ACUTE CONVULSIVE REACTION TO SURFACE ANAESTHETIC:
TREATMENT BY DEPOLARIZING MUSCLE RELAXANT

BY

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The occurrence of toxic reactions following the use of topically applied local anaesthetics continues to be reported intermittently in the medical literature. Most of the reactions reported are convulsive in nature and many non-fatal cases have been treated by the intravenous injection of barbiturates, inhalation of oxygen, or oxygen and carbon dioxide mixtures, and other measures. The following case of convulsive reaction to amethocaine was treated with success by the intravenous injection of a short-acting, depolarizing muscle relaxant, suxamethonium.

CASE REPORT

Miss L. T., aged 65, was admitted to hospital suffering from right lower lobar pneumonia of acute onset. Her condition improved rapidly when treated with penicillin and tetracycline, but 4 weeks after the onset of her symptoms she developed signs of collapse of the right lower lobe, confirmed by X-ray. Over the course of the next few weeks this gradually re-expanded on physiotherapy, but on screening, 3 months after the original attack she was seen to have paradoxical movement of her right hemidiaphragm. She was then transferred from the outlying hospital, where she had been originally treated, to Morriston Hospital, Swansea, for further investigation to exclude a carcinoma of the bronchus.

On admission, examination showed her to be in good general condition, and young for her age. Blood pressure was 165/110 mm Hg and examination of her chest revealed signs of collapse of the right lower lobe. This was confirmed by X-ray, also by fluoroscopy, which revealed the presence of paradoxical respiration.

One week after admission, bronchoscopy was performed under local anaesthesia. Premedication was given in the form of pentobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by morphine 10 mg and atropine 0.6 mg hypodermically. Amethocaine 1 per cent was used in the form of perniobarbitone 180 mg orally followed by mor...
Next day the patient was quite normal and had no recollection of the events described, beyond remembering that she felt faint and "went off". In view of the alarming reaction to the amethocaine it was decided not to proceed with the investigation and the patient was discharged for follow-up as an outpatient, with no change in her X-ray appearances.

**DISCUSSION**

Since the reaction in this case followed immediately after the instillation of the contrast medium, the possibility must be considered that the convulsions resulted from the Dionosil. No reports of any like occurrences could be found in the literature, however, and the manufacturers knew of no similar toxic effects. On the other hand, the reaction followed exactly the known pattern of reaction to local anaesthetics and it can reasonably be ascribed in this case to the amethocaine.

Schoen (1939) described three cases of fatal convulsive reaction to amethocaine administered for the purpose of bronchography and laryngoscopy. He reviewed the literature available up to that time, and suggested that serious reactions could be avoided by addition of adrenaline to the amethocaine in all cases before use.

In Great Britain, renewed attention was drawn by Jackson in 1949 to the possible dangers attendant upon the application of local anaesthetics to the mouth, pharynx and respiratory passages, for the purpose of endoscopy. He mentioned two cases of convulsions which occurred during preparation for bronchoscopy using 2 per cent amethocaine with adrenaline. In a review of the literature, he found twelve deaths reported following the use of amethocaine for bronchoscopy and gastroscopy, and a further three deaths during preparation for urethral instrumentation. In addition Jackson mentioned many other non-fatal reactions which had been reported from Germany, the U.S.A., and Britain. In the great majority of cases, the reactions have followed the use of amethocaine rather than any other agent, and nearly always in a strength of 2 per cent or above.

Since 1949, endoscopies have continued to be performed under local anaesthesia in large numbers and further reports of toxic reactions, both fatal and non-fatal, have appeared.

Weisel and Tella (1951) reported nineteen reactions, seven of them convulsive in nature during the course of 1,000 endoscopies in which they used amethocaine in a maximum dosage of 40 mg. Palmer and Deutsch (1955) used 20 ml of 1 per cent amethocaine in the form of a gargle for oesophagoscopy in an ill patient, resulting in immediate cardiovascular and respiratory collapse and death, which they attributed to "sensitivity". Hohlfeld (1956) mentioned toxic reactions and death after cinchocaine, procaine and amethocaine, whilst Gillfillan (1956) reported a case in which a patient collapsed following the swabbing of the pyriform fossae with 1 per cent amethocaine and the instillation of about 3 ml of 1 per cent amethocaine into the trachea. Deep coma ensued with feeble twitchings of the limbs, followed by complete muscular flaccidity and cardiac arrest. This was treated successfully by cardiac massage; further muscle twitchings which then developed were controlled by thiopentone. The patient recovered.

Four other cases of reactions to unspecified surface anaesthetics are mentioned in the review of Edwards and his colleagues (1956) on deaths associated with anaesthesia, whilst more recently cases have been reported by Johnston, Jensen and Byrd (1958) and Gupta (1959). The _British Medical Journal_ (1961) reported the findings of an inquest upon a patient who suffered a fatal convulsive reaction to a surface anaesthetic. On this occasion, cocaine was used as preparation for bronchography. Convulsions which developed were treated with intramuscular adrenaline, and rapidly became fatal.

