

Do Patients With ICDs or Pacemakers Develop Device Malfunction After ERCP?

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INTRODUCTION

- Sphincterotomy in endoscopic retrograde cholangiopancreatography (ERCP) involves the use of electrocautery to access the biliary tree.
- A theoretical risk of electromagnetic interference (EMI) exists in patients with implantable cardioverter-defibrillators (ICDs) or pacemakers (PMs) who undergo electrosurgery.
- Studies found the risk of EMI to be minimal in this population, however these studies utilized small sample sizes.
- Our goal is to assess the potential risk of EMI in patients with ICDs or PMs undergoing ERCP.

METHODS

- The national inpatient sample (NIS) was used to identify hospitalized patients with ICDs/PMs and gallstones, further stratified based on whether they received ERCP, from 2001 to 2013 via ICD-9 codes.
- Primary outcomes: mortality, length of stay (LOS) and hospital charges
- Secondary outcomes: complications of ICD/PM malfunction (including ICD discharge and syncope), different arrhythmias, cardiac arrest, and various degrees of heart block.
- Chi-squared tests were used to analyze categorical data and independent t-tests were used to analyze continuous data.
- Multiple logistic regression was used to control for confounders.

RESULTS

- A total of 46,880 patients with ICDs/PMs and gallstones were identified, 6,250 of whom underwent ERCP.
- Patients of both ERCP and non-ERCP groups were mostly male (59.51% versus 57.14%) and Caucasian (79.08% versus 82.49%).
- Patients of the ERCP group were on average older (78.22±11.129 years versus 75.45±12.203 years; adjusted $p<0.05$).
- Mortality was higher in the non-ERCP group (2.71% versus 2.06%; adjusted $p<0.05$).
- LOS (7.28±5.774 days versus 5.54±5.102 days; $p<0.05$) and total charges (\$55,305.18±55,500.141 versus \$36,701.06±46,133.869; $p<0.05$) were higher in the ERCP group.
- The non-ERCP group had higher rates of syncope (1.28% versus 0.69%; adjusted $p<0.05$), unspecified cardiac dysrhythmia (0.89% versus 0.54%; adjusted $p<0.05$) , and left bundle branch block (LBBB; 1.43% versus 1.04%; $p<0.05$).
- Differences in rates of other arrhythmias and heart block were statistically insignificant.

		Non-ERCP group		ERCP group		OR	CI	p-value	AOR	ACI	Adjusted p-value
		Percentage	n	Percentage	n						
Mortality		2.71	1,101	2.06	129	0.757	0.629-0.91	<0.05	0.734	0.606-0.89	<0.05
Complete AV block		0.70	283	0.77	48	1.103	0.812-1.5	0.53	0.983	0.703-1.374	0.918
1 st degree AV block		0.46	187	0.35	22	0.764	0.491-1.189	0.232	0.866	0.554-1.352	0.526
Other 2 nd degree AV block		0.14	57	0.24	15	1.712	0.969-3.026	0.061	1.663	0.921-3.001	0.092
Left BBB		1.43	582	1.04	65	0.723	0.559-0.936	<0.05	0.715	0.546-0.935	<0.05
Right BBB		0.88	357	0.93	58	1.057	0.8-1.396	0.698	0.877	0.71-1.083	0.224
Syncope		1.28	520	0.69	43	0.534	0.391-0.73	<0.05	0.543	0.394-0.748	<0.05
ICD discharge		0.06	23	0.03	2	0.565	0.133-2.398	0.433	0.813	0.188-3.521	0.782
Paroxysmal V Tach		3.62	1,471	2.86	179	0.785	0.671-0.919	<0.05	0.858	0.727-1.012	0.069
VFib/VFlutter		0.28	114	0.3	19	1.084	0.666-1.763	0.746	1.059	0.624-1.797	0.832
Cardiac arrest		0.44	179	0.37	23	0.835	0.54-1.29	0.415	0.925	0.591-1.449	0.735
Cardiac dysrhythmia, unspecified		0.89	362	0.54	34	0.608	0.428-0.866	<0.05	0.668	0.461-0.969	<0.05
AFib/AFlutter		37.76	15,341	40.03	2,502	1.1	1.042-1.162	<0.05	1.037	0.978-1.1	0.219
Premature Beats		0.63	258	0.528	33	0.831	0.578-1.195	0.316	0.926	0.639-1.344	0.687
Sex at birth	Female	40.49	16,448	42.86	2,679	1.103	1.045-1.164	<0.05	1.102	1.04-1.167	<0.05
	Male	59.51	24,179	57.14	3,571						
Race	Caucasian	79.08	28,024	82.49	4,554			<0.05			
	Black	8.69	3,080	4.64	256						
	Hispanic	7.68	2,722	8.2	453						
	Asian or Pacific Islander	2.09	742	2.46	136						
	Native American	0.39	138	0.33	18						
	Other	2.07	733	1.88	104						
		Non-ERCP group			ERCP group			Mean difference		CI	p-value
		Mean	SD	SE Mean	Mean	SD	SE Mean				
Age at admission (years)		75.45	12.203	0.061	78.22	11.129	0.141	-1.763±0.164		-2.085 to -1.442	<0.05
LOS (days)		5.54	5.102	0.025	7.28	5.774	0.073	-1.737±0.071		-1.875 to -1.599	<0.05
Total charges (USD)		36,701.06	46,133.869	230.58	55,305.18	55,500.141	707.539	-18,604.115±650.266		-19,878.646 to -20,062.883	<0.05

Figure 1 Demographics, primary and secondary outcomes in hospitalized patients with either a pacemaker or ICD, with a diagnosis of gallstones, compared amongst those who underwent ERCP and those who did not.

ERCP: endoscopic retrograde cholangiopancreatography; n: sample size; OR: odds ratio; CI: 95% confidence interval; AOR: adjusted odds ratio; ACI: adjusted confidence interval; AV: atrioventricular; BBB: bundle branch block; V Tach: ventricular tachycardia; VFib: ventricular fibrillation; VFlutter: ventricular flutter; AFib: atrial fibrillation; AFlutter: atrial flutter; AV: atrioventricular; SD: standard deviation; SE: standard error; USD: US dollars; LOS: length of stay.

CONCLUSIONS

- We found that patients with ICDs/PMs admitted with gallstones who underwent ERCP had mostly the same rates of arrhythmias and heart block as those who did not undergo ERCP.
- Those who did not undergo ERCP had higher rates of mortality and syncope. This could be due to the medical optimization patients undergo prior to ERCP. These patients are more closely observed and managed with frequent follow-ups, potentially improving outcomes.
- Further prospective studies are needed to elucidate the potential for EMI in those undergoing ERCP.