A COMPARISON OF THE INCIDENCE OF CARDIAC ARRHYTHMIA DURING TWO METHODS OF ANAESTHESIA FOR DENTAL EXTRACTIONS

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SUMMARY

One hundred premedicated inpatients undergoing wisdom tooth extraction were divided into two groups of 50. Group A was anaesthetized by a technique based on droperidol and phenoperidine, whilst group B was anaesthetized with halothane. The e.c.g. in both groups demonstrated a similar overall incidence of cardiac arrhythmia, but analysis revealed a significantly higher incidence of ventricular arrhythmia in group B. The heart rate was significantly less in group A.

The association of cardiac arrhythmia with dental extraction under halothane anaesthesia is well documented (Kaufman, 1966; Rollason and Dundas, 1970; Alexander, 1971; Ryder, 1971). There is a lower incidence when i.v. methohexitone is used but the technique is associated with an increase in arterial pressure (Shafto, 1969; Wise et al., 1969).

Holderness, Chase and Dripps (1963) described the use of a droperidol and fentanyl combination during spontaneous ventilation, with nitrous oxide and oxygen for minor surgical procedures, and noted the profound analgesia, minimal hypotension, probable protection against adrenaline-induced ventricular arrhythmia and uncomplicated recovery associated with this technique (Holderness, Chase and Dripps, 1963). Droperidol has been shown to prevent adrenaline-induced cardiac arrhythmia during cyclopropane anaesthesia in man (Long, Dripps and Price, 1967), and has been used to abolish ectopic beats during minor oral surgery (Alexander, 1971).

This trial compared the incidence of cardiac arrhythmia during halothane anaesthesia and neuroleptanaesthesia.

PATIENTS AND METHODS

One hundred inpatients undergoing wisdom tooth extraction were studied consecutively in two groups of 50. All patients had a normal e.c.g. before operation.

Group A

Thirty-four females and 16 males aged between 14 and 39 yr (mean 22.9, SD 5.18), were premedicated as shown in Table I. On arrival in the anaesthetic room the heart rate and arterial pressure were recorded and the effect of the premedication noted. Droperidol 5–10 mg was given i.v., depending upon the degree of sedation, and phenoperidine 0.5 mg was given in all cases. Sleep was induced with thiopentone followed by suxamethonium 1 mg/kg. Nasal intubation was performed and the throat was packed with Vaseline gauze. The patient was ventilated with nitrous oxide (7 litre/min) and oxygen (3 litre/min) until spontaneous ventilation recommenced, further phenoperidine being given to maintain a respiratory frequency of 12–16 b.p.m. Anaesthesia was maintained using a circle absorber circuit with a 10-litre gas flow.

At the end of surgery the patient was allowed to breathe 100% oxygen whilst pharyngeal toilet was performed. A single cough was usual on removing the tube but laryngeal stridor did not occur. In the recovery area, the patient was invariably responsive to an auditory stimulus but slept if left undisturbed for any time up to 6 h after the operation.

Group B

Twenty-four females and 26 males aged between 16 and 48 yr (mean 24.86, SD 6.58), were...
Premedicated as shown in Table I. Sleep was induced with thiopentone.

Anaesthesia was maintained with halothane in nitrous oxide (7 litre/min) and oxygen (3 litre/min), delivered in concentrations of between 1% and 2% from a Mark II Fluotec vaporizer (Cyprane, Keighley). Suxamethonium 1 mg/kg was employed to aid nasal intubation and packing of the throat. The patients breathed spontaneously through a circle absorber circuit with a 10-litre gas flow.

E.c.g. was monitored on an oscilloscope (Video-graph 1A, M.I.E.) and a recording was obtained intermittently. Standard lead II was employed throughout and observations were confined to the period during operation on all patients. Only arrhythmia persisting for more than 3 s was recorded. Heart rate and arterial pressure were recorded 10 min after the start of surgery.

Quantal data were analysed using $\chi^2$ quantitative data using Student's $t$ test.

RESULTS

The data show a similar frequency of patients with cardiac arrhythmia in the two groups. However, analysis of the types of arrhythmia reveals significant differences (tables II and III).

| TABLE II. Number of patients developing cardiac arrhythmia |
| --- | --- |
| Group A | Group B |
| 10 (20%) | 11 (22%) |

| TABLE III. Analysis of cardiac arrhythmia |
| --- | --- | --- |
| | Group A | Group B |
| Functional rhythm | 10 | 5 |
| Fusion beats | — | 2 |
| Unifocal ventricular ectopics | — | 7 |
| Multifocal ventricular ectopics | 1 | — |
| Ventricular tachycardia | — | 2 |

Four patients in group B (halothane) had more than one type of arrhythmia. The ventricular arrhythmias in group B were distributed amongst nine patients. None in group A (droperidol/phenoperidine) had ventricular arrhythmia ($P < 0.01$). Despite the incidence of junctional rhythm in group A being twice that of group B, the difference is not statistically significant.

