

PULSE RATE AND OXYGEN SATURATION CHANGES IN OESOPHAGIOGASTRODUODENOSCOPY

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Abstract

Context: Endoscope is important diagnostic and therapeutic method for the investigation and management of many upper GIT diseases and the use of the pulse oximeter during this procedure are useful in monitoring any abnormal changes in pulse rate and O₂ saturation and nowadays it is mandatory to use pulse oximeter during upper gastrointestinal endoscope.

Objectives: The aim of this study is to evaluate the significant changes in the pulse rate and O₂ saturation during endoscope and the safety of the endoscope in non-sedated patients. **DESIGN:** Prospective study done by examination of seventy patients by upper gastrointestinal endoscope and recording their pulse rate and O₂ saturation before and after the introduction of endoscope by the use of pulse oximeter.

Settings and Patients: All patients aged from (20 -80) year old, underwent upper GIT endoscope between February and October 2007 in the endoscope department in AL-Najaf teaching hospital .with use of the pulse oximeter by one examiner in a randomized pattern, significant pulse rate changes considered >10 beats, and significant oxygen saturation changes >5%.

Results: Fifty patients show significant increase in pulse rate when the endoscope passed to the esophagus, twenty-six patients were young ,sixteen patients were middle age, and eight were elderly patients, their increase in pulse rate was from (10 -19) beat/min. the main increasing was in young age group. No significant changes occurred in O₂ saturation except in two patients there were decrease in O₂ saturation one of them was suffering from severe anemia before endoscope and the other was suffering from severe chronic obstructive airway disease.

Conclusion: Maximum pulse rate changes occur in young people at the introduction of the endoscope into the esophagus, then after the patient have no significant variation in the pulse rate. The saturation of O₂ shows no affection by the procedure per se.

التغيرات في معدل نبض القلب وتشبع الدم بالاكسيجين خلال ناظور المريء والمعدة والاثني عشري تمهيد: إن ناظور الجهاز الهضمي العلوي في تشخيص وعلاج امراض الجهاز الهضمي مهم جدا وان استعمال جهاز مراقبة معدل النبض والتشبع بالاكسيجين أصبح إلزاميا لمراقبة التغيرات غير الطبيعية ومعالجتها بصورة مبكرة جدا

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الهدف: إن الهدف من هذه الدراسة هو تقييم التغيرات في معدل نبض القلب وتشبع الدم بالأكسجين خلال عملية ناطور المريء والمعدة والاثني عشري ومدى سلامة الفحص بناظور الجهاز الهضمي العلوي من غير استعمال الأدوية المهدئة عند إجراء الفحص بالناظور. المرضى والطريقة: أجريت عملية فحص سبعين مريضاً تراوحت أعمارهم بين ٢٠---٨٠ سنة بواسطة ناظور الجهاز الهضمي العلوي مع استعمال جهاز مراقبة معدل نبض القلب وتشبع الدم عملية الفحص بواسطة أخصائي فحص بالناظور واعتبر التغير في معدل نبض القلب أكثر من ١٠ نبضات تغير مهم واعتبر تغير التشبع بالأكسجين أكثر من ٥ تغير هام النتائج: خمسون من المرضى السبعين حدث عندهم زيادة ملحوظة في معدل نبض القلب (أكثر من ١٠ نبضات) عند مرور الناظور في المريء وهم يمثلون (٧٠,١٤%) من عدد المرضى الكلي، ستة وعشرون منهم من الشباب وستة عشر من متوسطي العمر وثمانية من المسنين وهذا التغير كان تغييراً عابراً ولم يكن هنالك تغيير ملحوظ في التشبع بالأكسجين. الاستنتاج: عملية ناظور الجهاز الهضمي العلوي عملية آمنة والتغيرات التي تحدث في معدل نبض القلب والتشبع بالأكسجين عابرة عند فحص المرضى من دون إعطاء أدوية مهدئة قبل الفحص.

