INTRANASAL ADMINISTRATION OF NITROGLYCERINE ATTENUATES THE PRESSOR RESPONSE TO LARYNGOSCOPY AND INTUBATION OF THE TRACHEA

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SUMMARY

The intranasal administration of nitroglycerine (NTG) was undertaken in 35 adult female patients before the induction of anaesthesia. A control group consisting of 32 patients did not receive NTG. Systolic arterial pressure (SAP) and heart rate (HR) were recorded before the induction of anaesthesia and at 0, 3, and 5 min after tracheal intubation. SAP did not increase significantly in the NTG group immediately after intubation, while significant decreases in SAP were observed at 3 and 5 min (P < 0.005 and P < 0.001 respectively). SAP did increase significantly in the control group. HR was increased in both groups immediately after intubation (P < 0.001 and P < 0.001 respectively). NTG administered intranasally is a safe, simple and effective method to attenuate the hypertensive response to laryngoscopy and tracheal intubation.

Cardiovascular instability, as demonstrated by increases in arterial pressure and heart rate (HR), accompanies direct laryngoscopy and tracheal intubation (Wycoff, 1960; Prys-Roberts et al., 1971; Stoelting, 1977). Usually these transient changes have no deleterious consequences, but in some patients they can provoke left ventricular failure (Masson, 1964), myocardial ischaemia and cerebral haemorrhage (Forbes and Dally, 1970). The present study assessed the efficacy of nitroglycerine (NTG) solution administered intranasally before laryngoscopy and intubation in the prevention of these changes.

PATIENTS AND METHODS

Sixty-seven female patients (ASA class I) aged between 21 and 36 yr and undergoing excision of a breast lump were studied (weight range 61–77 kg). All gave informed consent to participate in the study. All patients had normal electrocardiograms (ECG) on admission to the hospital and arterial pressures within the physiological range.

Premedication consisted of diazepam 20 mg by mouth 90 min before the induction of anaesthesia. No anticholinergic drugs were given. On arrival of the patient in the operating theatre, systolic arterial pressure (SAP) and HR were recorded after a resting period of 5 min. No invasive methods were used to record SAP and HR as the operation performed was minor and did not justify their use. The 67 patients were randomly allocated to two groups: an NTG group and a control group. After 5 min oxygenation with 100% oxygen via a mask, 35 patients received 2 ml of an NTG solution (60 mg) which was instilled intranasally using a glass syringe and a 16-gauge teflon i.v. cannula. The dose of NTG was arbitrarily chosen (15 mg for each 20 kg of the patient’s weight). As the body weight of the patients varied between 61 and 77 kg, each received 60 mg of NTG (2 ml solution). One minute after the nasal administration of NTG, anaesthesia was induced with thiopentone 6 mg kg⁻¹ followed by suxamethonium 1.5 mg kg⁻¹ to facilitate endotracheal intubation. Each intubation of the trachea was performed by the first author. When difficulties in intubation occurred or if intubation was not accomplished at the first attempt the patient was withdrawn from the study. SAP and HR were recorded as soon as the cuff of the tracheal tube was inflated (time zero) and at 3 and 5 min after intubation in the absence of concurrent stimulation produced by surgery. The remaining 32 patients (control group) did not receive NTG. Following tracheal intubation, ventilation of the lungs was controlled with 33% oxygen in nitrous oxide for 5 min. No analgesic drugs or inhalation anaesthetics which might have affected the hypotensive effect of NTG were given for the 5 min following tracheal intubation.

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Student’s t test for paired observations was used for analyses within the groups, and that for unpaired observations for analyses between groups.

RESULTS

Systolic arterial pressure
In patients who received NTG, SAP did not change significantly as a result of tracheal intubation. A statistically, but not clinically significant, decrease in SAP was observed at 3 and 5 min after intubation (P<0.05 and P<0.001 respectively) (table I). An abrupt increase in SAP was observed in the control group immediately after intubation (from a mean value of 136 mm Hg to a mean value of 182 mm Hg) (P<0.001). SAP was significantly greater at 0 and 3 min after intubation in the control group when compared with the NTG group (table I) and the range of increases in SAP following intubation was greater in the patients in the control group (table II). SAP did not differ between the groups following operation.

Heart rate
HR was significantly increased in both groups after intubation (P<0.001 and P<0.001 respectively). At 5 min after intubation HR was still faster in the NTG group while in the control group it had declined to the values obtained before induction of anaesthesia (table III).

DISCUSSION

NTG is rapidly absorbed into the vascular space when administered intranasally. The peak blood concentrations are reached at 2 min and decrease rapidly within 15 min (Hill et al., 1981). In their study, Hill and colleagues (1981) claimed that neither systemic hypotension nor tachycardia occurred following the administration of the drug by this route. However, doses used were smaller than those of the present study. Since the hypertensive response to laryngoscopy and intubation is observed after 15 s (Stoelting, 1977), the intranasal administration of NTG 1 min before the start of the injection of thiopentone should produce peak concentrations coincident with the increase in arterial pressure which accompanies laryngoscopy and intubation. An allowance of 30–45 s was made to cover the times required to inject the thiopentone and suxamethonium and undertake laryngoscopy.

