

ALTERATIONS OF SURFACE ELECTROCARDIOGRAM IN 35 PATIENTS DURING UPPER FIBERENDOSCOPY *

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SUMMARY

Thirty-five patients with gastric complaints were analysed by continuous cardiac monitoring during routine upper fiberendoscopy (UFE); 15 of them showed previous electrocardiographic alterations. New alterations occurred in 8 patients during fiberendoscopy, all of them with previous changes of the electrocardiographic pattern: all these were slight and transient. Atrial and ventricular premature beats (more frequent and persistent in women), complete bundle branch block, atrial fibrillation, and ischemic T wave were detected, the latter in only one male patient. Generally the ECG alterations appear when the fiberscope passed the medium third of the esophagus and the cardia. The changes observed on withdrawal of the optic apparatus were irrelevant. Tachycardia was, as a rule, more frequent and persistent in women. Candidates to UFE should be previously submitted, at least, to screening standard ECG.

Upper fiberendoscopy (UFE) is a rapidly spreading diagnostic technique and a precious aid, especially in the early detection of neoplastic conditions.

Although generally accepted as a relatively innocuous technique, the risk of various kinds of accidents is recognized.¹

UFE is indicated in an ever growing number of patients of all ages, and it is sometimes essential in patients with associated pathology, notably of the cardiovascular system. In these patients, electrocardiographic alterations have been described, ranging from electric disturbances not accompanied by symptomatology, to accidents with anginal crises and even cardiac arrest^{2, 3, 4, 5} during the procedure.

For these reasons, cardiologists are frequently called for the evaluation of the risks involved in a patient in whom UFE is contemplated.

MATERIAL AND METHODS

The present study was carried out sequentially in a group of 35 patients, 21 males and 14 women, their ages being comprised between 25 and 64 years for the men and between 33 and 77 years for the female patients (Table 1). All these patients had full clinical indications for UFE owing to gastric or duodenal pathology. None of them presented symptoms or signs of oesophageal pathology, and they have not been selected in relation to any other clinical condition.

Premedication with Metoclopramide (100 mg.) and Pethidine (10 mg.) was administered to all patients 15 min. before peroral instrumentation, and the oropharynx

* Communication to the III Portuguese Congress of Cardiology, Póvoa de Varzim, May, 1979.

* Communication to the III Annual Meeting of the Portuguese Society of Gastroenterology, Oporto, November, 1979.

was anesthetized with Lidocaine (Xylocaine), viscous solution or spray, immediately before the introduction of the optic apparatus.

Table 1

*ECG During UFE. Number of Patients.
SEX/AGE Distribution*

SEX	N = 35	AGE (years)	MEAN (years)	SD. (years)
M	21	25-64	50	± 9
F	14	33-77	53	± 11

All the examinations were carried out with the patients in the left lateral position by the same endoscopist (C. S. S.); an Olympus Gastrointestinal Fiberscope (GIF) model D₃ was always used, and the mean duration of the procedure was 20 minutes.

All patients were submitted to standard ECG examination 24 to 72 hours before the endoscopic procedure, in order to detect previous electric disturbances.

Throughout the course of the endoscopic examination, continuous monitoring with an Hewlett-Packard monitoring apparatus Mod. 7803 B was performed, with paper registration with an Hewlett-Packard Electrocardiograph Model 1500 B.

The position of the electrodes, conditioned (Fig. 1) by the left lateral position adopted in all patients, was as follows: RA electrode in the fourth right intercostal space at the sternal edge, and the LA electrode at the intersection of the same horizontal plane with the median dorsal line. The indifferent electrode was placed at the right iliac crest.

