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## ASPECTS OF THE INDUCTION OF ANAESTHESIA WITH THIOPENTONE

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Although the contra-indications to the use of thiopentone diminish with the experience of the administrator,<sup>1</sup> Kok has recently again emphasized the potential dangers of thiopentone as an anaesthetic agent.<sup>2</sup>

When thiopentone is given to induce anaesthesia, a temporary fall in the blood pressure and a depression of respiration occurs, which if excessive may lead to myocardial anoxia.

**Case History.** A man aged 63 years had had a femoral arterial graft on the previous day. Subsequently the circulation to both lower limbs became impaired and it was decided to explore the aortic bifurcation. The patient appeared ill. The blood pressure, which had been 140/95 mm. Hg the previous day, was now 120/90 mm., and extra systoles not previously noticed were fairly frequent. He was pre-medicated with 1/6 gr. of morphia and 1/100 gr. of atropine and anaesthesia was induced with 4 c.c. of 5% thiopentone, followed by 25 mg. of succinylcholine given intravenously. Intubation was carried out without difficulty or delay and the patient was inflated with oxygen. At this stage the pulse became impalpable and no heart sounds were heard on auscultation. The chest was opened within 5 minutes of the start of induction but resuscitation, including cardiac massage, was unsuccessful. A post-mortem examination revealed marked atheroma of the coronary arteries, an old septal infarct and marked myocardial fibrosis.

Although succinylcholine occasionally produces a profound fall in blood pressure,<sup>3</sup> it was thought that the use of thiopentone for induction was a major contributing cause of this death, and that had the induction been carried out with an inhalation agent this calamity would have been less likely. In my opinion, if a patient is critically ill in most cases the premedication should consist only of atropine and induction of anaesthesia can be more safely undertaken with an inhalation agent, provided the anaesthetist is proficient with such a technique. It is true that the fall in blood pressure and the depression of respiration can be lessened by the slow administration of minimal amounts of thiopentone; yet in practice these clinical signs are evident in a large majority of administrations of thiopentone. During induction with thiopentone, the breathing is often shallow and the respirations are then suddenly abolished for periods which are sometimes as long as 30 seconds or more. Anoxia is likely to occur at this time unless the patient is gently inflated with oxygen and it is a good practice to ask the patient to breathe deeply before and during the injection of thiopentone.

To estimate the fall in blood pressure which one might expect to follow the administration of thiopentone, the blood pressure was measured at 1, 5 and 10 minutes after the injection of thiopentone in 14 individuals varying in age between 15 and 73 years and averaging 41 years. The total dose in each case varied from 250 to 500 mg. according to the weight and condition of the patient, the average dose being 44 mg. per stone body-weight, and the thiopentone was administered as a 2.5% solution which was given over a period of 2 minutes without a pause. A graph in Fig. 1 represents the mean drop in the systolic blood pressures expressed as a percentage of the systolic pressures before induction and measured at 1, 5 and 10 minutes after induction.

In a second group of 18 patients, anaesthesia was induced with 2½% thiopentone containing 5mg. of methylamphetamine per 500mg. of thiopentone. The ages varied from 21 to 74 years, the average age being 56 years. The mean dose of thiopentone was 47 mg. per stone body-weight and the dose never exceeded 500 mg. The other graph in Fig. 1 represents the mean

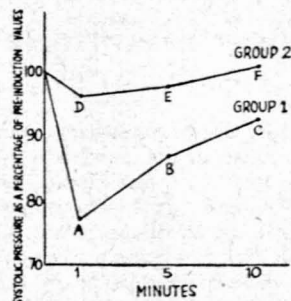


Fig. 1. Graphs comparing the changes in the mean systolic blood pressures in 2 groups. Anaesthesia was induced with thiopentone in group 1 and with thiopentone plus methylamphetamine in group 2.

Range	Standard Deviation	Range	Standard Deviation
A. 100—59%	11.0%	D. 116—73%	10.4%
B. 100—69%	9.2%	E. 112—75%	11.7%
C. 104—77%	8.1%	F. 120—89%	10.8%

changes in the systolic blood pressure expressed in a similar manner to the first group.

Apart from the addition of methylamphetamine to the thiopentone and the older average age, the second group did not appear to differ in any other respect from the first group. Half of each group were cases for thoracotomy and the other half were patients for gynaecological operations. In the majority of cases of both groups the thiopentone was followed by 20 mg. of tuberine, inflation with cyclopropane and oxygen, and intubation.

When the two groups are compared with respect to the blood pressure changes, the following observations can be made. At 1 minute after induction the mean fall in systolic blood pressure was 23% in group 1 and 4% in group 2. After 5 minutes the mean fall in systolic pressure was 14% in group 1 and 4% in group 2. After 10 minutes the mean fall in systolic pressure was 7% in group 1, and in group 2 the mean systolic pressure had risen to 1% above the mean pre-induction systolic pressure.

In group 1 the reduction in both pulse pressure and blood pressure was significant and lasted for 5-10 minutes. The fall in blood pressure was as large in the young patients as in the older ones; thus in 3 patients aged 15, 20 and 29 years, and all weighing approximately 9 stone, the respective falls in systolic pressure 1 minute after induction (with 500 mg. of thiopentone in each case) were 38%, 36% and 41%.

In group 2 no significant reduction in the mean blood pressure or pulse pressure followed induction, and no significant changes were noted in the heart rate or rhythm.

#### DISCUSSION

In the vast majority of anaesthetics where thiopentone is used for induction, all that is required of the anaesthetist is to administer the drug slowly in moderate proportions which experience will dictate. Adequate oxygenation can be ensured by inflating the lungs when necessary.

There is, however, a group of patients in whom it is particularly desirable to avoid a fall in the blood pressure during induction of anaesthesia. This group includes patients who are suffering from disease of the mitral valve, aortic valve, or

coronary arteries. The addition of a small amount of methylamphetamine to the thiopentone used in induction reduces the fall in blood pressure which is likely to occur. If larger doses of methylamphetamine are given it has been found that in certain cases the blood pressure and the cardiac work are increased to an extent which may be considered undesirable during the induction of anaesthesia. In these larger doses methylamphetamine might also reinforce any of the detrimental effects of sympathetic stimulation which sometimes accompany the induction of anaesthesia.

The purpose of this paper is to stress two clinical phenomena which follow the induction of anaesthesia with thiopentone, namely the fall in blood pressure and the depression of respiration. The simultaneous administration of methylamphetamine has been found to be of help in the type of case mentioned; but it is not suggested that it should be extensively used or that this practice should influence the dose or technique in the administration of thiopentone.

#### SUMMARY

Some of the dangers and problems which are met with during the administration of thiopentone for the induction of anaesthesia are discussed. The fall in blood pressure which occurred in a group of patients in whom thiopentone was used to induce anaesthesia is compared with the changes in blood pressure in a second group, in whom thiopentone plus methylamphetamine was used. Some indications for the use of this combination are suggested. In cases in which these indications were present this mixture has been used with satisfactory results by the author.

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