Preliminary surveys show that antibody to Sendai virus is not uncommon in Southern England.

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SUXAMETHONIUM CHLORIDE ADMINISTRATION AND POST-OPERATIVE MUSCLE PAIN

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A great deal has been written in praise of suxamethonium chloride ("scoline") as a muscle relaxant in clinical anaesthesia, stressing its freedom from side-effects such as bronchospasm, tachycardia, and fall in blood pressure. In many ways suxamethonium is the ideal relaxant: the rapid onset of complete relaxation followed by the quick return of full muscle power has made it very popular for endotracheal intubation, orthopaedic manipulation, and short abdominal operations. The ideal conditions produced for intubation have undoubtedly reduced the incidence of minor trauma to lips, tongue, and teeth, and of sore throat. One of its principal disadvantages, that of prolonged apnoea, has received so much attention as to obscure other side-effects which produce considerable anaesthetic morbidity.

It is the purpose of this paper to call attention to muscle pain and stiffness, in some cases of great severity, following the use of suxamethonium in patients who are discharged from hospital within 48 hours of operation.

Churchill-Davidson (1954) first drew attention to muscle pains after suxamethonium administration, but this received little attention in the literature; some writers denied that it even occurred. It has been noted that patients kept in bed for two to four days after operation rarely complain of post-operative muscle pains. In the present investigations dental patients discharged the day after operation were chosen. The investigations were designed to show the incidence of post-operative muscle pain, to make an estimate of its severity, and to try to find some simple means of preventing it.

Technique

The patients were premedicated with "omnopon" and scopolamine, or morphine and atropine, in doses appropriate to their age, weight, and physical condition. Induction was with 0.5–0.75 g. of thiopentone 5%, immediately followed by suxamethonium, 50–75 mg., and naso-tracheal intubation. Maintenance was with nitrous oxide, oxygen, and trichlorethylene. On the Nosworthy card was recorded the occupation of the patient, the dose of suxamethonium, and its speed of administration, divided into fast, medium, and slow. The resulting fasciculations were recorded as strong, moderate, and weak, and any particular muscle group strongly affected was noted. The patient's shoulders, chest, abdomen, and legs were bared in order to observe this accurately. The patients were seen the day after operation, when they were discharged, and five days later in the out-patient department, when they attended for routine dental follow-up. The site of any muscle pain or stiffness, its severity, and any spontaneous observations of the patient were recorded.

Control Series

In all, 73 patients were anaesthetized in the way described and followed up. The results were: 25 (35%) complained of pain and/or stiffness on day of discharge; 52 (72%) complained of pain and/or stiffness when seen in out-patient department; and 16 (22%) complained of severe pain and/or stiffness.

The relationship of pain and stiffness to the degree of fasciculations was studied. There seems to be no clear-cut correlation between strong fasciculation and the development of severe pain and stiffness afterwards. Some cases in which the fasciculations were weak developed severe pain and stiffness. One case is of particular interest in this connexion. The only visible fasciculation was an isolated jerk of the rectus muscle, and the patient complained post-operatively that she felt as if she had been "kicked in the belly by a horse." However, when seen in the out-patient department five days later she had experienced generalized aching for three days after discharge. Likewise, there seemed to be no definite relationship between the occupation and the state of physical fitness of the patient. Many athletic patients developed pain, and a blacksmith's striker complained of severe shoulder pain.

Our results are thus in close agreement with Churchill-Davidson's figures—that is, 72% of cases developed pain and stiffness. Our incidence of severe pain was, however, much lower: 22% as compared with 42% approximately. This difference can be explained on the basis that Churchill-Davidson's cases were out-patients, immediately ambulant after operation, whereas ours were in bed for 24 hours after operation. The longer the patient remains in bed after operation the less likely he is to develop suxamethonium pain. One patient, an architect, who had undergone five dental operations before this investigation and developed suxamethonium pain after each one, gave a very interesting account of this phenomenon. He had observed that if he kept still and made no sudden movements he was free of pain; but any activity, such as getting up out of a chair, was painful. Patients quiescent in bed after operation may not notice any discomfort. The figures from the control series show this clearly. Many patients who have no pain on the day of discharge develop it later when they return home. The incidence of pain in patients seen in the out-patient department is twice that on the day of discharge.

Experiments with Modified Technique

The following modifications of anaesthetic technique were made in an attempt to abolish muscle pains:

1. *Chlorpromazine Hydrochloride Experiment.*—Chlorpromazine hydrochloride has a direct paralytic action on skeletal muscle (Burn, 1954). It was hoped that it might modify the painful after-effects of suxamethonium. Chlorpromazine hydrochloride, 50 mg., was given intramuscularly with the premedication. A further 25 mg. was given intravenously on arrival in the theatre, followed by 0.25 g. of thiopentone, 50–75 mg. of suxamethonium, nitrous-oxide, oxygen, and trichlorethylene. Fourteen cases were anaesthetized. The results were: 7 (50%) complained of

pain and/or stiffness on the day of discharge; 8 (56%) complained of pain and/or stiffness when seen in the out-patient department; and none complained of severe pain and/or stiffness. Although this series of cases was very small, administration of chlorpromazine hydrochloride did not seem to influence the incidence of post-operative pain, and the experiment was abandoned on account of the drowsy condition of the patients post-operatively, which in some cases persisted on the morning of discharge.