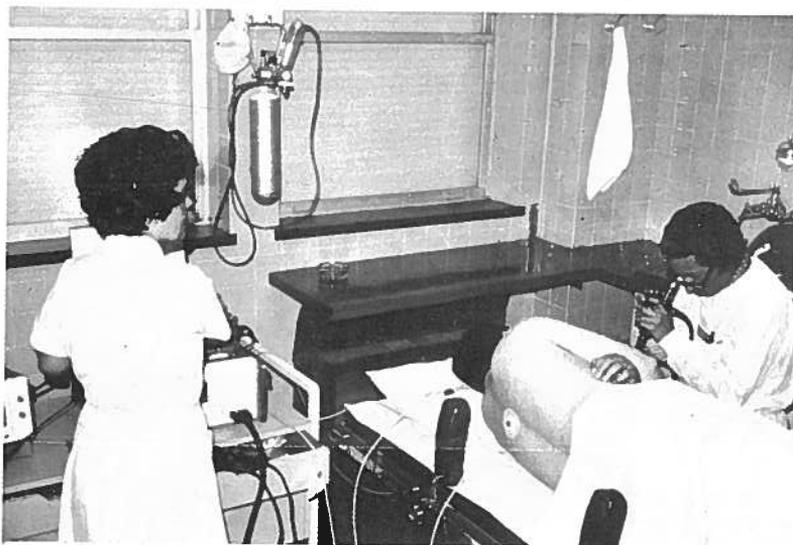


Fig 1 — Endoscopy room during the procedure.

Paper registrations were made at pre-established levels during a brief suspension of the progression or withdrawal of the gastroscope.

Electrocardiographic patterns were always registered at the following levels (Fig. 2): Level I: hypopharynx; Level II: medium third of the esophagus; Level III: cardia; Level IV: gastric cavity; Level V: duodenal bulb, and whenever electrocardiographic changes were detected by continuous monitoring.

Approximately 5 minutes after the end of each examination, a new standard ECG was always performed.

The data obtained were analysed comparatively in relation to sex, previous presence or absence of electrical changes, and appearance of new electric alterations, their frequency and location.

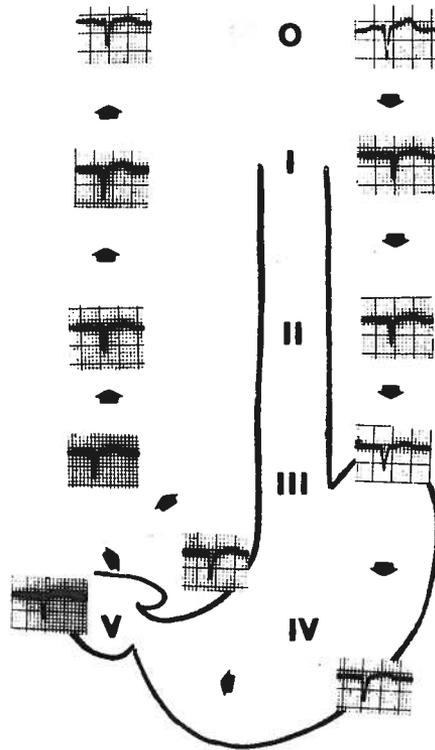


Fig. 2—Steps of ECG registration during UFE.

RESULTS

Alterations of the cardiac rate were analysed before, during and after the endoscopic procedure (Fig. 3). Tachycardia was present in both sexes at the introduction of the fiberscope; however, the behaviour of women was different from men during the gastroscopy: in female patients tachycardia is more important and persistent than in man, the heart rate falls down during endoscopy, and, at the end of the examination, its values are similar to those detected before the endoscopy.

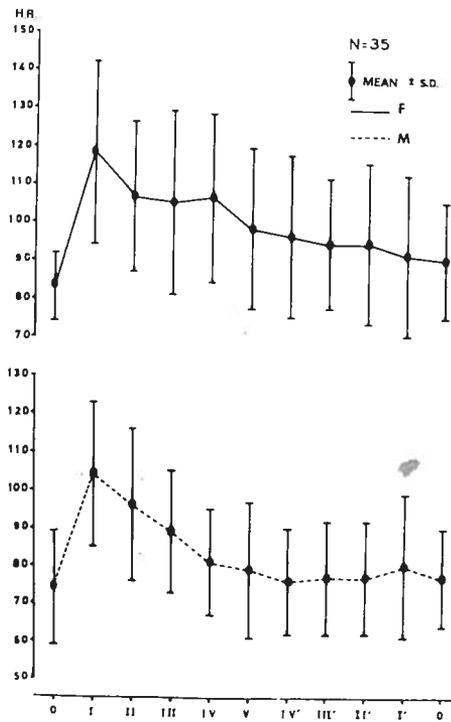


Fig. 3 — Alterations of heart rate during UFE.

No patient of either sex with normal ECG prior to the examination developed electric alterations during UFE (Table 2).

Table 2

N. cases with new ECG abnormalities during UFE.
Relationship with sex and previous ECG data.*

	Previous ECG Normal	Abnormalities During UFE	Previous ECG Abnormal	Abnormalities During UFE
(M=21)	13	0	8	2
(F=14)	7	0	7	6

Of the 15 patients presenting with electrical changes prior to endoscopy (eight men and seven women), only eight showed new electric alterations (six women and two men).

