A comparison of the effects of sufentanil and fentanyl on intraocular pressure changes due to easy and difficult tracheal intubations

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ABSTRACT

الأهداف: دراسة تأثير عقاري سوفينتانيل وفينتانيل على ضغط المقلة بعد تركيب الأنبوب السهل والصعب.

الطريقة: خلال الفترة من يناير 2006 إلى يناير 2008م كان هنالك 120 مريض خضعوا للتخدير العام – مركز مستشفى الأم تيرسيا – قسم التخدير و العناية المركزية – تيرانا – ألبانيا. تم تقسيم المرضى إلى مجموعتين بعدد 60 مريض بحيث تلقى المرضى عقار سوفينتانيل أو عقار فينتانيل لمدة 2 دقيقة قبل تركيب الأنبوب. وتبين أن 14 مريض يعانون من صعوبة تنظير المريء وتركيب أنبوب الرغامى، أجريت محاولات عديدة لتركيب الأنبوب في 8 مريض من مجموعة عقار سوفينتانيل و 6 مريض من مجموعة فينتانيل. قمنا بمقارنة قيمة ضغط المقلة قبل وبعد 2 دقيقة من تركيب الأنبوب بين المجموعتين وأيضاً بين المجموعتين التي نتج عنها صعوبة في تركيب الأنبوب.

النتائج: تم قياس متوسط ضغط المقلة بعد 2 دقيقة من تركيب الأنبوب في المجموعة التي تلقت عقار سوفينتانيل وكان أقل من مجموعة فينتانيل. بلغت تغيرات الضغط داخل المقلة في المجموعتين 1.67mm Hg لدى مجموعة سوفينتانيل و 1.77mm Hg- لدى مجموعة فينتانيل. تم تصنيف المجموعات الصغيرة بواسطة المرضى الذين يعانون من صعوبة في تركيب الأنبوب وكان متوسط تغيرات ضغط المقلة 1.93mm Hg+ و 3.7mm Hg+ في المرضى الذين تلقوا عقار سوفينتانيل وعقار فينتانيل.

خاتمة: كلا العقارين يعتبران غير حادين في زيادة ضغط المقلة خلال تنظير المريء وتركيب أنبوب الرغامي، ولكن يعتبر عقار سوفينتانيل في الحماية في حالات تركيب الأنبوب الصعبة أفضل من عقار فينتانيل.

Objectives: To study the effects of sufentanil and fentanyl on intraocular pressure after easy and difficult intubations.

Methods: From January 2006 to January 2008 there were included 120 patients undergoing general anesthesia at University Hospital Center (Mother Theresa) Service of Anesthesia and Intensive Care, Tirana, Albania. The patients were divided into 2 groups, 60 patients each receiving Sufentanil (group S), and Fentanyl (group F), 2 minutes before intubation. Fourteen patients were found to have difficult laryngoscopy and tracheal intubations (8 in group S, and 6 in group F), in which several attempts to intubate were carried out. We compared the intraocular pressure values before, and 2 minutes after the intubations between the 2 groups, and also between the 2 groups that resulted as difficult intubations.

Results: The mean intraocular pressure measured 2 minutes after intubation in group S was lower than in group F. Mean intraocular pressure changes in the 2 groups were: 1.67 mm Hg in group S, and -1.77 mm Hg in group F. The small groups included patients with difficult intubation; mean intraocular pressure changes were +1.93 mm Hg in group S, and +3.7 mm Hg in group F.

Conclusions: Both drugs blunt the increased intraocular pressure during laryngoscopy and tracheal intubations, but in difficult intubation, sufentanil presented better protection than fentanyl.

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Laryngoscopy and tracheal intubations have several hemodynamic effects related to increased sympathetic response.[1-3] During laryngoscopy and tracheal intubation, an increase in intraocular pressure is often seen especially after succinylcholine use.[2] Normal intraocular pressure varies from 12-20 mm Hg, and it can be increased after laryngoscopy and tracheal intubation. Opioids, tranquilizers, non-depolarizing muscle relaxants decrease intraocular pressure.[3] Several methods and drugs have been used in order to prevent the increasing intraocular pressure, especially when succinylcholine, or rapid induction is used. Such treatments include many drugs, such as clonidine, dexmedetomide, sufentanil , lidocaine, nitroglycerin, esmolol, and gabapentin.[2,4-16] There was no previous study to compare the effects of sufentanil and fentanyl on intraocular pressure in easy and even in difficult intubations. Succinylcholine was not used in our serial because it is a well-known drug that increases intraocular pressure. We did not perform rapid induction in order to avoid any drug that increases the intraocular pressure as succinylcholine does. Our goal was to study the effects of sufentanil and fentanyl on intraocular pressure after easy and difficult intubations.