The arrhythmias did not require treatment, because of either spontaneous recovery or an absence of effect on other measurements. In only one patient there was a relationship between the onset of arrhythmia and manipulation of the tooth. In all the others the onset and cessation of cardiac arrhythmia were unrelated to the surgical stimulus. Analysis of the heart rate and arterial pressure recordings taken 10 min after the start of surgery revealed an insignificant difference between either the mean systolic or the mean diastolic pressures in the two groups, but a highly significant difference between the mean heart rates ($P < 0.005$) (table IV).

| TABLE IV. Heart rate and arterial pressure 10 min after start of surgery |
| --- | --- | --- |
| Range | Mean | SD |
| Systolic pressure (mm Hg) | 100–180 | 126.1 | 15.662 |
| Diastolic pressure (mm Hg) | 50–100 | 78.9 | 8.08 |
| Heart rate (beat/min) | 60–100 | 70.22 | 8.486 |
| Systolic pressure (mm Hg) | 80–180 | 127.2 | 15.562 |
| Diastolic pressure (mm Hg) | 50–110 | 80.0 | 9.849 |
| Heart rate (beat/min) | 60–110 | 83.32 | 13.609 |

DISCUSSION

It has been demonstrated, in man, that droperidol has an anti-arrhythmia action against a controlled adrenaline infusion during cyclopropane anaesthesia. However, this action of droperidol was not attributed to any significant $\alpha$- or $\beta$-blocking property of the drug in the dose used (Long, Dripps and Price, 1967). Ryder, Charlton and Gorman (1973) claimed that only small doses of practolol were required to produce a $\beta$-blocking effect. Holderness, Chase and Dripps (1963) conclude that the use of a droperidol/fentanyl combination confers protection against adrenaline-induced ventricular arrhythmia.

The cause of cardiac arrhythmia under halothane anaesthesia in dentistry is reputed to be an increased concentration of catecholamines exerting a $\beta$-stimulating effect on a myocardium sensitized by halothane (Black, 1965; Katz and Bigger, 1970). It has been suggested that the increase may be a result of stimulation of the fifth cranial nerve (Ballentine and Jackson, 1960; Hunter, 1964), the increase in carbon dioxide associated with respiratory depression (Miller et al., 1970) and fear, especially in the unpremedicated patient.

The significance of cardiac arrhythmia is debatable. It may cause a decrease in cardiac output (Parje and Rudewald, 1965; Bartel and McIntosh, 1971) and it
has been suggested that ventricular fibrillation and death may ensue (Annotation, 1966). Cardiac arrhythmia cannot be totally excluded as a cause of collapse in the dental chair (Bourne, 1970). Allen and colleagues (1965) noted little change in cardiac output during ectopic rhythm in fit patients undergoing dental extractions under general anaesthesia and Dr P. W. McCormick (personal communication) reports that the most frequent change accompanying a ventricular ectopic rhythm is an increase of arterial pressure. Alexander (1971) concluded that most of the ectopic rhythms, which had been termed ventricular, were in fact nodal in origin. To support this conclusion, he cited a detailed analysis of e.g. traces, the refractoriness of the suspect ectopics to lignocaine, and the lack of any associated clinical effect.

It is difficult to compare our data with other studies of cardiac arrhythmia during oral surgery, because of the varying use of premedication, length of surgery and the proportion of anaesthetic time during which the electrocardiogram was monitored. However, the incidence of 20% of patients in group A exhibiting cardiac arrhythmia and 22% in group B would appear to be in agreement with Tuohy (1968), Rollason and Dundas (1970), Alexander (1971) and Ryder (1971).

CONCLUSION

In a comparison with halothane anaesthesia, the use of neuroleptanaesthesia for inpatient wisdom tooth extraction significantly reduces the incidences of ventricular arrhythmia and produces a slowing of the heart rate.

REFERENCES


COMPARAISON DE L'INCIDENCE DE L'ARYTHMIE CARDIAQUE PENDANT L'APPLICATION DE DEUX METHODES D'ANESTHESIE POUR LES EXTRACTIONS DENTAIRES

RESUME

Cent patients hospitalisés soumis à une prémédication avant de subir une extraction de dent de sagesse ont été divisés en deux groupes de 50. Le groupe A a été anesthésié à l'aide d'une technique basée sur le droperidol et la phénoperidine, tandis que le groupe B a été anesthésié à l'halothane. Les électrocardiogrammes des deux groupes ont démontré qu'il existait une incidence générale similaire d'arythmie cardiaque, mais l'analyse a révélé l'existence d'une incidence beaucoup plus importante d'arythmie ventriculaire dans le groupe B. La fréquence cardiaque a été nettement inférieure dans le groupe A.

EIN VERGLEICH DER HäUFIGKEIT DES AUFTRETTENS VON HERZARRHYTHMIE WÄHREND ZWEI NARKOSEMETHODEN BEI ZAHNEXTRAKTIONEN

ZUSAMMENFASSUNG

Einhundert medikamentös vorbehandelte Patienten in einem Krankenhaus wurden für die Extraktion eins Weisheitszahnes in zwei gleichgrosse Gruppen geteilt.
Gruppe A wurde mit einer auf Droperidol und Pheno- 
peridin beruhenden Methode narkotisiert, Gruppe B mit 
Halothan. Die EKGs zeigten bei beiden Gruppen eine im 
allgemeinen ähnliche Häufigkeit des Auftretens von Herz- 
Arrhythmie, eine Analyse ergab jedoch eine wesentlich 
höhere Häufigkeit von ventrikularer Arrhythmie bei Gruppe 
B. Die Herztätigkeit war in Gruppe A wesentlich niedriger.

COMPARACION DE LA FRECUENCIA DE 
ARRITMIA CARDIACA DURANTE DOS 
METODOS DE ANESTESIA EN EXTRACCIONES 
DENTALES

SUMARIO
Un centenar de pacientes internos premedicados sometidos 
a extracciones dentales fueron divididos en dos grupos de 
50. El grupo A fue anestesiado mediante una técnica 
basada en droperidol y fenoperidina, mientras que el 
grupo B fue anestesiado con halotano. El ECG en ambos 
grupos mostró una frecuencia general similar de arritmia 
cardiaca, pero el análisis reveló una frecuencia significa- 
tivamente mayor de arritmia ventricular en el grupo B. 
La frecuencia cardiaca fue significativamente menor en el 
grupo A.
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