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Esophagogastroduodenoscopy and O_2 Saturation in COPD Patients

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ABSTRACT

Background: *Diagnostic upper gastrointestinal (GI) endoscopy without sedation in selected patients has become more common over the past few years, none-the-less sedatives are avoided in the elderly. We studied the effect of rapid esophagogastroduodenoscopy (EGD) without sedation on patients with COPD to determine the critical hypoxemia during endoscopy.*

Materials and Methods: *In a prospective study, easy EGD was performed electively in 74 patients with COPD (FEV1, FVC, and FEV1.FVC<60%) during 25 months in Masih Daneshvari Hospital. All patients had continuous monitoring and recording of arterial oxygen saturation with pulse oximeter. Patients had similar characteristics concerning age, gender, cardio-pulmonary function and other interventional factors. Hypoxemia during the procedure was also registered. It is noticeable that easy endoscopy refers to performing EGD in less than 10 minutes without sedation.*

Results: *This study showed that during non-sedated EGD, SaO_2 dropped to less than 90% in 23% (16 cases) of patients with COPD. None-the-less following administration of oxygen during the procedure, PaO_2 tended to normal values and therefore the procedure was continued without interruption in all cases.*

Conclusion: *This study showed that easy endoscopy in COPD patients with normal cardiac function may be considered as a safe procedure with no complication.* ***(Tanaffos 2006; 5(2): 33-39)***

Key words: *Upper GI endoscopy, Sedatives, Chronic obstructive pulmonary disease*

INTRODUCTION

For patients in any age group, endoscopy should be applied only when the results will influence the management or outcome. Indications for gastrointestinal endoscopy in the elderly are largely the same as those applied in adults with some variations in their relative frequency based upon the development of age-related diseases such as cancer, gastrointestinal ischemia, and biliary stone disease (1-3). The same relative and absolute contraindications also pertain, without respect to age. Increased attention should be paid especially to the risk engendered by age-related diseases, such as cardiac and pulmonary dysfunction. Preparation for

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endoscopy in the geriatric or aged populations slightly differs from that in younger adults (3, 4). The primary modification in conscious sedation practices required in the geriatric population is the administration of fewer agents at a slower rate and cumulative dose. While neural control of ventilation remains intact in healthy geriatric patients, the cardio-respiratory stimulation mediated by reflex mechanisms in response to hypoxia or hypercarbia are blunted and delayed (5-7). One way of minimizing the risk in the elderly patients is to perform endoscopy without sedation. The objective of this study is to evaluate the impact of rapid EGD (in less than 10 minutes) without sedation on SaO_2 in COPD patients.

MATERIALS AND METHODS

This study was performed on patients who were hospitalized in Masih Daneshvari Hospital due to COPD and needed an upper gastrointestinal endoscopy. Following the primary evaluation for feasibility and estimation of variability for determination of the sample size, 74 patients who were hospitalized in Masih Daneshvari Hospital during 25 months and met the inclusion criteria were included in the study.

The inclusion criteria were hemoglobin more than 10 gr/dL, absence of clinical and laboratory signs of hepatic cirrhosis or chronic renal failure, EF>45% in echocardiography, patients who were in ASA(American Society of Anesthesiology) class III or higher (the ones who could at least perform their own daily tasks), FEV1, FEV1/FVC<60% of the predicted value and O_2 sat>90% before intubation.

The exclusion criteria were unstable hemodynamic status, active GI bleeding, and O_2 Sat<85%. In this situation we decided to encourage the patient to breath deeply and frequently to receive oxygen through the nasal cannula and if O_2sat raised greater than 90% within a maximum of 3 minutes, endoscopy was performed.

Before the endoscopy, a detailed history was obtained from each patient including information about the previous lung disease, the routine medication and smoking history. Then the personal information was registered. Height and weight were measured and body mass index (BMI) was calculated.

Hemoglobin measurement and routine laboratory tests were performed after hospitalization. Pulmonary function tests were performed for each patient before and 15 minutes after 2 puffs of salbutamol spray inhalation and the best flow volume loop of the three attempts was recorded. After an overnight fast, all subjects underwent upper gastrointestinal endoscopy with standard endoscopy premedications consisting of only 2% lidocaine spray for local throat anesthesia. No sedative was used. All patients had continuous monitoring and recording of arterial oxygen saturation with a pulse oximeter. Non invasive blood pressure and cardiac monitoring for each patient was continuously performed and the minimum of arterial oxygen saturation during and after the endoscopy was registered. Patients whose O_2 saturation decreased to 85% - 90% were monitored closely and were carefully observed for signs of clinical distress and need for oxygen supplement. After EGD, patients were asked about experiencing dyspnea during the procedure. Finally, after performing EGD, we classified the severity of oxygen desaturation according to the recommendation of the "American Society for Gastrointestinal Endoscopy" and the policy for the delivery of sedation to the patient and also the guidelines recommended by the Australian and New Zealand College of Anaesthetists (ANZCA) and the Gastroenterological Society of Australia (GESA) as follows:

- The first group (no hypoxemia): patients with no SaO_2 drop ($SaO_2 \geq 95\%$).