Introduction

Endoscope means looking inside and typically refers to looking inside the human body for medical reasons using an instrument called an endoscope, the word is derived from the Greek by combining the prefix endo-meaning within, and the verb skopein., meaning to view or observe. It dose not mean merely look at something but rather to view with purpose, to observe with intent to monitor⁽¹⁾

*Overview:

Endoscope is a non-invasive diagnostic medical procedure used to assess the interior surfaces of an organ by inserting a tube into the body. The instrument may have a rigid or flexible tube and not only provide an image for visual inspection and photography, but also enable taking biopsies and retrieval of foreign objects. Endoscope is also the vehicle for minimally invasive surgery.

Many endoscope procedures are considered to be relatively painless and, at worst, associated with mild discomfort. Most patients tolerate the procedure with only topical anesthesia of the oropharynx using lignocaine spray. Complications is rare (only 5% of all operations). But can include perforation of the organ under inspection with the endoscope or biopsy instrument. If that occurs, open surgery may be required to repair the injury⁽⁴⁾.

*Rigid or flexible endoscope consisted of;

Light delivery system to illuminate the organ or object under inspection. The light source is normally outside the body and the light is typically directed via an optical fiber system

Lens system transmitting the image to the viewer from the fiberscope

Additional channel to allow entry of medical instruments or manipulators, and recently Pulse oximeter for monitoring patients

Uses:

Endoscope for the gastrointestinal tract can involve:

Oesophagus, stomach, duodenum (eso-phagogastroduodenoscopy)

Small intestine

Colon, (colonoscopy, proctosigmoido-scopy)

Bile duct which include;

*Endoscopicretrograde cholangiopancreato-graphy, (ERCP)

*Duodendoscope-assisted cholangiopancrea-toscopy,

*intraoperative Cholangioscopy ⁽⁴⁾

History of endoscope .The ancient Greeks had no equivalent for endoscope but being clever and wise, they would have understood its modern meaning and likely would have admired its choice. The earliest recorded attempt at endoscope was by Phillip Bozzini of Minz and Frankfurt who in 1806 devised a tin tube illuminated by wax candle fitted with mirror , he called this devise einer Lichteeiter (A light conductor).

Adolf Kussmaul (1822-1902) was the first to devise gastroscope in 1868, his instrument was a straight, rigid, metal tube, passed over a previously inserted flexible obturator .The first subject for experimentation was recruited from the ranks of sword-swallowers .in 1881 Mikulicz reported his tube 65cm long

and14mm in diameter this instrument employed an optical system and was equipped to insufflate air. At the juncture of the 19th and 20th centuries, the most notable accomplishments in endoscope were by German workers. In 1920 Schindler modified rigid gasrtoscope and used it for examination of hundreds patient in Munich-Schwabing Hospital.

In the era before intragastric photography was feasible, gasroscopic images were vividly rendered by colored drawing or paintings, usually by professional artists who were allowed glances through the endoscope, but sometimes by the physicians themselves.⁽¹⁾

In 1932, Wolf-Schindler introduced semi flexible gastroscope.

In1957 fiberscope introduced in the upper GIT endoscope Endoscope of the proximal gastrointestinal tract using fibreoptic instruments has taken an increasing dominant role in diagnosis and therapy since the introduction of the first pan endoscope by Hirschowitz in 1963 the video image endoscope was the most fundamental change in the endoscope design and the advantages of the video image endoscope or the video scope are well documented, these include the ability to perform procedures with a natural, relaxed posture while observing a video monitor; simultaneous viewing by the

physician, trainee, endoscope assistant, and even the patient; enhancement of the training through observation of procedures and video tape also for the follow up the patients and research.

Many interventional techniques had been introduced through the endoscopic ultra sound, endoscopic photocoagulation, the first attempt to use a photocoagulative effect to achieve haemostasis in the gastrointestinal tract was by Goodale et al in 1970⁽¹⁾

Pulse oximetry is a simple non-invasive method of monitoring the percentage of hemoglobin (Hb) which is saturated with oxygen. The pulse oximeter consists of a probe attached to the patient's finger or ear lobe, which is linked to a computerized unit. The unit displays the percentage of Hb saturated with oxygen together with an audible signal for each pulse beat, a calculated heart rate and in some models, a graphical display of the blood flow past the probe. Audible alarms, which can be programmed by the user, are provided. An oximeter detects hypoxia before the patient becomes clinically cyanosed.⁽⁵⁾

In the beginning of the 1990, the use of the pulse oximeter monitoring introduced to the upper gastrointestinal tract endoscope examination and become as a routine.

