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A Study on Effect of Esomeprazolesodium and Pantoprazole on Volume of Gastric Juice

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Abstract

Introduction: There are three classical stages in the control of gastric secretion, which are mediated by short myenteric reflexes and long vagal reflexes and by systemic hormone secretion. More recently the role of local peptides in modulating secretion and motility has become evident. *Methodology:* With simple random sampling technique, 60 patients were selected who fulfil the inclusion criteria and exclusion criteria and divided them into two groups of 30 each.Group P: received intravenous pantoprazole 40 mg i.v.Group E: received intravenous esomeprazole 40 mg i.v. *Results:* Among the group P the mean gastric aspirate volume was 9.56±2.52 ml, and in group E mean gastric aspirate volume was 5.66±2.36 ml, which was statistically lower in group E as compared to group P. *Conclusion:* Esomeprazole reduced the volume of gastric juice to < 6ml and pantoprazole < 10 ml

Keywords: Esomeprazolesodium; Pantoprazole; Gastric Juice.

Introduction

Food is generally presented to the stomach in small soft boluses, prepared inthe mouth by chewing and moistened by saliva, containing mucins and ptyalin. As aresult of its large capacity, the stomach is capable of accommodating a significantquantity of food without a large increase in intragastric pressure. Its main function isto maintain an environment where its digestive enzymes can commence proteindigestion and to move food at a controlled rate via the pyloric sphincter into theduodenum. The major issues for gastric physiology are the nature and control ofgastric secretion and the methods of controlling motility and gastric emptying. Notsurprisingly, the system is integrated with considerable overlap in control of bothfunctions [1,2].

There are three classical stages in the control of gastric secretion, which aremediated by short myenteric reflexes and long vagal reflexes and by systemichormone secretion. More recently the role of local peptides in modulating secretionand motility has become evident.

1. The cephalic phase. This refers to anticipatory secretion of HCL and pepsinogen inresponse to the smell, sight, or taste of food. This is mediated by acetylcholine fromthe vagus nerve, which acts via the internal nerve plexuses in the stomach wall tostimulate acid secretion. The same neural stimulus causes release of bombesin orgastrin-releasing peptide (GRP) from enteric neurones, which stimulates so-called Gcells within the antrum to release gastrin into the circulation. This hormone furtherstimulates parietal cells to secrete acid. Release of histamine from cells in

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gastricglands, which then binds to H2 receptors on parietal cells, is thought to be a finalcommon component of neural and hormonalstimulation of gastric acid secretion [3].

2. The gastric phase. This refers to the stage where the presence of food in the stomachproduces gastric secretion. This arises from either gastric distension or the presence offood constituents. Polypeptides, in particular, cause direct stimulation of acidsecretion and promote gastrin release, while G-cell activity is also promoted bygastric distension. An autoregulatory control also comes into play with acid inhibitingits own secretion by suppressing G-cell release of gastrin. Acetylcholine via short andlong neural reflexes in these first two phases is the major stimulus for pepsinogensecretion [4].
3. The intestinal phase. This represents the role of a number of feedback mechanismsto inhibit gastric secretion, and, as its name suggests, it originates in the duodenum.

Stretching of the wall of the intestine, the presence of acid or digestive products, orhyperosmotic chyme causes a reduction of gastric secretion by gastrointestinal shortand long nervous reflexes. Hormonal feedback is through the release of secretin andgastric inhibitory peptide (GIP) from mucosal cells in the small intestine. GIP alsocauses the release of somatostatin, which inhibits both parietal and G cells [5].

Methodology

The study was approved by the Institutional Ethics committee. The study was conducted at JSS Medical College and Hospital, Mysore from November 2011 to June 2013. Adults patients posted for elective surgeries under general anesthesia in JSS Medical College and Hospital, Mysore.

Sampling Technique

With simple random sampling technique, 60 patients were selected who fulfil the inclusion criteria and exclusion criteria and divided them into two groups of 30 each.

Group P: received intravenous pantoprazole 40 mg i.v.

Group E: received intravenous esomeprazole 40 mg i.v.

Parameters Studied

1. pH of the gastric fluid – using pH meter.
2. Volume of the gastric fluid – volume is measured with graduated syringe.

Preparation of the Patient

All participants were examined preoperatively. Informed written consent was obtained from the participants prior to the study during the preanesthetic evaluation. Complete preanesthetic evaluation was performed in each patient including detailed history, physical examination and preoperative investigations. A complete history was taken regarding ailment for which the patient was admitted-past illness especially relevant to gastro-enterology, cardiovascular, respiratory, hepatic, excretory and endocrine system, previous operation if any. If the patient gave any history of operation in the past done under general anesthesia, they were asked in detail about preoperative medication, period of fasting preceding surgery or any vomiting perioperatively. On the day preceding the surgery at 10 p.m, the participants weregiven the concerned drugs. Group P patients received i.v pantoprazole 40mg and group E received i.v esomeprazole 40mg.