- The second group (mild hypoxemia): Patients with slight SaO_2 drop (SaO_2=90-94%).
- The third group (severe hypoxemia): patients with severe SaO_2 drop (SaO_2<90%).

In these cases, the procedure would be continued if SaO_2 raised to more than 90% following the administration of O_2 for a maximum of 3 minutes through a nasal cannula; otherwise endoscopy would be discontinued at any stage.

RESULTS

The results of this study which was conducted on 74 patients with obstructive lung disease showed that severe afore mentioned hypoxia (SaO_2<90%) occurred in 16 patients (23%) during endoscopy so that the patients were divided into 3 main groups:

Group I: SaO_2≥95% 12 cases

Group II: SaO_2= 90-94% 46 cases

Group III: SaO_2< 90% 16 cases

Mean arterial oxygen during and after the endoscopy was 93±2 percent, and the mean duration of endoscopy was 7±1.7 min (table 1).

Table 1. The results of different variables such as age, sex, weight, height, heart rate, spirogram, and the duration of endoscopy in 74 COPD patients.

Variables	Minimum	Maximum	mean ± Standard deviation
Age	43	84	64±8.9
FEV1	42	57	50±8.6
FEV1/FVC	36	58	55±15
Hgb	11.6	20.5	14±4.5
Height	149	178	166±6.5
Weight	41	85	63±9.4
Heart rate	55	130	75±16.8
SaO_2	88	98	93±2
BMI	15.6	35	22.9±3.3
Duration of endoscopy	3	10	7±1.7

The results showed that during the non-sedated EGD, critical hypoxemia developed in 23% (16 cases) of patients with advanced COPD (p=0.06). None-the-less with administration of oxygen during the procedure, PaO_2 rose to more than 90% and therefore the procedure was continued without interruption in all cases. No significant electocardiogrphic changes occurred during endoscopy in all patients.

This study showed that there was no significant difference between the three groups in regard to age, duration of the procedure, BMI and heart rate. (Figure 1-4). Also, there was no significant difference between the three groups in regard to FEV1/FVC and FEV1 (p>0.05).

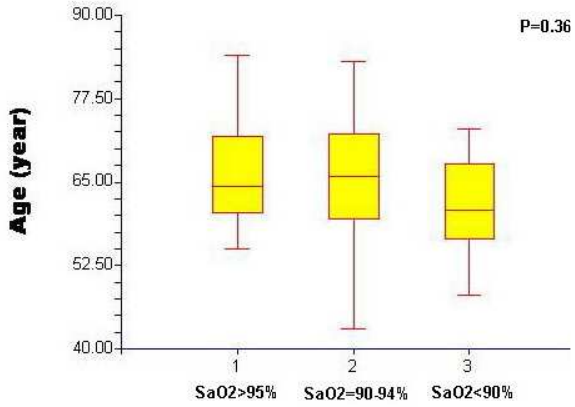

Figure 1. Age distribution in the 3 different SaO_2 groups.

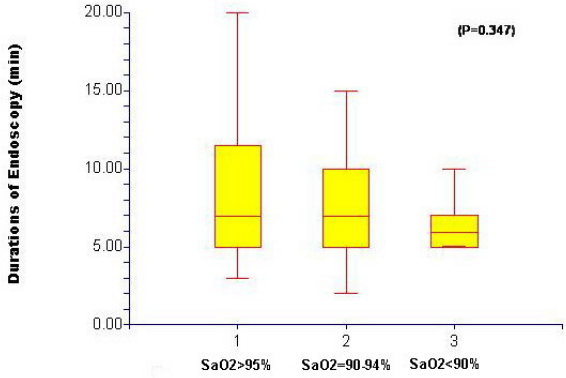

Figure 2. Comparison of the duration of endoscopy (minute) in the 3 different SaO_2 groups.