Patients and Methods

A prospective study done in AL-Sadder Teaching hospital from January 2007 to August 2007 by one endoscopist for 70 patients of different sex and age in randomized pattern.

Data collected including name, age, gender, chief complain also history taken for any other diseases like anemia or, cardiorespiratory problems.

The patients divided into three age groups

Young age group (20-39) year old, which include 33 patients.

Middle age group (40-59) year old; 23 patients,

Old age group (60-80) year old; 14 patients,

Pulseoximetry used to measure the pulse rate and oxygen saturation, video imaged endoscope to examine the gastro-intestinal tract The patients were examined by the use of pentax and storz endoscope and pulseoximeter (wankesha, Wisconsin).

The patients were put on pulse oximetric monitoring for two minutes before endoscope and the pulse rate and oxygen saturation recorded to be the standard reading then the endoscope done and the changes in the pulse rate and oxygen saturation during endoscopic procedure and after withdrawing of the endoscope recorded .

The endoscope done to the all patients without any medication prior to the examination.

Results

There are seventy patients included in this study ages range from twenty to eighty-year old. 41 male patients who represent 58.5% and 29 female patients who represent 41.5%.

We divided the patients into three groups young, middle and old age group the peak age was (20-39) year old there were 33 patients, 19 were males (27.1%) and 14 patients were females (20%). The distribution of ages related to sex of the patients is shown in table (1).

During the introduction of the endoscope and when it reach the esophagus the pulse rate and the O₂ saturation also measured and we find marked increase in pulse rate. Those who show more than 10 beats/min. increment were 59 patients whom represent (84.3%) In 50 patients, the increase in pulse rate was (10-19) beat/min. 26 (52%) of them, their ages were between (20-39) year old, and that represent (78.7%) of the patients at that age.

Seven patients show (20-29) beat/min. increasing in pulse rate. four of them were aged from (20-39) year old and the other three were (40-59) year old, while two patients show (30-40) beat/minute all of them were (20-29) year old.

After reaching the stomach endoscopically the pulse rate had been return nearly to the pre endoscopic state in most of the patients, 66 (94.2%) patients show

increasing in pulse rate not more than five beats /minute, 32 of them were aged (20-39) year old, 21 were (40-59), and 13 patients were (60-80) year old.

Nearly the readings of the pulse rate when the endoscope reached the duodenum were the same of that in the stomach, where 63 (90%) patients show (1-5) beats/minute increasing in pulse rate, 30 of them were (20-39) year old, 20 were (40-59) and 13 were (60-80) year old, table (2).

The oxygen saturation reading during the different site of endoscope shows no significant difference between them, only two of the seventy patients show significant decrease in oxygen saturation which was 88% and one of them was suffering from severe anemia due to upper gastrointestinal bleeding prior and during the endoscope and the other with known case of severe chronic obstructive airway disease.

Discussion

The complications related to the use of the endoscope in upper gastrointestinal diseases ranked to local complications (those occur at the site of investigation) and haemodynamic complications, which are related to changes in oxygen saturation, and pulse rate, the second type of complications recommend the use of the pulseoximeter. Yet the incidence of complications worldwide still occasional, it should be well

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regarded, in our study the average changes in oxygen saturation did not exceed 2%, (96%-98%) but two serious cases in which the oxygen saturation drop to > 5% this was alarming enough to stop the examination and withdraw the endoscope, while the first patient already have pulmonary failure oxygen saturation <88% drop to 74 % the second patient has oxygen saturation prior to the examination 94%, it dropped to 68% .he was having spurting gastroduodenal artery that lead to shock and hence rapid withdrawal of the endoscope upon monitoring oxygen saturation participated in saving his life.

