tessalon. A severe headache also occurred in a patient given intravenous therapy. Naegeli (1956) has also found this symptom in patients treated with tessalon.

We are unable to confirm the antitussive action of tessalon that has been reported (Giuliano and Rossa, 1955; Bucher, 1956; Herzog, 1956; Naegeli, 1956; Neumann, 1956; Simon, 1957; Shane *et al.*, 1957). One patient noticed considerable relief from coughing while taking both the placebo and the drug, and another lost the desire to cough after intravenous administration of tessalon. All our patients, however, had a severe grade of dyspnoea with a relatively minor degree of cough.

Summary

Tessalon—a polyethylene glycol derivative of *p*-aminobenzoic acid—has been given intravenously in doses up to 45 mg. without causing symptoms or having any measurable effect on minute-volume, air flow, intrathoracic pressure, maximum breathing capacity, respiratory rate, pulse rate, and blood pressure in four normal subjects and 10 patients with chronic lung disease.

A double-blind trial of tessalon in 23 patients with chronic pulmonary disease did not have any beneficial effect.

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DOUBLE CARDIAC ARREST WITH SURVIVAL

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During tracheobronchial manipulations cardiac arrest is a well-known complication. Such arrest may occur at separate operations on the same patient (Lampson, 1951), repeatedly at one operation (Knowles, 1953), or during angiocardiology (Holmdahl and Gyllenswärd, 1954). If during a non-urgent operation arrest occurs, it is probably safer to terminate the operation as soon as possible after the heart is restarted. However, if the operation is urgent, the possibility of further cardiac

impairment during or following a necessary operation, once the heart has been restarted, must be weighed against the functional impairment resulting if the operation is not completed. This problem is illustrated by the following case report.

Case Report

A man aged 24 years was involved in a factory explosion and suffered 10% third-degree burns of both hands, face, and left thigh.

On three occasions (March 12, 14, and 20, 1957) he was anaesthetized and orally intubated under "narkotal" (an ultra-short-acting barbiturate), suxamethonium, pethidine, nitrous oxide, and oxygen, for cleaning and dressing of the burns, without untoward results.

March 21.—He was anaesthetized by one of us (B. L. F.) for the first time. It was noticed that he suffered very great pain in his hands and was in a state of extreme anxiety, in spite of premedication with morphine, 10 mg., and scopolamine, 0.3 mg. While a vein was being found for intravenous injection, he was moaning, restless, and terrified of the repeated attempts at venepuncture. Owing to the rather extensive third-degree burn surface in this case no cut down of the vein had been made. Anaesthesia was induced with narkotal, 300 mg., and suxamethonium, 100 mg. A No. 10 Magill cuffed tube was inserted orally and connected to the anaesthetic machine, the patient being ventilated with nitrous oxide and oxygen. At this stage he rapidly turned white and the pupils became widely dilated. Spontaneous respiration had not returned after the suxamethonium. His pulse could not be felt and cardiac sounds were not heard. 100% oxygen was administered, and within two minutes of detection of cardiac arrest one of us (B. O. N.) made a left submammary intercostal incision, without bleeding from the skin vessels, and a hand was placed around the pericardium. Immediately before massage, spontaneous heart beats returned, the skin wound began spurting, the colour became pink, and the pupil returned to normal size. Blood pressure and pulse became stabilized at 110 and 80 respectively. The operation was postponed to allow the patient to awaken, which he did on extubation. Apart from even greater anxiety after being told the reason for his submammary wound, cerebral function seemed normal.

March 26.—A further excision of granulation tissue of the burnt hands was performed. Premedication was with promethazine, 50 mg., pethidine, 100 mg., and atropine, 0.5 mg. The patient was still very frightened. Induction was with nitrous oxide and oxygen, venepuncture being avoided until he was asleep. Narkotal, 300 mg., pethidine, 50 mg., and suxamethonium, 200 mg., in intermittent doses were administered, but without intubation, and the operation proceeded without incident. During the operation an infusion was set up in the foot and continued until the following day. In this way a venepuncture was not necessary while the patient was awake, and the cause for some of his fears would be removed.

March 27.—Because of the second/third-degree burns in his face and also because of his state of anxiety it was thought that the best anaesthesia would be by intubation. He was premedicated with chlorpromazine, 25 mg., morphine, 10 mg., and scopolamine, 0.3 mg. Induction was by chlorpromazine, 10 mg., pethidine, 50 mg., narkotal, 300 mg., suxamethonium, 50 mg., and local analgesic spray to the larynx and trachea. A No. 10 Magill cuffed tube was passed and maintenance was with nitrous oxide and oxygen. At this stage the pulse was 80 and blood pressure 110, the skin colour was pink, and the pupils were of normal size. Very rapidly over the next minute the pulse became increasingly faster until it was uncountable and then impalpable, the blood pressure dropped to zero, the skin became pale, and the pupils became widely dilated. No heart sounds were heard and the previous submammary incision was reopened. The heart was in asystole and cardiac massage was applied. After about 10 compressions

of the heart, spontaneous beating recommenced, while blood pressure, pulse, skin colour, and pupils returned to normal. It was then discussed whether or not operation should continue, and it was decided to proceed with the skin grafts. For adequate working function of the patient's hands and a good result for the face they must be grafted as soon as possible, as in a subsequent anaesthesia he might develop an irreversible cardiac arrest. The operation lasted two hours (including cardiac arrest) without further incident, and the patient awoke immediately after extubation. He made an uneventful recovery except for a transient pleural effusion, which was tapped under local analgesia without further recurrence. Electrocardiograms taken on March 23, 27, 28, and 30 were normal.

