Impact of Post-arrest Steroid Use on Outcomes of Cardiac Arrest Survivors with either COPD or Asthma

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PURPOSE

Several studies showed steroid use following cardiac arrest may improve outcomes in cardiac arrest survivors. However, the study evaluating the effect of steroid administrated during hospitalization on outcomes in cardiac arrest survivors with either chronic obstructive pulmonary disease (COPD) or asthma is lacking. The current study aimed to evaluate the effect of post-arrest steroid use on outcomes of cardiac arrest survivors with either COPD or asthma by using a population-based analysis.

Fig 1. Patient Selection

METHODS

There were 22,768 adult non-traumatic cardiac arrest survivors from the Taiwan National Health Insurance Research database during 2004 through 2011. After excluding patients with steroid use during resuscitation, patients with steroid use of mega-dose, and patients neither COPD nor asthma, 4,175 patients with either COPD or asthma were finally enrolled. Based on whether steroid was used or not during hospitalization, these patients were classified into the steroid and non-steroid groups (Fig 1). The underlying characteristics, pre-arrest steroid use or not, the CPR events, hospital level and geographic distribution of these 2 groups were matched by a propensity score.

Table 1. Baseline Characteristics

	Before propensity score matching			After propensity score matching		
	Steroid	Non- steroid	P-value	Steroid	Non- steroid	P-value
	n=1823	n=2352		n=1681	n=1681	
	n(%)	n(%)		n(%)	n(%)	
Age (years)	75.52±11.96	76.67±11.58	0.002	75.85±11.83	75.85±12.24	
Gender (Male)	1199 (65.77%)	1549 (65.86%)	0.953	1111 (66.09%)	1124 (66.86%)	0.635
Presenting complaint			<.0001			0.990
Cardiac event	329 (18.05%)	427 (18.15%)		307 (18.26%)	310 (18.44%)	
Respiratory event	346 (18.98%)	297 (12.63%)		272 (16.18%)	268 (15.94%)	
Other event	337 (18.49%)	407 (17.3%)		313 (18.62%)	319 (18.98%)	
Unknown	811 (44.49%)	1221 (51.91%)		789 (46.94%)	784 (46.64%)	
Diabetes mellitus	536 (29.4%)	757 (32.19%)	0.054	508 (30.22%)	510 (30.34%)	0.940
Hypertension	1045 (57.32%)	1365 (58.04%)	0.644	961 (57.17%)	960 (57.11%)	0.972
Coronary artery disease	494 (27.1%)	701 (29.8%)	0.055	470 (27.96%)	462 (27.48%)	0.758
Heart failure	432 (23.7%)	605 (25.72%)	0.133	407 (24.21%)	406 (24.15%)	0.968
Atrial fibrillation	164 (9%)	251 (10.67%)	0.073	158 (9.4%)	142 (8.45%)	0.333
Chronic kidney disease	142 (7.79%)	225 (9.57%)	0.044	137 (8.15%)	137 (8.15%)	1.000
Malignancy	225 (12.34%)	304 (12.93%)	0.574	212 (12.61%)	202 (12.02%)	0.600
Chronic obstructive lung disease	1549 (84.97%)	2047 (87.03%)	0.056	1431 (85.13%)	1444 (85.9%)	0.524
Asthma	606 (33.24%)	660 (28.06%)	0.000	530 (31.53%)	527 (31.35%)	0.911
Adrenal insufficiency	25 (1.37%)	20 (0.85%)	0.106	18 (1.07%)	18 (1.07%)	1.000
Autoimmune disease	36 (1.97%)	29 (1.23%)	0.055	28 (1.67%)	25 (1.49%)	0.678
Steroid use prior to cardiac arrest (1-year)	1254 (68.79%)	1479 (62.88%)	<.0001	1130 (67.22%)	1141 (67.88%)	0.685
Shockable rhythm	359 (19.69%)	549 (23.34%)	0.005	345 (20.52%)	336 (19.99%)	0.699
Epinephrine dosage (mg)	5.56±4.79	6.53±5.39	<.0001	5.70±4.87	5.75±4.70	
Vasopressin	6 (0.33%)	3 (0.13%)	0.164	3 (0.18%)	3 (0.18%)	1.000
Medical center	531 (29.13%)	526 (22.36%)	<.0001	451 (26.83%)	451 (26.83%)	1.000
Urbanization level of residence			0.177			0.864
1 (high)	423 (23.22%)	492 (20.92%)		380 (22.61%)	361 (21.48%)	
2	837 (45.94%)	1104 (46.94%)		774 (46.04%)	786 (46.76%)	
3	146 (8.01%)	221 (9.4%)		139 (8.27%)	136 (8.09%)	
≥ 4 (low)	416 (22.83%)	535 (22.75%)		388 (23.08%)	398 (23.68%)	
Geographic distribution			0.019			0.934
Taipei	702 (38.53%)	873 (37.12%)		643 (38.25%)	628 (37.36%)	
Northern	237 (13.01%)	334 (14.2%)		226 (13.44%)	232 (13.8%)	
Central	508 (27.88%)	636 (27.04%)		463 (27.54%)	471 (28.02%)	
Southern	157 (8.62%)	163 (6.93%)		143 (8.51%)	137 (8.15%)	
Kaopin	125 (6.86%)	176 (7.48%)		116 (6.9%)	111 (6.6%)	
Eastern	93 (5.1%)	170 (7.23%)		90 (5.35%)	102 (6.07%)	