Electrocardiographic alterations detected before endoscopy in women ($n = 7$) were (Table 3): 1 case of LGL syndrome, 1 of LVH, 1 of IRBBB, and 4 cases of alterations of the ST-T segment. During UFE, the patients with LVH developed transient atrial fibrillation, and RBBB appeared in the patient previously presenting with IRBBB. In 1 of 4 patients who had changes of the ST-T pattern before the endoscopy, the same aspects were maintained; in the remaining 3 cases APBs or VPBs appeared during endoscopy, always $\leq 10/\text{min.}$

All the electric changes observed occurred at levels I, II and III (Fig. 4).

After UFE all patients showed only the alterations already present in previous electrocardiograms.

Table 3

*New abnormalities detected in women (N=7)
with previous abnormal ECG's, during UFE.*

Before	UFE	After
L-G-L	+ APB *	L-G-L
LVH	+ Aur. Fib. **	LVH
ST-T	+ VPB *	ST-T
ST-T	+ APB * + VPB *	ST-T
ST-T	+ APB *	ST-T
IRBBB	+ RBBB	IRBBB
ST-T	=	=

* $\leq 10/\text{min.}$ ** transient.
 L-G-L = Lown - Ganong - Levine Syndrome
 LVH = Left Ventricular Hypertrophy
 IRBBB = Incomplete Right Bundle Branch Block
 RBBB = Right Bundle Branch Block
 APB = Atrial Premature Beats.
 VPB = Ventricular Premature Beats.

In the male group ($n = 8$) — (Table 4), ECG carried out before UFE showed 1 case of alteration of the ST-T pattern, 1 case of low voltage, 1 of LAE + LVH, 2 cases of LVH (1 of them with ventricular load), 1 case of LGL syndrome, 1 case of APBs, and 1 case of LAB.

During the endoscopic procedure, only in two of them (respectively low voltage and alteration of the ST-T pattern), new changes were detected. These consisted in APBs in the first ($\leq 10/\text{min.}$), and ischemic T wave in the other, persisting throughout the endoscopic examination (Fig. 5).

The changes observed in this group reverted to the previous patterns during or immediately after the endoscopic manipulation.

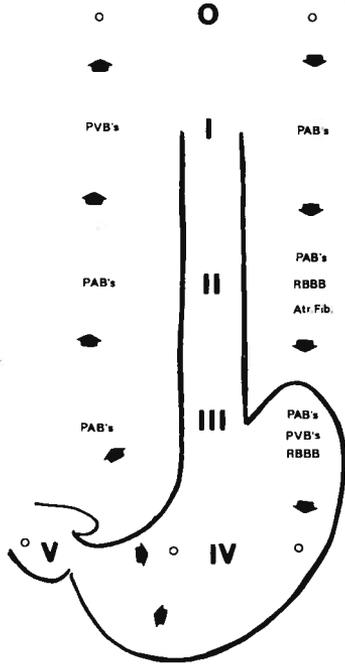


Fig. 4 — ECG changes during UFE (females).

Fig. 5 — ECG changes during UFE (males).

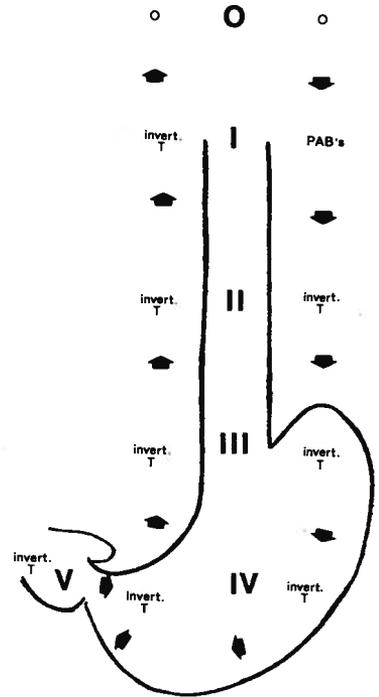


Table 4

*New abnormalities detected in men (N=8)
With previous abnormal ECG's, during UFE*

Before	UFE	After
ST-T Low Voltage	+ «Ischemic» T Wave + APB *	ST-T Low Voltage
LAE + LVH	=	=
LVH	=	=
LVH	=	=
L-G-L	=	=
APB *	=	=
LAHB	=	=

* ≤ 10 /min.

