

Electrocardiographic changes during oesophagogastroscopy

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Abstract

Background: Oesophagogastroduodenoscopy (EGD) should be very safe, but there are many potential hazards, although the rate of serious complications is small. There are so many complications that can arise during this procedure. Most of these complications involve the respiratory or cardiovascular systems, especially in sick or sedated patients. The aim of this study was to determine the various electrocardiographic changes that can occur at different stages of diagnostic EGD and to determine their severity.

Materials and Methods: The study is a descriptive one which was carried out at the endoscopy unit of Ladoko Akintola University of Technology Teaching Hospital, (LAUTECH), Osogbo, Osun State. Consecutive patients who were referred for oesophagogastroduodenoscopy (EGD) over a 3-month period and who consented to take part in the study were recruited. The electrodes of a portable electrocardiographic (ECG) machine (model Cardiovit AT_1 ECG Machine) were attached to the patients accordingly and remained fixed till the end of the procedure. ECG recordings were done at baseline, postpremedication, during intubation and 5 minutes postprocedure. The results of the study were analyzed using simple descriptive statistical methods such as range, mean and standard deviation for continuous variables, and numbers and percentages for discrete variables.

Results: Twenty-six (26) patients were studied, comprising 14 (53.8%) males and 12 (46.2%) females. The mean age of the patients was 47.19 ± 14.42 years. Three (11.5%) patients had tachycardia at the beginning of the procedure, while 13 (50%) patients developed tachycardia postpremedication and during the procedure, whereas 17 (65.4%) patients had tachycardia at the end of the procedure. Only one patient had bradycardia. Various ST-T wave abnormalities were observed at each stage of the procedure. Conduction abnormality was observed in 8 (30.8%), 9 (34.6%), 7 (26.9%) and 5 (19.2%) patients at rest, post-premedication, during the procedure and postprocedure respectively. Premature ventricular complexes (PVC) were observed in 4 (15.4%), 5 (19.2%), 4 (15.4%), and 4 (15.4%) patients at rest, post-premedication, during the procedure and post procedure respectively.

Conclusion: This study has shown that, although ECG abnormalities do occur during EGD, these abnormalities are not severe enough to warrant specific interventions or discontinuation of the procedure.

Key words: Changes, electrocardiography, oesophagogastroduodenoscopy

Date of Acceptance: 19-May-2012

Introduction

Oesophagogastroduodenoscopy (EGD) should be very safe, but there are many potential hazards, although the rate of serious complications is small. Large surveys suggest that simple diagnostic endoscopy carries a risk of significant

complications in about 1/1000 procedures, and of death in about 1/10,000. Problems are more likely to be encountered in the elderly and acutely ill, and during emergency and therapeutic procedures.^[1]

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Access this article online

Quick Response Code:



Website: www.njcponline.com

DOI: 10.4103/1119-3077.106720

PMID: *****

EGD has taken an increasing dominant role in diagnosis and therapy of abnormalities of the gastrointestinal tract, and there are many complications that can arise during this procedure.^[2] Most of these complications involve the respiratory or cardiovascular systems, especially in sick or sedated patients. This may account for more than 50% of all the reported complications.^[3] It is sometimes associated, especially in elderly patients, with serious arrhythmias. Therefore, since the introduction of gastrointestinal endoscopic procedures, there has been concern about cardiovascular complications, especially in patients with coronary heart disease. Complications can result from local anaesthesia, sedation, or the endoscopy itself.

Cardiac dysrhythmias can be induced by endoscopy, especially in the presence of hypoxia. Electrocardiographic (ECG) monitoring used routinely in many units, is certainly advisable when endoscopy is performed in patients with cardiac problems.^[1]

The aim of this study was to determine the various electrocardiographic changes that can occur at different stages of diagnostic EGD and to determine their severity.

Materials and Methods

The study is a descriptive one which was carried out at the Endoscopy Unit of Ladoke Akintola University of Technology Teaching Hospital, (LAUTECH), Osogbo, Osun State. This tertiary hospital subserves patients within Osun state and from neighbouring states like Ondo and Ekiti states.

Consecutive patients who were referred for oesophagogastroduodenoscopy (EGD) over a 3-month period and who consented to take part in the study were recruited. After explaining the importance of the study to the patients, written informed consent was obtained before carrying out the procedure. All necessary information like biodata, presenting complaints, history of hypertension, diabetes, cardiovascular disease and other relevant information were obtained from each patient and documented. Each patient also underwent clinical examination.

The electrodes of a portable electrocardiographic (ECG) machine (model Cardiovit AT_1 ECG Machine) were attached to the patients accordingly and remained fixed till the end of the procedure. ECG recording was made before the commencement of the EGD, and this was taken as the baseline. The second ECG recording was done about 2-3 minutes after the premedication was given and in this case it was intravenous diazepam 5 mg stat.

