A DOUBLE BLIND COMPARISON OF PANCURONIUM AND D-TUBOCURARINE FOR ENDOTRACHEAL INTUBATION

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THE CONTINUING SEARCH for an ideal non-depolarizing muscle relaxant has led to the synthesis of Pancuronium Bromide (Pavulon®).

First synthesized in 1964 by Hewett and Savage, this bisquaternary aminosteroid produces a non-depolarizing block. Extensive clinical investigation has established the safety and usefulness of this relaxant.[1] Unlike D-tubocurarine, ganglionic blockade and histamine release have not been prominent features. Thus hypotension and bronchoconstriction are not anticipated and Pancuronium has been shown to be readily reversed by the anticholinesterases.

METHODS

Ampoules of D-tubocurarine and pancuronium were made up such that each 10 ml ampoule contained either 30 mg of D-tubocurarine or 6 mg of pancuronium. The ampoules were alike in all respects and the injectable solutions were similar in colour and consistency. By means of a table of random numbers the ampoules were labelled by the Hospital Pharmacy and the code retained there until the study was completed.

We assumed from the work of Baird[2] that volume for volume, D-tubocurarine and pancuronium were equally potent, i.e. 7 ml of the ampoule contained 20 mgs of D-tubocurarine or 4 mg of pancuronium and the relaxant properties would thus be similar. This assumption allowed the drugs to be given blindly. This series consists of 191 patients of which 93 were found to have been given D-tubocurarine and 98 received pancuronium.

PATIENTS

Most of the patients were undergoing routine elective surgery; the majority being gynaecological in nature (Table I). 89 per cent were ASA risk 1 (Table II), reflecting the population selection. Premedication was not standardized (Table III). The pulse and systolic blood pressure were recorded immediately prior to induction and every five minutes thereafter.

INDUCTION

Seven ml of the numbered ampoule was injected through a free-running intravenous infusion and any observation of pain or burning made by the patient was

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TABLE I

Surgical Procedures	D-tubocurarine	Pancuronium
GYNAECOLOGICAL		
(a) Vaginal	31	30
(b) Abdominal	37	36
GENERAL SURGERY		
(a) Abdominal	12	20
(b) Body Wall	2	2
CARDIOVASCULAR		
(a) Abdominal	4	2
(b) Thoracotomy	1	2
OTHER EXTRA-PERITONEAL	6	6

TABLE II

AMERICAN SOCIETY ANESTHESIOLOGIST'S RISK

Risk	D-tubocurarine	Pancuronium
1	83	86
2	10	9
3	0	3
4	0	0

TABLE III

Pre-Medication	D-tubocurarine	Pancuronium
Meperidine and Atropine	60	71
Atropine	2	2
Meperidine, Promethazine, Atropine	19	14
Morphine & Atropine	12	11

noted. This was immediately followed by an induction dose of 2.5 per cent thiopentone appropriate for the patient's age and weight. The patient was then gently ventilated with nitrous oxide oxygen 5:2 by mask until two minutes had elapsed following the relaxant administration.

The larynx was exposed and the degree of abduction of the vocal cords, resulting from direct stimulation and the ease of intubation were noted. Based on these observations the intubation conditions were recorded as excellent, satisfactory or poor.

MAINTENANCE

Following the intubation anaesthesia was maintained with nitrousoxide and oxygen and 5:2 ratio using an Air Shields Ventimeter Ventilator to produce mild hyperventilation. The additional anaesthetic agents used are shown in Table IV.

A supplemental dose of 3 ml of relaxant was given when the usual clinical signs of fading relaxation were apparent (increased ventilation pressure, diaphragmatic movement, abdominal wall tension, etc.).

At the end of surgery the patients were all given atropine 1.2 mg and neostigmine 2.5 to 5.0 mg. In no case was reversal unsatisfactory.

Results

Table V shows that, two minutes after intravenous injection, pancuronium provided better conditions for intubation than an equally potent dose of D-tubocurarine. To qualify as excellent intubation conditions, we expected adequate relaxation of the jaw to allow easy exposure of the larynx. The vocal cords were widely dilated and either did not react to direct stimulation with the endotracheal tube or merely showed a faint tensing. No straining or coughing was seen in this group following intubation. Twenty-one patients in the D-tubocurarine group had a decrease of blood pressure greater than 15 per cent, while only 9 patients in the pancuronium group showed such a drop following its administration.

The duration of the surgical procedures varied greatly and we were thus not always able to ascertain the duration of action of the relaxant. This is shown in Table VI in which we see little difference in the time to requirement for the first additional dose of relaxant.

No data have been presented on the relaxant reversal, but in all cases adequate reversal was easily obtained. Thirty-one patients complained of pain or burning at the injection site with pancuronium as did 8 patients in the D-tubocurarine group. A flush over the upper body was frequently seen in the D-tubocurarine group but seemed unrelated to any hypotensive episode (Table VII).

TABLE IV

Additional Anaesthetic Agents	D-tubocurarine	Pancuronium
Halothane	12	11
Methoxyflurane	0	3
Innovar (droperidol and fentanyl)	66	67
None	15	17

TABLE V

Intubating Conditions	D-tubocurarine	Pancuronium
Excellent	38	83
Satisfactory	46	13
Poor	9	2

TABLE VI

Relaxant duration 1st Additional Relaxant (min).	D-tubocurarine	Pancuronium
Less than 30	8	8
30–45	23	25
45–60	14	13
60 plus	2	5

TABLE VII

Reaction to Relaxant	D-tubocurarine	Pancuronium
Skin flush	15	0
Pain or burning	8	31

Summary

A comparison of D-tubocurarine and pancuronium is presented from the result of a double blind trial. Although the subsequent clinical anaesthetic course is similar for the two drugs, we feel there is a distinct difference in intubating conditions. Relaxation of the jaw and vocal cords allows for repeated laryngeal exposure if necessary. The speed of onset of relaxation and absence of serious side effects suggests it would be a useful addiiton to our non-depolarizing relaxants. We suggest this drug will find a place in the teaching of endotracheal intubation to medical students and junior residents.

Résumé

Nous avons fait une comparaison entre la D-tubocurarine et le Pancuronium à la suite d'une étude à double inconnu. Même si le cours subséquent de l'anesthésie clinique est le même, nous avons l'impression qu'il y a une différence notable au moment de l'intubation. Le relâchement du maxillaire et des cordes vocales permet de faire plusieurs essais si nécessaire. La vitesse d'action et l'absence d'effets secondaires sérieux nous font croire qu'il serait utile parmi nos myorésolutifs non dépolarisants. Nous sommes d'avis que ce médicament devrait se trouver une place là où se fait l'enseignement de l'intubation trachéale aux étudiants en médecine et aux résidents juniors.

REFERENCES

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