The changes in oxygen saturation occur more with use of sedation, RIMMER KP (3) studied the mechanism of hypoxemia during upper gastrointestinal tract endoscope in 48 patients and they attributed significant hypoxemia to the use of sedation, EM Melleny (7) in Basildon hospital in united kingdom 1995 found 5 patients out of 50 patients (10%) developed transient hypoxemia which required no specific treatment when sedation not used ,and this is consistent with our results of oxygen saturation, the possible explanation is that reflex tachycardia will compensate the temporary choking which occur with initial introduction of the endoscope and this lasts for short time (3-5) seconds that no time for

oxygen saturation changes to occur.

TE Bowling (8) in St Marys Hospital, London studied the changes in pulse rate during upper gastrointestinal endoscope his conclusion, tachycardia is transient and not significant and no electrocardiographic abnormalities conducted with this examination

BB Osinaik (11) in Lautech teaching hospital Osuna state, Uganda found asymptomatic tachycardia in 35 patients out of 40 patients underwent upper gastrointestinal endoscope.

Hayward SR (14) described tachycardia greater than 120 beat /min. in 20 patients out of 78 patient examined by upper gastrointestinal endoscope comprising 25.6% but his patients actually received sedative premedication. In our study we included the site of the endoscope at time of maximum pulse rate changes, by this parameter we could not find similar studies nevertheless it is first to be conducted at least in AL-NAJAF city, the results showed that maximum changes in the pulse rate occurred in young (20-39) year old (33) patients at the entrance from the pharynx to the esophagus.

Our explanation; this is the site of maximum embarrassment for the respiration that can induce compensatory or reflex tachycardia, and why it occur in

young age group because the function of the autonomic innervations is still maintained while it decline or recede with the advancing in age, that is evident from the peak changes in the pulse (up to 40 beat / min.) in young patients and the least changes (<10 beat / min.) in elderly people.

Conclusion

* Haemodynamic complications of upper gastrointestinal endoscope are occasional, though the monitoring of pulse rate and specially oxygen saturation is extremely mandatory and can participate in preventing on table death.

* Maximum pulse rate changes occur in young people at the introduction of the endoscope into the esophagus.

* Oxygen saturation changes limited to non-significant level and occur only in-patient with risk factors not with endoscope examination per se.

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Table (1) Relation between Age and Sex distribution:

Age (year)	Male		Female		Total	
20-39	19	27.1%	14	20%	33	47.2%
40-59	15	21.4%	8	11.4	23	22.8%
60-80	7	10%	7	10%	14	20%
Total	41	58.5%	29	41.5%	70	100%

Site	Esophagus			Stomach			Duodenum		
	20-39 Year old	40-59 year old	60-80 year old	20-39 year old	40-59 year old	60-80 year old	20-39 year old	40-59 year old	60-80 year old
increasi ng of P.R.									
1-5	--- 0%	2 (8.7%)	2 (14.2%)	32 (97%)	21 (91.3%)	13 (92.8%)	30 (91%)	20 (87%)	13 (92.8%)
6-9	1 (3%)	2 (8.7%)	4 (28.5%)	1 (3%)	2 (8.7%)	1 (7.2%)	3 (9%)	2 (8.7%)	1 (7.2%)
10-19	26 (78.7%)	16 (69.5%)	8 (57%)	----- (0%)	----- (0%)	----- (0%)	----- (0%)	1 (4.3%)	----- (0%)
20-29	4 (12.1%)	3 (13%)	----- (0%)	----- (0%)	----- (0%)	----- (0%)	----- (0%)	----- (0%)	----- (0%)
30-40	2 (6%)	----- (0%)	----- (0%)	----- (0%)	----- (0%)	----- (0%)	----- (0%)	----- (0%)	----- (0%)
Total	33 (100%)	23 (100%)	14 (100%)	33 (100%)	23 (100%)	14 (100%)	33 (100%)	23 (100%)	14 (100%)

TABLE 2: The increasing of pulse rate in different sits of endoscope

according to the age of the patients

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