The third and fourth ECG recordings were made during intubation of the oesophagus and about 5 minutes

postprocedure respectively. The EGD was performed using a forward viewing gastroscope (PENTAX FG-29w). This was performed by a single endoscopist. The ECG readings were analyzed by a single cardiologist.

The results of the study were analyzed using simple descriptive statistical methods such as range, mean and standard deviation for continuous variables, and numbers and percentages for discreet variables.

Results

Twenty-six (26) patients were studied, comprising 14 (53.8%) males and 12 (46.2%) females [Table 1]. The mean age of the patients was 47.19 ± 14.42 years. The most common indication for oesophagogastroduodenoscopy (EGD) was dyspepsia, which was present in 20 (76.6%) patients. Other indications were dysphagia and upper gastrointestinal bleeding.

Only 6 (23.1%) patients had history of hypertension. None of the patients had history of cardiac disease. Five of these patients had various abnormalities of ST-T wave changes on ECG. Four of these patients already had these changes even before the procedure. Only two of them had ectopics on ECG which disappeared after the procedure.

Seven (26.9%) patients had a thickened arterial wall, 5 (19.2%) had locomotor brachialis and 2 (7.7%) patients had a displaced apex beat on clinical examination. Although, these features may suggest long standing hypertension, only four of them actually have hypertension.

Three (11.5%) patients had tachycardia at the beginning of the procedure, while 13 (50%) patients developed tachycardia postpremedication and during the procedure, whereas 17 (65.4%) patients had tachycardia at the end of the procedure. Only one patient had bradycardia and this was observed before the premedication was given. The heart rate later normalized during and after the procedure. Only two (7.7%) patients had non-sinus rhythm. Also,

Table 1: Sociodemographic variables

Variable	Frequency	Percentage
Age group (years)		
<50	13	50.0
50+	13	50.0
Sex		
Male	14	53.8
Female	12	46.2
Occupation		
Schooling	7	26.9
Trading	6	23.1
Civil servant	6	23.1
Others (farming, retired, clergy)	7	26.9

only two (7.7%) patients had prolonged PR interval [Table 2].

Seven (26.9%) patients had shortened QRS complex before the beginning of the procedure, whereas this was observed in only five (19.2%) patients during and after the procedure [Table 2].

Various ST-T wave abnormalities were observed at each stage of the procedure. Pathologic Q wave was observed in only two (7.7%) patients. Prolonged QTc interval was observed in only one (3.8%) patient before the procedure, and in two (7.7%) patients during the procedure [Table 2].

Conduction abnormality was observed in 8 (30.8%), 9 (34.6%), 7 (26.9%) and 5 (19.2%) patients at rest, post-premedication, during the procedure and postprocedure respectively [Table 2].

Premature ventricular complexes (PVC) were observed in 4 (15.4%), 5 (19.2%), 4 (15.4%), and 4 (15.4%) patients at rest, post-premedication, during the procedure and postprocedure respectively. There was no correlation observed between the ages of the patients and the ECG changes.

Discussion

Cardiovascular complications constitute about half of all the complications that occur during EGD, and these are changes in heart rate, arrhythmias and repolarization abnormalities. The mortality rate of these cardiac complications ranges from 1:20,000 to 1:50,000. The most common arrhythmias are tachycardia and extrasystoles. They have no clinical significance and are spontaneously reversible. Bradycardia occurs in less than 5% of patients. Tachyarrhythmia rarely occurs. Repolarization abnormalities are seen mostly in patients with coronary heart disease. This suggests myocardia ischemia which is usually silent and is caused by arterial hypoxia due to the increased cardiac work load that occurs during EGD.

In this study, the most common ECG abnormalities observed are tachycardia, ST-T wave changes, conduction abnormalities and premature ventricular complexes.

These findings are comparable to the findings of previous studies conducted around the world. In a study by Malhotra *et al.*,^[4] all these abnormalities were also observed, although, the sample size is larger than our own study and also some of the subjects in their study had preexisting cardiac diseases, but not withstanding all the abnormalities reverted back to normal within 10 minutes after the procedure. None of our own patients had an underlying cardiac disease. This fact shows that most of these observed ECG abnormalities

are probably induced by the endoscope. Although, the abnormalities observed during the EGD are supposed to reverse spontaneously after the procedure, this was not so in some of our patients, as many of them still had tachycardia and ST-T wave changes persisting even post procedure. However, a firm conclusion is difficult to draw in our case because, follow up ECGs were not done few hours or even days after the procedure.

Another observation from the Malhotra *et al.*^[4] study is that, none of their patients had any premedication. This is in contrast to our own study where all our patients had premedication with diazepam. This was associated with an increase in the number of subjects with tachycardia post premedication. This might be due to anxiety rather than the effect of diazepam, because tachycardia is not one of the known side effects of this drug, rather it is supposed to alleviate anxiety.

