

Atrial Fibrillation and Changes in Repolarization on ECG are Associated with Higher Mortality and Severity in Acute Pancreatitis: Systematic Review And Meta-analysis

Veronika Lillik ^{1,2}, Mahmoud Obeidat ¹, Ádám Zolcsák ^{1,3}, Péter Ferdinandy ^{1,4}, Elizabet Bodó¹, Asal Pourrastegar ¹, Ali Moradi ¹, Péter Hegyi ^{1,5,6,7} and Rita Nagy ^{1,8}

1. Centre for Translational Medicine, Semmelweis University, Budapest 2. First Department of Gastroenterology, Szent György University Teaching Hospital of Fejér County, Székesfehérvár 3. Department of Biophysics and Radiation Biology, Semmelweis University, Budapest 4. Department of Pharmacology and Pharmacotherapy, Semmelweis University, Budapest 5. Institute of Pancreatic Diseases, Semmelweis University, Budapest 6. Institute for Translational Medicine, Medical School, University of Pécs, Pécs 7. Translational Pancreatology Research Group, Interdisciplinary Centre of Excellence for Research Development and Innovation, University of Szeged, Szeged 8. Heim Pál National Pediatric Institute, Budapest

INTRODUCTION

Acute pancreatitis (AP) is a systemic inflammatory disorder with rising incidence and high mortality in severe cases. Cardiac abnormalities, even heart failure, are commonly seen phenomena during and after AP-related hospitalization.

AIM

Our aim is to investigate the bidirectional association between cardiac changes and AP outcomes.

METHODS

The protocol was registered on PROSPERO (CRD42023479679, CRD42023479674). We conducted a systematic search on the 5th of November 2023 in three main databases (PubMed, Embase, CENTRAL) and selected the articles based on predefined selection criteria. We were searching for articles including patients with AP and cardiac abnormalities [e.g. atrial fibrillation (AF), changes in repolarization and QTc interval prolongation on electrocardiogram (ECG), N-terminal pro–B-type natriuretic peptide (NT-proBNP) elevation] and looked at different clinical outcomes (e.g. mortality, severity). Pooled odds ratios (pOR) and mean differences (MD) with 95% confidence intervals (CI) were calculated using a random-effects model.

RESULTS

Seventeen eligible articles were included in our meta-analysis. By analyzing 1.3 million AP patients, those with AF have almost three-times higher odds for in-hospital death, than patients without AF (pOR: 2.69, Cl: 1.34; 5.38) (Fig.1.). Patients with severe (SAP) and moderate AP (MSAP) have almost three-times higher odds for in-hospital changes in repolarization on ECG (flat ST, ST depression, elevation, T-wave inversion, nonspecific changes) than patients in the mild (MAP) category (pOR: 2.75, Cl: 1.19; 6.36) (Fig.2.). SAP and MSAP patients have two-times higher odds for in-hospital QTc interval prolongation than MAP patients (pOR: 2.25, Cl: 0.63; 8.03), although this association didn't reach statistical significance yet (Fig. 3.). NT-proBNP levels in serum are not significantly higher in patients with SAP and MSAP compared to those with MAP (MD: 228.6 pg/ml, Cl: 567.6; 1024.7) (Fig.4.).

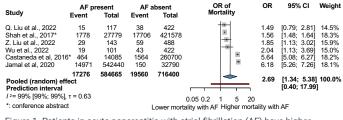


Figure 1. Patients in acute pancreatitis with atrial fibrillation (AF) have higher odds for mortality than patients without AF.

O: 1	SAP+MSAP			MAP		change in arization	OR	95% CI	Weight	
Study	Event	Total	Event	Total						
Rubio-Tapia et al., 2005 a	5	16	7	35	-	 • -		[0.47; 6.96]	16.6%	
Stimac et al., 2006* a	41	154	17	149		*	2.82	[1.52; 5.23]	78.1%	
Chacón-Portillo et al., 2017	'b 4	12	1	15		 • 	7.00 [0.66; 73.93]	5.4%	
	50	182	25	199						
Pooled (random) effect							2.75 [1.19; 6.36]	100.0%	
<i>I</i> ² = 0% [0%; 90%], τ = 0					0.01 0.1	1 10 100				
*: letter to editor	Change in in MAP	repolarization	Change in repolarization in SAP and MSAP							

Figure 2. Patients in severe (SAP) and moderate (MSAP) acute pancreatitis have higher odds for changes in repolarization on ECG than patients in the mild category (MAP).