Examination of these various reports shows that amethocaine is incriminated far more commonly than any other drug, indeed, reports of serious reactions occurring after the use of other surface anaesthetic agents are surprisingly rare. This may be explainable partly by the fact that, especially in the U.S.A., the opinion is held that amethocaine is more effective as a surface agent than any other compound, and it is therefore used for the greater percentage of cases.

Adriani and Campbell (1956) in reviewing the fatalities which followed the application of local anaesthetics to mucous membranes suggested that, whilst other agents such as piperocaine, cinchocaine, cocaine and lignocaine caused convulsions, amethocaine is more likely to produce syncope and collapse. This is not, however, confirmed by study of the literature. They emphasize that the
principal danger lies in surface application; subcutaneous or spinal injection has been followed only very rarely by untoward reactions, and Horan (1952) has used amethocaine intravenously on many occasions without harm to the patient.

In recent years, lignocaine in a strength of 4 per cent has been advocated as a safer alternative to amethocaine and other drugs of the ester series. It is disappointing, therefore, to find that in Gupta's cases lignocaine appeared to be incriminated in addition to amethocaine. Furthermore, in this connection, it is interesting to note the findings of Foldes and his associates (1960). They compared procaine, 2-chloroprocaine, amethocaine and lignocaine by intravenous administration of clinically equipotent doses in conscious volunteers, and found chloroprocaine to be the best tolerated and lignocaine the least. These findings were considered to run parallel to the rate of destruction of the drugs by plasma cholinesterase, the three former drugs being hydrolyzed with varying rapidity, whilst lignocaine is resistant to enzymatic hydrolysis. Contrary to the usual opinions on the relative safety of lignocaine, they found that the rate of muscle fasciculation was highest following lignocaine, and one subject developed convulsions.

**Treatment of the acute convulsive reaction.**

The aetiological factors involved and the precautions to be taken over dosage, premedication, posture during administration and so on have been very adequately covered in recent years in papers by several authors, notably Sadove and his colleagues (1952), Elsen (1955), Steinhaus (1957) and Green (1958). This paper, therefore, does not pretend to review the whole subject but to consider only the treatment of the severe convulsive state.

All authors, in discussing such treatment, advise the use of an intravenous, short-acting barbiturate such as thiopentone, which should be available for immediate use whenever a patient is receiving a local anaesthetic by surface application. Steinhaus, however (1952; 1957), shows that whilst local anaesthetic agents cause stimulation of the cerebral cortex, they depress the brain stem with its vital vasomotor and respiratory centres. Intravenous barbiturates are also powerful depressants, both of the central nervous system and of the cardiovascular system. Their use, therefore, in breaking the sequence of motor cortex stimulation — convulsion — anoxia — circulatory depression might increase the depression to a fatal degree. Furthermore, in the presence of severe hypoxia, with central and peripheral circulatory failure, there is a real danger of administration of an excessive dose, owing to failure to allow for the increased circulation time. Indeed, most anaesthetists when anaesthetizing a patient in such a critical state would normally avoid the use of an intravenous barbiturate.

If, however, the convulsive state be terminated by the use of a short-acting neuromuscular blocking agent, no risk of further depression of the central nervous or cardiovascular systems is entailed. Oxygenation can be restored easily and maintained by positive pressure ventilation with oxygen, or oxygen and nitrous oxide, from an anaesthetic machine with facemask, which should always be to hand. Once the immediately critical state of hypoxia is under control, other drugs may be given as indicated, including barbiturates in small doses, under conditions in which their effects can be carefully observed and controlled. If further doses of muscle relaxants of depolarizing type are indicated by the recurrence of convulsions, atropine 1 mg should first be given intravenously, in order to prevent cardiac arrhythmias and sinus bradycardia, which may sometimes follow serial injections of suxamethonium compounds.

**SUMMARY**

A case of acute convulsive reaction to amethocaine is described, and the literature on the subject is reviewed.

The use of a short-acting neuromuscular blocking agent (suxamethonium) to control the convulsive state is described and its use is advocated in similar cases.

**ACKNOWLEDGMENT**

My thanks are due to Dr. E. A. Danino for permission to publish details of this case.

**REFERENCES**


**FIRST ASIAN AND AUSTRALASIAN CONGRESS OF ANESTHESIOLOGY**

The first Asian and Australasian Congress of Anesthesiology will be held in Manila from November 6 to 11, 1962.

The general theme of the Congress will be “Problems in Anesthesiology in Asia and Australasia” but papers may be submitted on any other subject.

Fifteen to thirty minutes will be allotted to each speaker and papers must be submitted by September 1, 1962.

All communications should be sent to: Dr. Quintin J. Gomez, Chairman of the Organizing Committee, First Asian and Australasian Congress of Anesthesiology, Philippine General Hospital, Taft Avenue, Manila.