No significant increases in SAP were observed, after laryngoscopy and tracheal intubation, in those patients who received intranasal NTG whereas SAP was significantly increased in the other patients. HR was significantly increased in both groups of patients after intubation and no significant differences were detected either before anaesthesia or on intubation between the groups. The significantly faster HR observed in the NTG group at 5 min after intubation cannot be considered clinically significant, particularly since atropine had not been administered (Fassoulaki and Kaniaris, 1982).

The method used has been proved effective, safe, rapid, convenient and economical. The administra-
The usefulness of the nasal administration of NTG to attenuate the hypertensive response to laryngoscopy and intubation (Stoelting, 1979). In contrast a solution of NTG for intranasal administration can be prepared readily by the anaesthetist crushing NTG tablets in normal saline just before the induction of anaesthesia.

The principal advantage of the method described is that, while a desirable and transient hypotension is achieved, cardiac output is not likely to decrease to the same degree as with other hypotensive agents. Sodium nitroprusside has been used to attenuate the hypertensive response to laryngoscopy and intubation (Stoelting, 1979). However, the action of this drug on the coronary vessels has not been assessed. By dilating the coronary vessels just before the commencement of anaesthesia, NTG may increase coronary blood flow and oxygen delivery to the myocardium. Thus hypertension during tracheal intubation is avoided and, at the same time, the technique may be of benefit to patients with ischaemic heart disease and impaired myocardial function. However, it must be emphasized the the present study was based on healthy subjects and the data can not be extrapolated to hypertensive patients with myocardial ischaemia. Modifications of the dose of NTG used in the present study may be required.

In conclusion, the present study establishes the usefulness of the nasal administration of NTG to attenuate the hypertensive response to laryngoscopy and tracheal intubation.

REFERENCES


NITROGLYCERINE AND THE PRESSOR RESPONSE TO INTUBATION


L’ADMINISTRATION PAR VOIE NASALE DE NITROGLYCERINE DIMINUE LA REPONSE TENSIONNELLE A LA LARYNGOSCOPIE ET A L’INTUBATION TRACHEALE

RESUME

L’administration par voie nasale de nitroglycerine (NTG) a été utilisée chez 35 femmes adultes 1 min avant l’induction de l’anesthésie. Un groupe contrôle de 32 patients n’a pas reçu de NTG. La pression artérielle systolique (PAS) et la fréquence cardiaque (FC) ont été mesurées avant l’induction de l’anesthésie et à 0, 3 et 5 min après l’intubation trachéale. La PAS n’a pas augmenté de façon significative dans le groupe NTG juste après l’intubation alors que des diminutions significatives de PAS ont été observées à 3 et 5 min (P<0,005 et P<0,001 respectivement). La PAS a augmenté de façon significative dans le groupe contrôle. La FC a augmenté dans les deux groupes juste après l’intubation (P<0,001 et P<0,001 respectivement). La NTG administrée par voie nasale est une méthode sûre, simple et efficace pour atténuer la réponse hypertensive à la laryngoscopie et à l’intubation trachéale.

ZUSAMMENFASSUNG

Nitroglycerin (NTG) wurde 35 erwachsenen Patientinnen eine Minute vor der Narkoseeinleitung intranasal verabreicht. Eine Kontrollgruppe, die aus 32 Patientinnen bestand, erhielt kein NTG. Der systolische arterielle Druck (SAP) und die Herzfrequenz (HR) wurden vor der Narkoseeinleitung und 0,3 und 5 Minuten nach der trachealen Intubation aufgezeichnet. Der SAP stieg in der NTG-Gruppe unmittelbar nach der Intubation nicht signifikant an, während signifikante Abfälle des SAP nach 3 und 5 Minuten zu beobachten waren (P<0,005 und P<0,001 in der genannten Reihenfolge), während SAP in der Kontrollgruppe sofort signifikant anstieg. Die HR war in beiden Gruppen unmittelbar nach der Intubation (P<0,001 und P<0,001 in obiger Reihenfolge) erhöht. NTG intranasal verabreicht ist ein sicheres, einfaches und wirksames Mittel um den Blutdruckanstieg nach Laryngoskopie und trachealer Intubation abzuschwächen.

INTRANASALE VERABREICHUNG VON NITROGLYCERIN SCHWÄCHT DEN BLUTDRUCKANSTIEG NACH LARYNGOSKOPIE UND TRACHEALER INTUBATION AB
Se llevó a cabo una administración intranasal de nitroglicerina (NTG) a 35 pacientes mujeres adultas 1 min antes de la inducción de la anestesia. Un grupo de control de 32 pacientes no recibió NTG. Se tomó registros de la presión arterial sistólica (SAP) y del ritmo cardíaco (HR) antes de la inducción de anestesia y a los 0, 3 y 5 min después de la intubación traqueal. La SAP no aumentó de manera significante en el grupo con NTG inmediatamente después de la intubación, mientras se observaron descensos significativos de la SAP a los 3 y 5 min ($P<0.005$ y $P<0.001$, respectivamente). La SAP aumentó de manera significante en el grupo de control. El HR aumentó en ambos grupos inmediatamente después de la intubación ($P<0.001$ y $P<0.001$, respectivamente). La administración intranasal de NTG constituye un método seguro, sencillo y eficaz de atenuar la respuesta hipertensiva a la laringoscopia y a la intubación traqueal.