***MSAP category didn't enist,** SAP-MSAP reported together or MAP

									SAP+MSAP			MAP						
Even	t Total	Event	Total	prolongation	OR	95% CI Weight	Study	Total	Mean	SD	Total	Mean	SD	N1-proBNP			Weight	
0	16	1	35		0.70	[0.03; 18.05	5.7%			(pg/ml)			(pg/ml)		∌	23.1	[-36.3: 82.5]	34.4%
ь 9	48	10	71	<u> </u>					7ª 12	126.3	75.3	15	103.2	73.4	+			
		6	17	ш.				Zhao et al., 2021 b	179	401.3	660.3	59	344.8	719.0				
					11.42[[0.53; 246.3	4]6.4%	Shi et al., 2018 °	31	711.8	118.9	43	123.0	30.0			[,,
	111	17	130	₩	2.25	ro co. o oo	1400 00/		222			117						
					2.25	[0.03; 0.03]	100.0%	Pooled (random) effect						1		228.6	[-567.6; 1024.	7] 100.0%
12= 9% [0%; 86%] , т = 0.23			0.01 0.1 1 10 10)			/ 2= 99% [99%; 100%], т	= 317.7	72				-1000	0 -500 0 500 1000				
					in													
	Even 0 9 24 17 ° 3 36	9 48 24 35 17 3 12 36 111	Event Total Event 1 0 16 1 1 9 48 10 24 35 6 17 ° 3 12 0 36 111 17	Event Total Event Total 0 0 16 1 35 b 9 48 10 71 17 3 12 0 15 36 111 17 138	Event Total Event Total Prolongation Pr	Event Total Event Total Prolongation OR	Event Total Event Total Prolongation OR 95% Cl 0	Event Total Event Total Prolongation OR 95% Cl Weight	Event Total Event Total prolongation OR 95% CI Weight Study 0 0 16 1 35 0 9 48 10 71 24 35 6 17 17 3 12 0 15 36 111 17 138 29 20 15 30 111 17 138 20 10 10 10 100 10 10 10 100 10 10 10 10 100 10 10 10 10 100 10 10 10 10 10 100 10 10 10 10 10 10 10 10 10 10 10 10 10 1	Event Total Event Total prolongation OR 95% CI Weight Study Total 0 0 16 1 35 0.70 [0.03; 18.05] 5.7% Chacón-Portillo et al., 2017* 12 17 ° 3 12 0 15 11.42[0.53; 3.77] 52.0% Chacón-Portillo et al., 2021 * 179 36 111 17 138 2.25 [0.63; 8.03] 100.0% Shi et al., 2018 * 31 222 2.25 [0.63; 8.03] 100.0% 220 (random) effect 1.2 = 99% [99%; 100%] , τ = 317.7 1.2 (random) effect 1.2 (random) effect	Event Total Event Total Prolongation OR 95% Cl Weight Study Total Mean (pg/ml)	Event Total Event Total Prolongation OR 95% Cl Weight Study Total Megmn SD Megmn	Event Total Event Total Prolongation OR 95% Cl Weight Study SAP+MSLP	Event Total Event Total Prolongation OR 95% Cl Weight Study SAP+MSLP Wald Mean (pg/ml) No. Total Mean (pg/ml) No. N	Event Total Event Total Event Total Proformation OR 95% CI Weight Study SAP+MSE/F Formation Total Mean SD (pg/ml) Formation SD (pg/ml) Formation OR Post CI Weight Study SAP+MSE/F Formation Total Mean SD (pg/ml) Formation SD Fo	Event Total Event Total Prolongation OR 95% Cl Weight Study Study Total Mean SD Total Mean SD (pg/ml) SD	Event Total Event Total Event Total Prolongation OR 95% Cl Weight Study SAP+MS- Substitution Total Mean SD Total Mean SD (pg/ml) Substitution SD SD SD SD SD SD SD S	Event Total Event Total Event Total Prolongation OR 95% Cl Weight Study Sudy Total Mean (pg/ml) Total Mean (pg/ml) Total Mean (pg/ml) Sudy Total Mean (pg/ml) Total To

Figure 3. Patients in severe (SAP) and moderate (MSAP) acute pancreatitis have higher levels of NT-proBNP (pg/ml) than patients in the mild category (MAP).

a MSAP category ddn't exist, B SAP, MSAP and MAP reported separately (SAP-MSAP redorded separately (SAP-MSAP reported together vs MAP).

a SAP-MSAP reported together vs MAP and MAP reported separately (SAP-MSAP added up), c SAP-MSAP reported together vs MAP as and MAP reported separately (SAP-MSAP added up), c SAP-MSAP reported together vs MAP as and MAP reported separately (SAP-MSAP added up), c SAP-MSAP reported together vs MAP and MAP reported separately (SAP-MSAP added up), c SAP-MSAP reported together vs MAP as and MAP reported separately (SAP-MSAP added up), c SAP-MSAP reported together vs MAP and MAP reported separately (SAP-MSAP added up), c SAP-MSAP reported together vs MAP and MAP reported separately (SAP-MSAP added up), c SAP-MSAP reported together vs MAP and MAP reported separately (SAP-MSAP added up), c SAP-MSAP reported together vs MAP and MAP reported separately (SAP-MSAP added up), c SAP-MSAP reported together vs MAP and MAP reported separately (SAP-MSAP added up), c SAP-MSAP reported together vs MAP and MAP reported separately (SAP-MSAP added up), c SAP-MSAP reported together vs MAP and MAP reported separately (SAP-MSAP added up), c SAP-MSAP reported together vs MAP and MAP reported separately (SAP-MSAP added up).

CONCLUSIONS

Patients with AF face a threefold increased odds for death in AP, and those with SAP and MSAP are three times more likely to develop changes in repolarization on ECG. Although the higher odds for QTc interval prolongation and the elevation of NT-proBNP levels in SAP and MSAP are not statistically significant yet, the numbers are clinically very relevant. Cardiology screening, including ECG and cardiac laboratory marker measurements are crucial for AP patients. Longitudinal studies are needed to assess the long-term relationship between AP and cardiac abnormalities.

