

Complications of ERCP in Patients Undergoing General Anesthesia Versus MAC

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ERCP is well known to carry risks such as perforation, pancreatitis, and cardiopulmonary adverse events. Cardiopulmonary complications occur in approximately 1 % of cases, with a mortality rate of 0.07 % [1]. In the United States, sedation practices vary widely [2–5].

This retrospective study performed at three academic-affiliated community hospitals in Michigan evaluated whether performing all ERCP procedures under GA reduced the risk of complications when compared to MAC sedation. The hospitals were Providence Hospital, Providence Park Hospital, and St. John Macomb Hospital.

A total of 650 procedures (367 procedures performed under MAC sedation and 283 procedures performed under GA) were included in this study. Statistical differences were noted in age, race and BMI when comparing the two groups, with the group receiving MAC sedation being older and having a higher proportion of Caucasian patients and a lower BMI on average. While the Charlson comorbidity index (CCI) was comparable between the two groups ($p = 0.13$), the patients receiving GA had a higher degree of difficulty with the ERCP ($p = 0.01$). A total of 89 % of ERCPs were for biliary indications in the GA group and 83 % in the MAC group.

In the GA group, one patient had a prolonged weaning from the respirator (2 days). Non-cardiopulmonary complications included two cases of self-limited post-sphincterotomy bleeding and six cases of pancreatitis, five of which were mild and one of which was moderate. In the MAC group, 22 patients experienced cardiopulmonary complications: 13 cases of clinically significant hypoxia, two cases of hypoxia requiring non-invasive positive pressure ventilation and two cases of hypoxia requiring endotracheal intubation. Five patients manifested arrhythmias including bradycardia (2), tachycardia (2), and post-procedure atrial fibrillation (1).

The difference in cardio-pulmonary complications between the two groups is statistically significant ($p < 0.0001$). Gastrointestinal complications in the MAC group included 19 cases of post-ERCP pancreatitis, 17 of which were mild, one of which was moderate, and one of which was severe (see Table 1).

On univariate analysis, the patient's age, gender, procedure indication, procedure duration, ASA grade and diagnostic ERCP (no intervention) were noted to have a statistically significant effect on complications. On multivariate analysis, diagnostic ERCP and female gender were noted to have a statistically significant effect on complication rates in the MAC group. Multivariate analysis in the GA group did not reveal any significant associations.

Overall we noted a statistically significant difference in the rates of cardiopulmonary and overall complications in the MAC group when compared to the GA group at our center.

While the majority of general gastrointestinal endoscopic procedures are performed under conscious sedation, a shift toward deep sedation or GA during ERCP has been made in many institutions [6, 7]. We wish to stress that we are not trying to state that any form of sedation for ERCP is

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Table 1 Procedural complications

Complication	GA (n = 283)	MAC (n = 367)	p value
Post-ERCP pancreatitis, n (%)	6 (2.1)	19 (5.2)	0.004
Post-ERCP infection/sepsis, n (%)	1 (0.4)	12 (3.3)	0.009
Perforation, n (%)	1 (0.4)	2 (0.5)	1
Cardiopulmonary complications, n (%)	1 (0.4)	22 (6.0)	<0.0001
Anemia/bleeding, n (%)	2 (0.7)	6 (1.6)	0.48
Biliary abnormalities, n (%)	3 (1.1)	6 (1.6)	0.74
Abdominal pain, n (%)	1 (0.4)	6 (1.6)	0.014
Death, n (%)	0	1 (0.3)	1

“wrong” or “bad”; centers must select a mode of sedation (and who should be administering it) according to patient mix, local expertise, and institutional experience. Patient safety and acceptability, cost, and physician preference must all be considered when choosing the type of sedation for an invasive/interventional procedure such as an ERCP.

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