Cardiac movement identified on Focused Cardiac Ultrasound and Resuscitation outcome in Non-traumatic out-of-hospital cardiac arrest.

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BACKGROUND

Focused Cardiac Ultrasound (FCU) has been reported its usage to identify the correctable cause of cardiac arrest but there are few studies on its application to predicting the resuscitation outcomes. The aim of the study is to determine the association between cardiac wall movement identified on FCU and non-traumatic OHCA survival rates.

MATERIAL AND METHODS

A prospective obsrevational study was conducted. All adults non-traumatic OHCA patients who were resuscitated by emergency department staffs andNarenthorn EMS Rajavithi hospital from February - October 2016 were enrolled in this study.Cardiac wall and/or valve movement data were recorded using 2D ultrasound on ED arrivals and 5 repetitive scans during the 2-min pause in each CPR cycles. Any changes of cardiac motions from absence to presence of movement will be recorded and analyzed with ROSC, survival to hospital admission and to hospital discharge or 30th day after arrest events.

Table 1 : Patients' demographic data.

	n = 63
Age (years) (min 18 , max 92)	55 ± 19
Gender : Male(%)	46 (73%)
Witnessed arrest	47 (74.6%)
EMS witnessed	7 (11.1%)
Lay witnessed	40 (63.4%)
Bystander CPR	4 (7.4%)

Time from collapse to receive first compression (min)	
If witnessed by Lay	17.3 ± 13
Non witnessed (estimate)	44.3 ± 34.39

Mode of ED arrival	
EMS (ALS unit)	40 (63.5%)
FR / BLS unit	1 (1.6%)
Not using EMS	18 (28.6%)

Etiology of arrest	
Presumed cardiac	41 (65.1%)
Respiratory	13 (20.6%)
Intoxicate & Others	3 (4.8%)

Initial ECG	
VF	15 (23.8%)
Asystole	35 (55.6%)
PEA	13 (20.6%)

Initial Cardiac Motion in FCU	
Positive motion	30 (47.6%)
No motion initially	33 (52.3%)

RESULTS

63 non-traumatic OHCA patients were enrolled in the study. The average age is55.51±19.17 years with predominantly male (73%). Majority cause of arrest is presumed cardiac etiology (65.1%) with 63.48% were witnessed. Bystander response rate was 7.1%.Patients' clinical and demographic data were similar to previous literature except for lower bystander CPR rate. The present of cardiac wall or valve movement in FCU on emergency departments arrival has shown the statistically significant relationship to the ROSC and survival to hospital admission (p-value <0.001, OR 77.33, 95%CI 9.14 to 654.41 and p value<0.001, OR 8.29, 95%CI 2.33 to 29.44 respectively). The transition from absence to presence cardiac wall motion after receiving resuscitation were correlated with ROSC and survival to hospital admission (p-value <0.001). Sensitivity and Specificity of FCU cardiac wall movement to ROSC and survival to hospital admission are 76.32% and 96.67% respectively with 84.13%accuracy.

Cardiac Motion Finding in FCU and Resuscitation Outcomes

	ROSC	
	Yes	No
Cardiac wall OR valve movement		
Presence	29 (96.7%)	1 (3.3%)
Absence	9 (27.3%)	24 (72.7%)
Cardiac wall AND valve movement		
Presence	25 (100%)	0 (0%)
Absence	13 (34.2%)	25 (65.8%)

	Survival to admission	
	Yes	No
Cardiac wall OR valve movement		
Presence	16 (53.3%)	14 (46.7%)
Absence	4 (12.1%)	29 (87.9%)
Cardiac wall AND valve movement		
Presence	14 (56.0%)	11 (44.0%)
Absence	6 (15.8%)	32 (84.2%)

	Survival to day 30 th	
	Alive	Died
Cardiac wall OR valve movement		
Presence	2 (6.7%)	28 (93.3%)
Absence	1 (3.0%)	32 (97.0%)
Cardiac wall AND valve movement		
Presence	2 (6.7%)	28 (93.3%)
Absence	1 (3.0%)	32 (97.0%)

Change on Focused Cardiac Ultrasound (FCU) findings and Resuscitation Outcomes

	ROSC		p-value
	Yes	No	
NO wall/valve movement			<0.001
Yes	9 (100%)	0 (0%)	
No	0 (0%)	24 (100%)	p-value
Survival to admission			
Yes	4 (44.4%)	5 (55.6%)	0.003
No	0 (0%)	24 (100%)	
Survival to day 30th			p-value
Alive	1 (11.1%)	8 (88.9%)	
Died	0 (0%)	24 (100%)	0.273
No	0 (0%)	24 (100%)	

FCU findings as Resuscitation Outcomes Predictors

Finding on Focused Cardiac Ultrasound	ROSC	OR 95% CI p value	Survival to Adminssion	OR 95% CI p value
Either <u>Wall</u> or <u>Valve</u> movement at initial finding	29 (46.03%)	77.33 (9.14 to 654.41) p <0.001	16 (25.39%)	8.29 (2.33 to 29.44) p <0.001
Both <u>Wall</u> and <u>Valve</u> movement at initial finding	25 (39.68%)	96.33 (5.43 to 1708.5) p <0.001	14 (22.22%)	6.79 (2.09 to 22.01) p <0.001
<u>Change</u> from initial no movement to positive movement during resuscitation	9 (14.28%)	931 (17.21 to 50322) p <0.001	4 (6.35%)	40.09 (1.87 to 859.04) p = 0.003

CONCLUSIONS

Presence cardiac wall/valve movement on focused cardiac ultrasound was associated with ROSC and survival to hospital admission. Focused cardiac ultrasound may have its benefits on resuscitation outcome prognostication

	Cardiac wall OR Valve movement		Cardiac wall AND Valve movement	
	Presence	Absence	Presence	Absence
ROSC	29	9	25	13
	1	24	0	25
Sensitivity (95%CI)	76.32% (59.76%-88.56%)		65.79% (48.65%-80.37%)	
Specificity (95%CI)		96.00% (79.65%-99.90%)		100% (86.28%-100%)

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