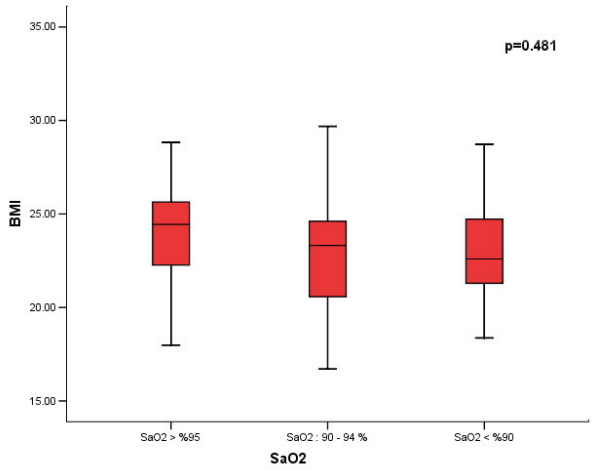

Figure 3. Comparison of BMI in the 3 different SaO_2 groups

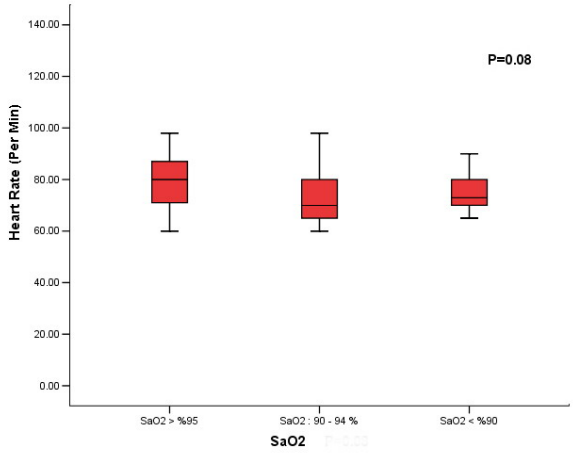

Figure 4. Comparison of the heart rate in the 3 groups with alternative SaO_2

DISCUSSION

The approach to upper GI endoscopy, particularly in the use of sedatives varies widely throughout the world (1,5).

Current interest in non-sedated endoscopy has been stimulated even with conventional 9-10 and 11 mm endoscopes. Thus, although the British Society of Gastroenterology study of practice in the U.K in 1991 showed that only about 10 percent of diagnostic upper GI endoscopies were performed without the use of sedative, the results of a large center study in the U.K in 1998 showed that about 65 percent of such procedures were performed without sedation. American patients appear to be less willing than patients in other parts of the world for non-sedated endoscopy and more than 30 percent refused the sedation (2).

In this study, the results showed that regardless of the wide variety of factors effective on PaO_2 such as applying several gastroduodenoscopes with different diameters, the time of endoscopy, the endoscopist's skill and type of the sedative, non-sedated speedy endoscopy in patients with advanced COPD did not have significant effect on PaO_2 drop and none of the patients experienced cardiac arrhythmia, cloudy consciousness, and/or respiratory distress. However, in 16 patients (23%) PaO_2 dropped to less than 90% which was treated rapidly by administration of oxygen through the nasal route so that the procedure was not discontinued in any of them.

Data support the concept that arterial oxygen desaturation occurs more frequently during EGD with sedatives especially in the elderly or those with underlying cardio-pulmonary disease (6-8).

None-the-less, because gas exchanges are impaired in COPD patients, it may be hypothesized that patients with irreversible airflow obstructive disease have an increased risk of oxygen desaturation during EGD.

Generally, a dramatic drop in SaO_2 following premedication especially with the narcotics, has been observed in the patients (9, 10). In a study conducted by Rozen et al. on 114 patients who had used diazepam and meperidine or together with fentanyl as the premedication for endoscopy, the most significant SaO_2 drop occurred in those who had used diazepam together with meperidine. SaO_2 drop was more significant in patients who had a gastroduodenoscopy than in those who underwent colonoscopy which could be interpreted by vagus nerve stimulation and its influence on cardiac output

and also the mechanical effect of gastroduodenoscope on oropharynx and the pressure imposed on trachea. When pediatric gastroscope which has a smaller diameter was used instead of the adult one, no significant SaO_2 drop was observed even in those who had received fentanyl together with midazolam (11, 12).

Thus, regarding the previous experiments and the result of our study, insignificant PaO_2 drop in 77% of the patients with COPD indicates that non-sedated, speedy endoscopy may be safe in these patients.

PaO_2 drop in 23% of our patients was due to:

1) Mechanical effects of the gastroscope
2) Ventilation perfusion quotient mismatch
3) Both of the above

In a study conducted by Zsigmond et al. on asymptomatic COPD patients, the injection of diazepam and meperidine did not have a remarkable impact on SaO_2 (13); though apnea was reported to follow rapid injection of diazepam in the elderly (14, 15, 16).

In Zsigmond's study, only patients with no dyspnea were selected and arterial blood sampling for SaO_2 was not done immediately after the injection of diazepam which was totally different from studies of Rozen et al. (9, 10, 11) In the last 3 studies arterial blood sampling was performed immediately before administration of sedatives, right after passing the endoscope through the pharynx, and immediately after completion of the procedure (5).