In a study of 51 patients by Bough *et al.*,^[5] significant bradycardia and hypotension were noted immediately post-premedication with diazepam, but these parameters later rose during the procedure. In our own study, only one patient had bradycardia and this was observed even before the premedication was administered and the heart rate also normalized thereafter.

Thompson *et al.*^[6] in a study of 164 patients who underwent both EGD and colonoscopy noted cardiorespiratory events in 68% of them, but these were significantly more common in patients with a history of cardiac disease and those who underwent therapeutic procedures. In contrast, none of our patients had history of cardiac disease and all of them had only diagnostic procedure.

Wierzbicka-Paczos^[7] also observed tachycardia, ventricular and supraventricular premature beats, and ischemic changes in the majority of their 203 patients that underwent EGD, but many of these changes were observed in patients with preexisting cardiovascular diseases and the largest number of cardiac arrhythmias appeared during the introduction of the endoscope into the oesophagus.

Triandaf *et al.*^[8] in the study of 69 patients, out of which 32 (46.5) had preexisting ischaemic heart disease (IHD), also observed the same ECG changes as in our study, but in addition, angina chest pain was observed in only one patient with IHD. However, all the abnormalities were transient, and no treatment was needed.

Also, Levy *et al.*^[9] in a study of 55 patients recorded all the ECG changes as in our study, and noted that, all the changes disappeared spontaneously after the procedure. In contrast to our own study, some of the ECG changes persisted after the procedure, although, the last ECG recording was done few minutes after the procedure, whereas, in the study by

Table 2: ECG changes at different stages of EGD

	At rest	Post-premedication	During procedure	Post procedure
Heart rate				
Normal	22 (84.6)	13 (50.0)	13 (50.0)	9 (34.6)
Tachycardia	3 (11.5)	13 (50.0)	13 (50.0)	17 (65.4)
Bradycardia	1 (3.8)	-	-	-
Rhythm				
Sinus	24 (92.3)	25 (96.2)	26 (100.0)	26 (100.0)
Nonsinus	2 (7.7)	1 (3.8)	-	-
P-wave				
Normal	23 (88.5)	25 (96.2)	23 (88.5)	25 (96.2)
Prolonged	1 (3.8)	-	-	-
Absent	1 (3.8)	-	-	-
RAE/LAE	1 (3.8)	1 (3.8)	2 (7.7)	1 (3.8)
P+T	-	-	1 (3.8)	-
PR interval				
Normal	23 (88.5)	24 (92.3)	24 (92.3)	26 (100.0)
Prolonged	2 (7.7)	2 (7.7)	1 (3.8)	-
Absent	1 (3.8)	-	1 (3.8)	-
QRS				
Normal	19 (73.1)	20 (78.9)	21 (80.8)	21 (80.8)
Shortened	7 (26.9)	6 (23.1)	5 (19.2)	5 (19.2)
ST segment				
Normal	9 (34.6)	8 (30.8)	9 (34.6)	8 (30.8)
Depression and elevation	3 (11.5)	3 (11.5)	4 (15.4)	7 (26.9)
Elevation	11 (42.3)	12 (46.2)	10 (38.5)	7 (26.9)
Depression	3 (11.5)	3 (11.5)	3 (11.5)	4 (15.4)
T-wave				
Nil				2 (7.7)
Normal	12 (46.2)	8 (30.8)	6 (23.1)	8 (30.8)
Inversion	7 (26.9)	8 (30.8)	8 (30.8)	6 (23.1)
Broad	1 (3.8)	1 (3.8)	1 (3.8)	3 (11.5)
Tall and broad	2 (7.7)	2 (7.7)	2 (7.7)	1 (3.8)
Depression	-	1 (3.8)	2 (7.7)	5 (19.2)
Tall	3 (11.5)	4 (15.4)	6 (23.1)	1 (3.8)
Broad and tall, inversion	-	1 (3.8)	1 (3.8)	-
Tall, Inversion	1 (3.8)	1 (3.8)	-	-
Pathologic Q wave				
Nil	23 (88.5)	24 (92.3)	24 (92.3)	25 (96.2)
Present	2 (7.7)	2 (7.7)	2 (7.7)	1 (3.8)
Tall and broad	1 (3.8)	-	-	-
QTc interval				
Nil	1 (3.8)	-	-	-
Normal	23 (88.5)	25 (96.2)	24 (92.3)	25 (96.2)
Prolonged	1 (3.8)	1 (3.8)	2 (7.7)	1 (3.8)
Not detectable	1 (3.8)	-	-	-
Conduction abnormality				
Nil	18 (69.2)	17 (65.4)	19 (73.1)	21 (80.6)
Present	8 (30.8)	9 (34.6)	7 (26.9)	5 (19.2)
LVH				
Nil	21 (80.8)	22 (84.6)	22 (84.6)	22 (84.6)
Normal	1 (3.8)	1 (3.8)	1 (3.8)	2 (7.7)
Present	4 (15.4)	3 (11.5)	3 (11.5)	2 (7.7)
Ectopic				
Nil	22 (84.6)	21 (80.8)	22 (84.6)	22 (84.6)
Present	4 (15.4)	5 (19.2)	4 (15.4)	4 (15.4)

Levy *et al.* ECG recording was terminated 1 hour after the withdrawal of the scope.