LAE = Left Atrial Enlargement

LVH = Left Ventricular Hypertrophy

L-G-L = Lown - Ganong - Levine Syndrome

APB = Atrial Premature Beats

LAHB = Left Anterior Hemiblock

DISCUSSION

Occurrence of electrocardiographic alterations during UFE was demonstrated by various Authors,^{2, 3, 4} although their underlying mechanisms are not fully established.

Owen,⁶ in 1933, believed that these changes are triggered by visceral reflexes (distension, sudden collapse, or irritation of the hollow abdominal viscera), and also by gagging, retching and vomiting.

Crittenden and Ivy⁷ demonstrated that the administration of atropine rises the heart rate without producing morphological alterations of the electrocardiogram.

In our cases ECG changes should not be ascribed to reflex mechanisms, and premedication administered to our patients did not include atropine.

In the patients with normal ECG prior to the endoscopy, no changes were detected other than slight tachycardia at the insertion of the optical apparatus, contrarily to Carvalhinhos et al.⁴, who found 71% of alterations during the procedure.

In spite of the differences of methodology, our results are similar to those obtained by Semler and Dimroth,² who studied 50 patients at rest, 30 min. after premedication (which included atropine), during the introduction and the withdrawal of the fiberscope. They verified, like ourselves, a rise in the heart rate during the introduction of the fiberoptic apparatus (in our cases a mean increase of 30 beats/min. in men and 40 beats/min. in women). In our female patients tachycardia persisted longer, and, at the end of the examination, the heart rate was higher than the initial values, although lower than the values found by those Authors.

In the male group the difference was more important, inasmuch as the heart rate decreased more rapidly after the introduction of the fiberscope, being normal at the end of the examination.

We believe that these differences are due to the absence of atropine in the premedication employed in our patients.

The remaining electrocardiographic changes are included, in the great majority, in the group APBs/VPBs, as previously described by Carvalhinhos et al.,⁴ and by Semler and Dimroth.² They were, however, more frequent in the present study, probably due to the use of continuous cardiac monitoring.

In this study we tried to correlate the finding of electrocardiographic changes with the level of the fiberscope. We found that the electric alterations occur mostly during the introduction of the apparatus, at the medial third of the esophagus, and at the cardia. When the gastroscope is placed in the gastric cavity or in the duodenal bulb, no alterations were detected, irrespectively of the kind of manipulation effected (insufflation, inversion, aspiration, biopsy), contrarily to the commonly accepted ideas which correlate gastric and colic distension with the production of premature beats.⁶

In the group showing ST-T changes prior to UFE, special reference should be made to a man who had ST-T deflection compatible with acute ischemia which was initiated by the introduction of the fiberscope, and persisted throughout the examination. No chest pain was referred, and the electric changes were transient.

Based on our results, we suggest that candidates to UFE should be submitted to previous cardiovascular examination, or, at least, to previous standard electrocardiogram.

RESUMO

ALTERAÇÕES ELECTROCARDIOGRÁFICAS DE 35 DOENTES DURANTE A FIBROENDOSCOPIA ALTA

Trinta e cinco doentes do foro gastroenterológico, de ambos os sexos, foram analisados por monitorização cardíaca contínua durante a fibroendoscopia alta de rotina; destes, 15 apresentavam alterações electrocardiográficas prévias. Durante a fibroendoscopia apareceram novas alterações electrocardiográficas em 8 doentes, todos eles com prévias alterações do traçado; nenhuma delas foi grave e todas tiveram carácter transitório, tendo-se detectado extrasístoles auriculares e ventriculares (mais frequentes e persistentes nas mulheres), bloqueio completo de ramo direito, fibrilhação auricular, e, num único doente, T isquémico. As alterações surgiram principalmente na introdução do aparelho e durante a sua passagem no 1/3 médio do esófago e no cardia. Ao retirar o aparelho e aos mesmos níveis as alterações foram irrelevantes. Na generalidade, a taquicardia foi mais frequente e duradoura nas mulheres. Um ECG standard deveria ser sempre efectuado antes da fibroendoscopia alta.

ACKNOWLEDGEMENTS

Our thanks are due to the technical assistance of Miss Maria Clara Pité and to the Nurses Mrs. Maria de Lourdes Pereira da Silva and Orinda da Conceição Machado de Almeida for their collaboration, which was indispensable for the execution of the present work.

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