2. D-*Tubocurarine Chloride Experiment.*—In 65 cases Gray's test dose of D-tubocurarine (5 mg.) was given intravenously before the thiopentone and suxamethonium induction. It is important to observe the effects of these test doses, as a sensitive patient might develop a mixed block on subsequent suxamethonium administration. All of our cases developed ptosis, but none showed hypersensitivity. Visible fasciculations were not abolished in every case: in the few in which they did occur they were weak and transient. The results were: 2 (3%) complained of pain and/or stiffness on the day of discharge; 15 (22%) complained of pain and/or stiffness when seen in out-patient department; and 3 (5%) complained of severe pain and/or stiffness. Churchill-Davidson, in a much smaller series of cases, using 40 mg. of gallamine triethiodide in place of 5 mg. of D-tubocurarine, found that 40% complained of muscle pains, as compared with 22% in this series. There is no doubt that the administration of 5 mg. of D-tubocurarine effectively reduces the incidence and severity of post-operative suxamethonium pain, and is a simple practical measure. The case referred to above in which the patient had experienced suxamethonium pain from five previous anaesthetics underwent a further five dental operations during the investigations. In each of these inductions 5 mg. of D-tubocurarine was given before the thiopentone and suxamethonium induction as described, with complete relief of post-operative muscle pain.

3. D-*Tubocurarine Post-suxamethonium Experiment.*—In order to prove that 5 mg. of D-tubocurarine before suxamethonium is the effective measure in reducing muscle pains, 5 mg. of D-tubocurarine was given after the suxamethonium in 25 cases. No modifications of fasciculations were seen; this was expected, as suxamethonium acts more rapidly than D-tubocurarine. The results, as expected, correlate closely with the control series: 7 (28%) complained of pain and/or stiffness on the day of discharge; 19 (76%) complained of pain and/or stiffness when seen in the out-patient department; and 4 (16%) complained of severe pain and/or stiffness.

4. *Slow Administration Experiment.*—In 27 cases suxamethonium was given at the rate of 10 mg. per 30 seconds until apnoea occurred. When administered in this way fasciculations are greatly reduced in strength. The results were: 12 (44%) complained of pain and/or stiffness on the day of discharge; 20 (74%) complained of pain and/or stiffness when seen in the out-patient department; and 8 (30%) complained of severe pain and/or stiffness. Some of the most severe cases occurred in this group. One female patient was confined to bed on her return home and was so stiff and aching that her relatives had to lift and turn her over in bed. Bourne *et al.* (1952) state that where fasciculations are vigorous post-operative stiffness is more likely. This series shows conclusively that the degree of pain bears no relationship to the strength of visible fasciculations. Six patients who complained of severe pain had no fasciculations at all.

5. *Procaine Experiment.*—Procaine produces neuromuscular block by inhibiting production of acetylcholine at the end-plate. In 25 cases 10–20 ml. of 1% procaine was given intravenously before the thiopentone and suxamethonium induction. The results were: 2 (8%) complained of pain and/or stiffness on the day of discharge; 11 (44%) complained of pain and/or stiffness when seen in the out-patient department; and 3 (12%) complained of severe pain and/or stiffness. Procaine administration does seem to have some influence on suxamethonium muscle pain, but is a clumsy method and not so effective as D-tubocurarine. Procaine administration is time-consuming and suffers from the danger that it may prolong the action of suxamethonium, since they are both destroyed by the same enzyme.

Discussion

It is evident from the results of the investigations that suxamethonium is responsible for considerable post-operative discomfort when a patient is discharged home within 48 hours of its administration. After the patient has been up and walking around for about eight hours, aches and pains start, lasting two or three days; in some cases they are severe and may last for as long as six days. A common description by patients is to say, "I feel as if I had been kicked in the belly by a horse," or "trampled on by a herd of elephants": a tough young man will say, "I feel as if I have been in a brawl." Many patients have called in their own doctors for advice and treatment. The condition usually goes unrecognized, and various diagnostic labels are attached, such as "Fibrositis" or "You must have been in an awkward position on the table."

From the statistical results and from interviews with these patients in the out-patient department it is our firm opinion that suxamethonium should be given up as a relaxant in those cases where the patient is discharged within 48 hours of operation, unless previously modified with D-tubocurarine. Suxamethonium is often the relaxant of choice for a difficult intubation or a manipulation in a very muscular individual, and in these cases the likelihood of suxamethonium pain can be greatly reduced by the use of 5 mg. of D-tubocurarine before the suxamethonium.

Summary

229 cases undergoing dental operation were given suxamethonium chloride ("scoline") for endotracheal intubation, and the incidence of post-operative pain attributable to the drug was investigated.

Slow administration of suxamethonium does not reduce the incidence and severity of post-operative muscle pain.

The only practical and convenient measure to reduce this muscle pain is the administration of 5 mg. of D-tubocurarine or 40 mg. of gallamine triethiodide before the suxamethonium.

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For the first time a section devoted to hospitals will be included in the annual Congress of the Royal Society of Health, which is being held at Folkestone from April 30 to May 3. This section will be presided over by LORD INMAN, Chairman of Charing Cross Hospital. Another innovation will be a forum consisting of a general practitioner, two medical officers, the medical director of a London hospital, and a health visitor, which will discuss questions concerning the health and welfare of the family. During the Congress papers will be read on such subjects as world nutrition, new methods in food preservation, absenteeism in industry, marriage and mental health, slum clearance, food hygiene, fluoridation of public water supplies, and atmospheric pollution. To commemorate the tercentenary of the death of William Harvey, Sir ARTHUR MACNALTY will deliver a special lecture entitled "William Harvey—His Influence on Public Health." Provision has also been made for an overseas forum at which late papers from foreign delegates will be given.