RESULTS

After propensity score matching, both the steroid and non-steroid groups had 1681 patients. The inhospital mortality rate was higher in the non-steroid group (84.65%) as compared to steroid group (73.65%) (adjusted HR: 0.43, 95% CI: 0.40-0.47). There were less patients in the steroid group died within 1 year than in the non-steroid group (84.3% vs 92.5%, adjusted HR: 0.47, 95% CI: 0.44-0.51)(Table 2). Post-arrest steroid use was significantly associated with survival-to-discharge in patients with asthma or COPD, regardless of stratification of age, gender, diabetes, COPD, asthma, shockable rhythm, and steroid use prior to cardiac arrest, respectively. The Fig 2 demonstrated survival curve . The 1-year survival curves of both groups were plotted in the Figure 3.

Table 2. Outcome between Groups

	Before propensity score matching			
	Steroid	Non- steroid	Hazard ratio(95% CI)	Adjusted HR(95% CI)
	Death(n,%) n=1823	Death(n,%) n=2352		
Total patients				
Survival to discharge	1329 (72.9%)	2020 (85.88%)	0.44 (0.41~0.47)†	0.45 (0.42~0.48)†
One-year survival	1521 (83.43%)	2200 (93.54%)	0.50(0.47~0.54)†	0.51 (0.47~0.54)†
	After propensity score matching			
	Steroid	Non- steroid	Hazard ratio(95% CI)	Adjusted HR(95% CI)
	Death(n,%) n=1681	Death(n,%) n=1681		
Survival to discharge	1238 (73.65%)	1423 (84.65%)	0.45 (0.42~0.49)†	0.43 (0.40~0.47)†
One-year survival	1417 (84.30%)	1555 (92.50%)	0.51 (0.48~0.55)†	0.47 (0.44~0.51)†

Fig 2. Subgroup Analysis for Survival to Discharge

Characteristics subgroup	Steroid No. of death/No. of patients	Non-steroid No. of death/No. of patients	Adjusted HR(95% CI)	Interaction p-value
Age(years)				
<70	273/407	333/411	0.428 (0.361~0.508)	0.4758
≥70	965/1274	1090/1270	0.436 (0.398~0.478)	
Gender				
Male	844/1111	961/1124	0.420 (0.380~0.464)	0.8375
Female	394/570	462/557	0.454 (0.394~0.523)	
DM				
Yes	368/508	432/510	0.447 (0.386~0.518)	0.258
No	870/1173	991/1171	0.423 (0.383~0.466)	
COPD				
Yes	1068/1431	1227/1444	0.435 (0.399~0.475)	0.7203
No	170/250	196/237	0.433 (0.346~0.541)	
Asthma				
Yes	374/530	450/527	0.425 (0.366~0.492)	0.5635
No	864/1151	973/1154	0.437 (0.397~0.482)	
Adrenal insufficiency				
Yes	15/18	17/18	0.303 (0.116~0.793)	0.6896
No	1223/1663	1406/1663	0.434 (0.400~0.471)	
Autoimmune disease				
Yes	21/28	21/25	0.483 (0.244~0.957)	0.5119
No	1217/1653	1402/1656	0.431 (0.397~0.468)	
Shockable rhythm				
Yes	259/345	285/336	0.446 (0.372~0.534)	0.7559
No	979/1336	1138/1345	0.429 (0.392~0.470)	
Steroid use prior to cardiac arrest				
yes	833/1130	972/1141	0.437 (0.396~0.482)	0.5306
no	405/551	451/540	0.428 (0.371~0.493)	
Total patient	1238/1681	1423/1681	0.433 (0.399~0.469)	

CONCLUSIONS

Post-arrest steroid use is associated with improved survival to hospital discharge and 1-year survival in cardiac arrest survivors with either COPD or asthma.

Fig 3. Survival curves