In another study by Seinela *et al.*,^[10] the most common ECG changes observed were ST changes and ventricular ectopics. In this particular study, the sample size is comparable to ours, but the subjects were 80 years and above. In contrast to our study, the minimum age was 23 years, although the maximum was 85 years, half of the subjects were less than 50 years of age. Again this shows that age seems not to affect the observed ECG changes.

Wilcox *et al.*^[11] studied the prevalence of silent myocardia ischaemia and arrhythmias in patients with coronary heart disease undergoing gastrointestinal endoscopy and found that, none of the patients had evidence of ischemia exclusively during the endoscopic procedure. Although, various ST-T wave changes were observed at different stages in our own study, the most common abnormality was ST segment elevation and this occurred post-premedication.

In a study by Gupta *et al.*^[12], the most common ECG abnormalities observed were cardiac arrhythmias and ST-T wave changes, although these changes were observed more in patients with cardiac or pulmonary diseases. In contrast to our own study, none of our patients had underlying cardiac disease apart from those with systemic hypertension.

Conclusion

This study has shown that, although ECG abnormalities do occur during EGD, these abnormalities are not severe enough to warrant specific interventions or discontinuation of the procedure. However, it is advisable that, patients with a history of cardiac problems, the elderly and those requiring

therapeutic endoscopy should be monitored carefully for early detection of cardiorespiratory events.

References

1. Cotton PB, Williams CB. Diagnostic Upper Endoscopy. In: Practical gastrointestinal endoscopy. Chapter 4, 4th Ed. Blackwell Science, London. 1996, 51-77.
2. Hirschowitz BI. A fiberoptic flexible oesophagoscope. *Lancet* 1963; 2 : 388
3. Carey WD. Indications, contraindications and complications of gastrointestinal endoscopy. In : Sivak MV, (edi). Gastroenterologic endoscopy, Philadelphia:WB Saunders, 1987 : 868-80
4. Malhotra HS, Ronas S, Pal LS, Dasgupta DJ. Electrocardiographic changes during upper gastrointestinal endoscopy in ambient hypoxia. *J Assoc Physicians India* 1991; 39 (9) : 692-3
5. Bough EW, Meyers S. Cardiovascular responses to upper gastrointestinal endoscopy. *Am J Gastroenterol* 1978; 69 (6) : 655-61
6. Thompson AM, Park KG, Kerr F, Munro A. Safety of fiberoptic endoscopy: analysis of cardiorespiratory events. *Br J Surg* 1992; 79 (10):1046-9
7. Wierzbicka-Paczos E. Arrhythmia during endoscopy of the upper gastrointestinal tract. *Przepl Lek* 1989; 46 (5):451-4
8. Triandaf I, Stanciu C, Solomon M, Grauer M, Untu A. Continuous electrocardiographic monitoring during upper gastrointestinal endoscopy. *Med Interne* 1978; 16 (1) : 43-45
9. Levy N, Abinader E. Continuous electrocardiographic monitoring with Holter electrocardiograph throughout all stages of gastroscopy. *Am J Dig Dis* 1977; 22 (12):1091-6
10. Seinela L, Reinikainen P, Ahvenainen J. Effect of upper gastrointestinal endoscopy on cardiopulmonary changes in very old patients. *Arch Gerontol Geriatr*. 2003; 37 (1): 25-32
11. Wilcox CM, Faibicher M, Wenger NK, Shalek KA. Prevalence of silent myocardia ischemia and arrhythmias in patients with coronary heart disease undergoing gastrointestinal tract endoscopic procedures. *Arch Intern Med* 1993; 153 (20): 2325-30
12. Gupta SC, Gopalswamy N, Sarkar A, Suryaprasad AG, Markert RJ. Cardiac arrhythmias and electrocardiographic changes during upper and lower gastrointestinal endoscopy. *Mil Med* 1990; 155 (1): 9-11.

How to cite this article: Akere A, Akinwusi PO, Adeoti ML. Electrocardiographic changes during oesophagogastroscopy. *Niger J Clin Pract* 2013; 16:23-7.

Source of Support: Nil, **Conflict of Interest:** None declared.