In a limited study conducted by Rostykus et al. (16) on 13 cases of advanced COPD, 7 patients with the following hemodynamic and physical conditions underwent upper GI endoscopy: age=59±5, FEV1=46±9, and FEV1/FVC= 45±5 with $p<0.01$. In 6 of these 7 patients SaO_2 dropped to less than 90% (Mean SaO_2 during and after the procedure dropped from 95±0.61 to 85±0.02 with $p<0.01$). In 5 patients EKG changes such as PVC, T and ST segment changes were noticed during SaO_2 drop to less than 90% which was relieved in a maximum of one hour following the procedure.

As it was shown in whorwell's study, in advanced COPD patients evaluations of basal PaO_2, FVC and FEV1/FVC were sufficient for prediction of the potential risk of complications of upper GI endoscopy (16, 17). The results of our study showed that with basal PaO_2 more than 90%, there would be no potential risk for endoscopy even when FEV1 and FEV1/FVC are less than 60% with dynamic function of ASA class III or more. Since sedatives were not used in all 74 patients as the premedication, physical effects of endoscopy on hypopharynx and trachea may lead to SaO_2 drop.

Taylor and Prout studies considered the aspiration of gastric contents as a leading factor for bronchospasm and ventilation perfusion quotient (18, 19).

Using xylocaine gel or spray may cause laryngeal dysreflexia and consequently aggravation of the situation. As it was previously mentioned, the effect of factors such as stimulation of the vagus nerve, which leads to bronchospasm (20, 21) and its impact on cardiac output or arterial pressure results in hypoxemia, pulmonary circulation alternation, and decreased arterial oxygenation.

Palmer et al. considered retroflexion of gastroscopy and stimulation of the receptors (which result in gastric distention) as a factor to stimulate the vagus nerve (22). Fujita, Mc clog and Pecora studies showed that EKG changes during the endoscopy were transient and were not related to cardiac diseases (23, 24, 25).

Concerning the selected method, the results of our study on 74 patients did not show remarkable arrhythmia during endoscopy; although with the patients' selection and interruption of endoscopy in case of SaO_2 drop to less than 90%, arrhythmia was not expected.

Statistical analysis did not show any significant difference between the three groups of our patients. The difference between the first group (PaO_2>95%)

and the third group (PaO_2<90%), particularly, shows that a transient fatal hypoxia (PaO_2<90%) has no effect on heart rate showing that the cardiac function is normal (EF>45%). Thus, normal EF can be applied as an index in selection of old patients which are believed to develop hypoxia during diagnostic or interventional procedures.

Since in the present study the effect of upper GI endoscopy on arterial oxygenation was to be investigated, we tried to select the cases in which the input and output indices and some confounder factors such as age, sex, the drug of choice and the history of smoking were similar.

Age alone is not a major determinant of morbidity during upper GI endoscopy. Rather, age-related diseases such as COPD and using sedatives prior to the procedure are more likely to contribute to the cardiopulmonary complication. Therefore, in elderly patients with an underlying pulmonary disease upper GI endoscopy without sedatives is not complicating and may be performed safely provided that the patient is ambulatory and capable of doing his/ her daily routine tasks.

Ultimately, by the end of the study, statistical tests confirmed that the confounder variables were ineffective. The study conducted by Pecora et al. (25) has focused on the effects of the drugs, rate of smoking and duration of endoscopy. The patients were divided into four groups, each consisting of 15 men and women. The first group consisted of patients who smoked 22 packs/ year and used meperidine and diazepam or only diazepam before upper GI endoscopy. The second group consisted of non-smokers who used the same sedatives as the first group before upper GI endoscopy. The third group consisted of patients who smoked 39 packs/ year and did not use sedatives before upper GI endoscopy and the forth group consisted of non-smokers who did not use sedatives before the endoscopy. The procedure was performed in the standard position for all patients. The instruments used were the Olympus GIFS2, GIFQ and GIFP3. The results of the above mentioned study showed that SaO_2 dropped in all patients specially at the beginning of the procedure and after 3 minutes. Although basal PO_2 before the endoscopy in smokers was less than non-smokers, the procedure did not have a significant impact on SaO_2 drop.

Ultimately, the results showed that in spite of a drop in PaO_2 in all patients, SaO_2 did not drop significantly in smokers who had used sedatives (meperidine and diazepam) (25).

CONCLUSION

The results showed that regardless of confounder factors such as gastroscope diameter, the endoscopist's skill, duration of endoscopy, age, and number of cigarettes smoked per day, non-sedated rapid endoscopy in less than 10 min in COPD patients will result in hypoxemia (SaO_2<90%) in about 20% of the cases which will be alleviated by administration of extra oxygen.

Admittedly, if SaO_2 is less than 90% before the procedure, oxygen therapy is essential. An easy endoscopy with no complication is expected in advanced COPD patients who are under close monitoring by pulse oxymeter and in whom SaO_2 is more than 90%.

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