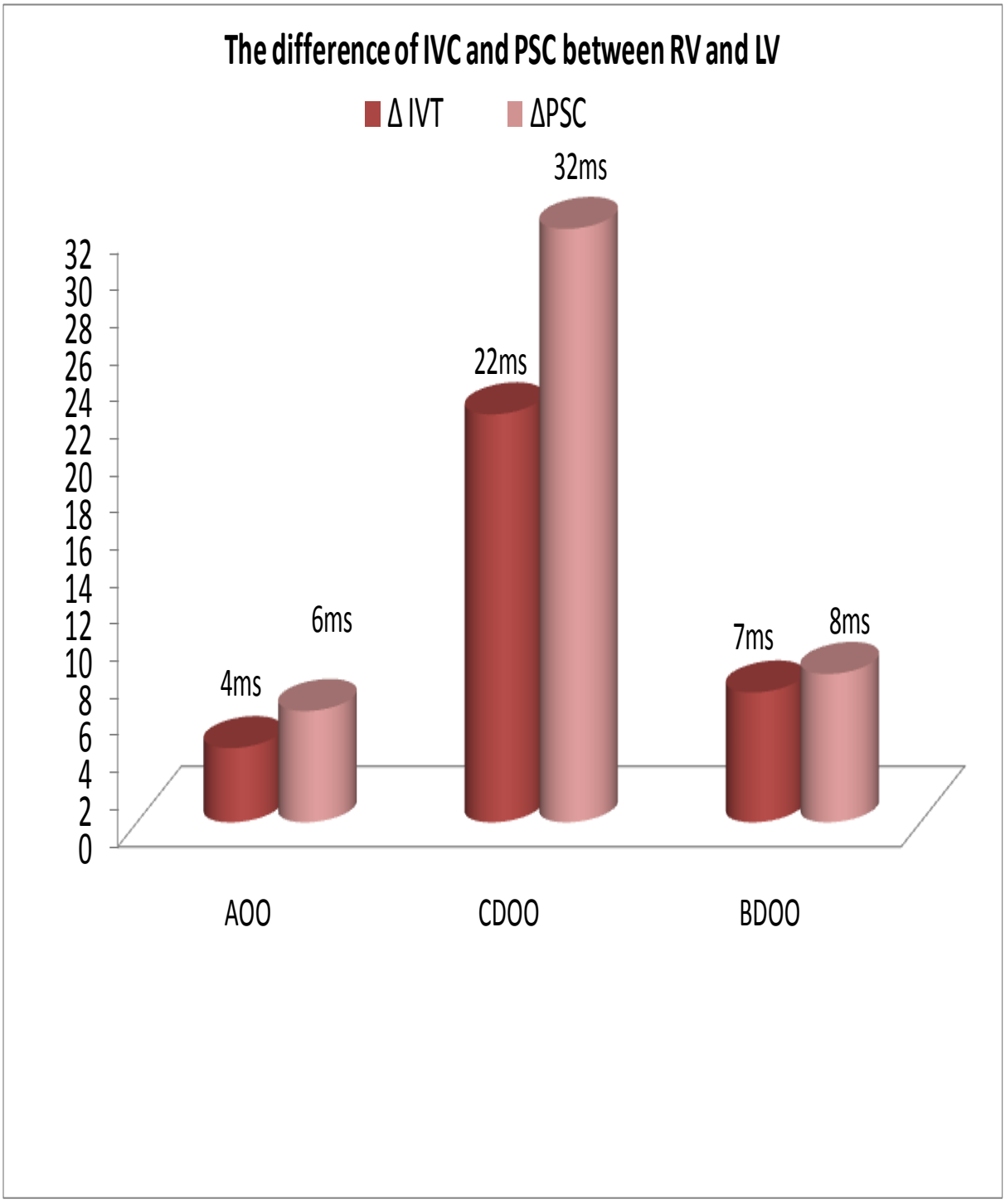


Fig (9"). The difference of IVC and PSC between RV and LV for the Three Different Modes of cardiac Pacing.