The patient left hospital two weeks after the grafting. When seen three months later his hand function was fair, though he was still very anxious. Otherwise cerebral function was good. Later, operations were carried out seven times on the hands and face under local analgesia. On the hands the method used was brachial plexus block. There has been no further incident in connexion with these anaesthetics. When the patient was seen again one year and three months later, his anxiety was much less and the electrocardiogram continued to be normal.

Discussion

That cardiac arrest followed the fourth and sixth anaesthetics with intubation, but not the fifth without intubation, suggests that intubation triggered off cardiac arrest. Why this had not occurred after any of the first three intubations is not clear, but the patient's increasing fear may have passed a critical point at the fourth anaesthesia. The resulting increased reflex excitability, together with the viscerocardiac reflex (Keating, 1956) from intubation, might then have been enough to stimulate cardiac arrest. It seems clear that the possibility of cardiac arrest on intubation should be kept in mind if a patient comes to operation in great fear and/or pain. If it is possible to avoid intubation, other methods of anaesthesia should be employed. However, if (a) cardiac arrest has occurred, (b) the patient is young and otherwise healthy, and (c) cardiac resuscitation is successful with circulation restarted within the safety time-limit (less than three minutes without anoxia preceding the cardiac arrest) it is recommended that the operation be continued.

Summary

A case report is presented of a patient, in great pain and anxiety, who on two occasions developed cardiac arrest immediately after intubation.

On the first occasion, following successful cardiac resuscitation, the operation was postponed, but after the second successful resuscitation, operation being urgent and the patient young and otherwise fit, it was completed without further incident.

It is suggested that cardiac arrest under anaesthesia for an urgent operation, in a young and otherwise fit patient, need not warrant postponement of the operation if the heart can be successfully restarted.

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HEINZ-BODY ANAEMIA DUE TO DAPSONE

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Dapsone (diaminodiphenyl sulphone), originally introduced for the treatment of leprosy, has since 1953 (Kruizinga and Hamminga, 1953) been used in the treatment of dermatitis herpetiformis. Many authors have found it of great value (Vickers, 1954; Morgan *et al.*, 1955; Alexander, 1955), and it is preferred by many doctors and their patients to sulphapyridine, liquor arsenicalis, etc., which had previously been used to suppress the symptoms of this condition.

In dermatitis herpetiformis the minimum dose of dapsone required to suppress the symptoms varies greatly in different patients, some requiring as much as 200 mg. daily, while others are controlled by 50 mg. daily or less. Side-effects during dapsone therapy are common. The manufacturers give warning of the dangers of haemolysis; other side-effects which have been reported are liver damage, drug rashes, depression, which can be very severe, and, recently, agranulocytosis (McKenna and Chalmers, 1958).

It is well recognized that anaemia, sometimes severe, can occur during the course of dapsone therapy (Allday and Barnes, 1951; Kruizinga and Hamminga, 1953; Morgan *et al.*, 1955; Alexander, 1955). Early recognition of the onset of this state is important, and the detection of Heinz bodies is a most useful test. These are small refractile granules found in the red blood cells in many cases of drug haemolytic anaemia. They cannot usually be seen in a routinely stained blood film, but they are readily demonstrated by a simple technique, using a supravital stain.

Numerous Heinz bodies were found in a patient (Case 1) who developed haemolytic anaemia while taking dapsone, and as a result of this finding we performed the test in other patients.

Technical Methods

Demonstration of Heinz Bodies.—Method I:—A few drops of blood are mixed with about double their volume of 0.5% methyl violet in isotonic saline (this solution must be filtered before use). After standing for a few minutes, a drop is examined under a coverslip with the oil-immersion objective. *Method II* (permanent preparations):—A few drops of blood are mixed with about twice their volume of isotonic saline. The tube is centrifuged until the cells are deposited and the supernatant fluid is poured off. The cells are resuspended in a solution of 0.5% methyl violet in isotonic saline (filtered immediately before use). The tube is centrifuged again and films are made at once from the deposit; these are air dried and mounted without any fixation or counterstain.

Blood may be taken by finger prick or by venepuncture into citrate or ethylenediamine tetraacetate (E.D.T.A.). By either of the above methods Heinz bodies are shown as darkly stained discrete