Anesthesia Technique

The participants were received and identified in the operation theatre, and an intravenous line established and fluids administered at body temperature. The monitors Pulse oximetry, NIBP, ECG and EtCO2 were connected and basal vitals noted. All participants were preoxygenated for 3 minutes and administered fentanyl (2 $\mu g\ kg^{-1}$) injection.

Anesthetic induction was performed with propofol 2mg kg^{-1} i.v and trachel intubation was facilitated with suxamethonium 2mg kg^{-1} i.v. Anesthesia was maintained with nitrous-oxide and oxygen at 2:1 ratio and vecuronium 0.1mg kg^{-1} or atracurium 0.5mg kg^{-1}. Then a nasogastric tube of 14 or 16-G size was placed in the stomach. Placement of the nasogastric tube within the stomach was confirmed by auscultation over the epigastrium by introduction of 15ml of air.

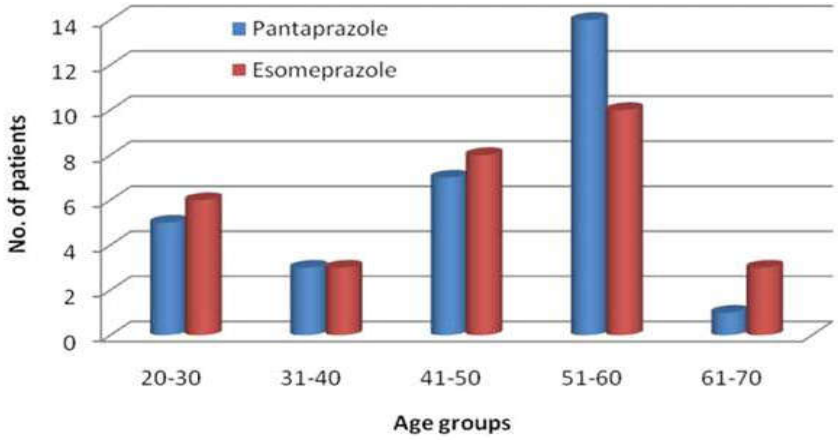
When 30 minutes had elapsed after induction, sample of gastric juice was aspirated and the sample quickly transferred to a clear test tube to be analyzed by pH strip and confirmed by pH meter.

Results

Majority of the patients underwent laproscopic cholecystectomy accounting to 30% in group P, in

Table 1: Volume of gastric juice in group P and group E

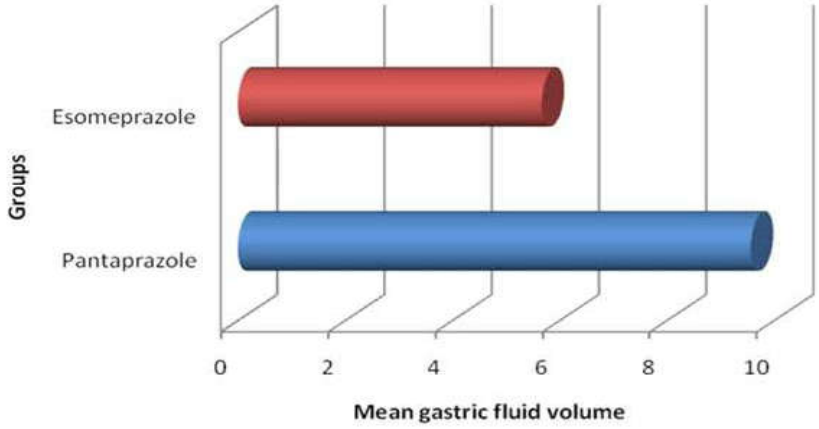
Gastric Juice	N	Mean
Pantaprazole	30	9.5667
Esomeprazole	30	5.6667



Graph 1: Age distribution of the patients

Table 2. Correlation of pH and volume of gastric juice

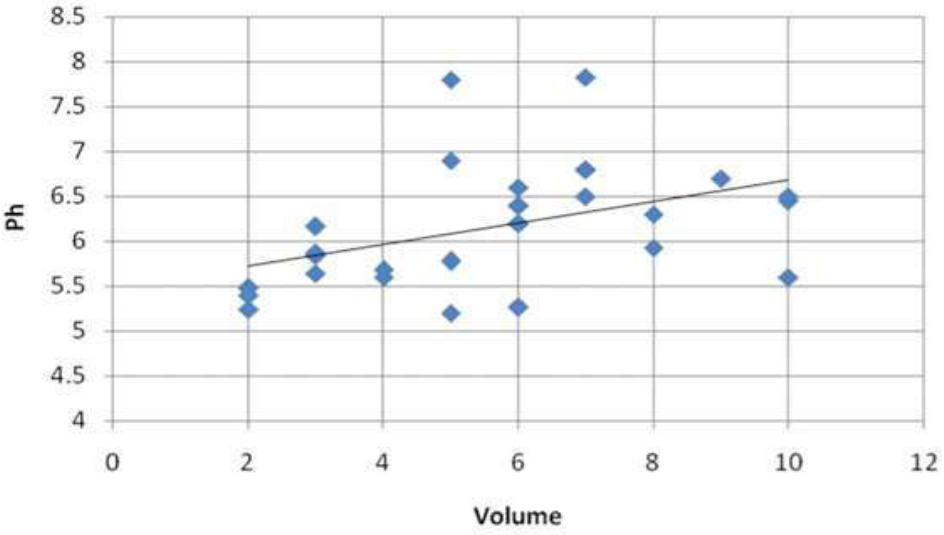
		PH	Gastric Juice
PH	Pearson Correlation	1	-.259(*)
Gastric juice	Pearson Correlation	-.259(*)	1