Methods. From January 2006 to January 2008, 120 American Society of Anesthesiology (ASA) 1 and 2 patients, undergoing general anesthesia for day surgery, at the University Hospital Center (Mother Theresa) Service of Anesthesia and Intensive Care, Tirana, Albania, were included in this study. We excluded patients with previous ophthalmologic disease, drugs, and failed intubation. The ethical approval was obtained. All the patients were given a written consent regarding type and risks of anesthesia, also explaining the study that we will conduct. The patients were divided into 2 equal groups, each receiving sufentanil (group S [n=60]), and fentanyl (group F [n-60]), (sufentanil 0.3 mcg.kg^{-1} and fentanyl 3 mcg.kg^{-1}) 2 minutes before intubation. The intraocular pressure readings, heart rate, and blood pressure were normal in all patients. The patient's airways were apparently normal.

We did not assess if it was a difficult intubation, however, we use the ASA definition. The ASA has defined difficult intubation as a situation when the anesthesiologist cannot intubate the patient's trachea. Difficult laryngoscopy is further defined as a situation when the vocal cords cannot be viewed with a conventional laryngoscopy by a senior anesthesiologist, or when more than 3 attempts were needed to intubate, or more than 10 minutes had passed before the patient may be intubated. A senior anesthesiologist is an anesthesiologist with a minimum experience of 5 years. No patient had failed intubation. The intraocular pressure was measured with a Tonopen device (Tono-pen Xl, Reichert Inc, New York, USA). In both groups the induction of anesthesia was the same including sodium thiopental 6 mg.kg^{-1}, vecuronium 0.1 mg.kg^{-1}, sufentanil 0.3 mcg.kg^{-1} or Fentanyl 3 mcg.kg^{-1}. The patient's trachea was intubated by a senior anesthesiologist, and then an ophthalmologist measured the intraocular pressure. Right intraocular pressure, heart rate, and blood pressure were measured, and recorded for each patient before the transfer to the operating room, as well as 2 minutes after the intubation. The intraocular pressure was performed by an ophthalmologist, blinded to both groups. We completed intubating the first group (group F) using fentanyl, and then the second group (group S) using sufentanil . Then, we compared both groups, and the minigroups that resulted in difficult intubations. We performed several attempts to intubate in the cases of difficult intubations. Our first aim was to compare sufentanil and fentanyl, but in performing the study, we noticed the difficult intubating cases, and we compared them also.

Statistical analysis was performed using only paired t-test and χ^2 test to evaluate the measured values. First, we analyzed the easy intubations group, and then the resulting difficult intubations patients. The software used was SPSS Version 14.00

Results. The mean values of intraocular pressure in group S was 15.67 mm Hg, and 15.75 mm Hg for group F. There was no significant difference between groups. We measured the intraocular pressure 2 minutes after the intubation. There was no significant demographic differences between the 2 groups in intraocular pressure (after easy intubations: -1.67 mm Hg for group S, and -1.77 mm Hg for group F), as well as, in mean one change. Our aim was not to observe the occurrence of hypertension, hypotension, tachycardia, bradycardia, myocardial ischemia, and dysrhythmia in the both groups. The comparison of mean intraocular pressure changes after the intubation in group S and group F showed a significant difference in the patients, which resulted in intubation difficulty (p<0.05). Fourteen patients were found to have difficult laryngoscopy and tracheal intubations (8 in group S, and 6 in group F), in which several attempts to intubate were carried out. During difficult intubations, the intraocular pressure increased more in the fentanyl group compared with the sufentanil group. The mean intraocular pressure changes in group S was +1.93 mm Hg, and +3.7 mm Hg in group F.

Discussion. The increase intraocular pressure reaches the maximum value at 2-4 minutes after the tracheal intubation.[1-3] Opiates, tranquilizers, non-depolarizing muscle relaxants decrease intraocular pressure.[3] The present study was conducted out of controversial results and conclusions of the previous studies.[4,5-16] There was no previous study that compared the effects of fentanyl and sufentanil in blunting the increased intraocular pressure in easy intubation, as well as in difficult intubations.

During difficult intubations several attempts are to be made in order to intubate the patient's trachea. This situation produces a more intense effect in increasing intraocular pressure. This was confirmed by our findings in the patients that were difficult to intubate, for example, more attempts to intubate more increases intraocular pressure. Those intubated with fentanyl had a greater increase of intraocular pressure than those with sufentanil .

In conclusion, our results confirmed that those intubated with fentanyl had a greater increase of intraocular pressure than those with sufentanil . Further studies are required with a large number of difficult to intubate patients.

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