Graph 2: Volume of gastric juice in group P and group E

Table 3: Results of the study

Characteristics of patients	Group P	Group E
Age (years)		
between 51-60	14 (46.7%)	10(33.3%)
between 41-50	7 (23.3%)	8 (26.7%)
between 20-30	5 (16.7%)	6 (20.0%)
between 31-40	3 (10%)	3 (10%)
between 61-70	1 (3.3%)	3 (10%)
Sex		
Male	21(70%)	4(13.3%)
Female	9 (30%)	26(58.3%)
ASA Physical Status		
Class-I	13(43.3%)	11(36.7%)
Class-II	17(56.7%)	19(63.3%)
Mean pH	5.15	6.16
Mean gastric juice volume	9.56 ml	5.66 ml



Graph 3: Correlation of pH and volume of gastric juice

group E 26.66%, followed by laparoscopic appendectomy, diagnostic laproscopy and thoracotomy. Among the group P the mean gastric aspirate volume was 9.56±2.52 ml, and in group E mean gastric aspirate volume was 5.66±2.36 ml, which was statistically lower in group E as compared to group P.

While correlating pH value with gastric juice volume it was found that as the pH decreases the gastric juice volume increases by two tailed Pearson's correlation Coefficient test, it is statistically significant (P=0.046, which is P<0.05).

Discussion

A prospective, parallel group, controlled, randomised, single-blinded study entitled "Effect of intravenous esomeprazole and intravenous pantoprazole on gastric pH in adults undergoing elective general anesthesia" was conducted at JSS Medical College and Hospital, Mysore between November 2011 to June 2013.

Sixty patients scheduled for various elective surgeries under general anesthesia belonging to ASA class I and II and Mallampatti grade I and II, the age-group >20years of both the sex were included in the study. The patients with anticipated difficult intubation, Mallampatti grade III and IV, patients undergoing emergency surgeries and patients having BMI > 40 kg m^{-2} were excluded from the study. The study population was divided randomly into two groups. Group P (n = 30) – received i.v pantoprazole 40mg.

Group E (n = 30) – received i.v esomeprazole 40mg.

The participants were received and identified in the operation theater, and an intravenous line established and normal saline administered at body temperature. The monitors Pulse oximetry, NIBP, ECG and EtCO2 were connected and basal vitals noted. All participants were preoxygenated for 3 minutes and administered fentanyl (2 µg kg^{-1}) injection.

Anesthetic induction was performed with propofol 2mg kg^{-1}i.v and trachel intubation was facilitated with suxamethonium 2mg kg^{-1}i.v. Anesthesia was maintained with nitrous-oxide: oxygen in 2:1 ratio and vecuronium 0.1mg kg^{-1} or atracurium 0.5mg kg^{-1}. Then a nasogastric tube of 14 or 16-G size was placed in the stomach. Placement of the nasogastric tube within the stomach was confirmed by auscultation over the epigastrium by introduction of 15ml of air.

When 30 minutes had elapsed after induction, sample of gastric juice was aspirated and the sample quickly transferred to a clear test tube to be analyzed by pH strip and confirmed by pH meter.

1. Majority of the patients underwent laproscopic cholecystectomy accounting to 30% in group P, in group E 26.66%, followed by laproscopicappen-dicectomy, diagnostic laproscopy and thoracotomy.
2. Among 30 patients in group P 13 (43.31%) patients were in ASA grade I, and 17 (56%) patients were in ASA grade II.

Among 30 patients in group E 11 (36.7 %) patients were in ASA grade I , and 19 (63.3%) patients were in ASA grade II.

This was not statistically significant (P=0.598) as shown by Pearson's correlation coefficient test .

3. Mean pH of group P was 5.15± 0.68 which is significantly lower than group E , who received i.v esomeprazole with mean pH of 6.6±0.67 , (P<0.001) as shown by two-tailed independent T test.
4. Among the group P the mean gastric aspirate volume was 9.56 ±2.52 ml , and in group E mean gastric aspirate volume was 5.66±2.36 ml, which was statistically lower in group E as compared to group P.
5. While correlating pH value with gastric juice volume it was found that as the pH decreases gastric juice volume increases by two tailed Pearson's correlation Coefficient test, it is statistically significant (P=0.046, which is P<0.05).

The results of this study were comparable with other studies [6,7,8,9].

Conclusion

Considering the cost and the availability of these two drugs, esomeprazole is much effective than the other. From the observations and analysis of the present study, it can be inferred that esomeprazole sodium 40 mg i.v is more effective than pantoprazole 40 mg i.v to raise the gastric pH and reduce the volume of gastric juice for prevention of aspiration pneumonitis.

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