

INCIDENCE OF "MUSCLE PAIN" AFTER SHORT-ACTING RELAXANTS

A COMPARISON BETWEEN SUXAMETHONIUM CHLORIDE AND SUXAMETHONIUM BROMIDE

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Muscular pain and stiffness following the administration of short-acting relaxant drugs such as suxamethonium chloride, which act by depolarizing muscle fibres, was first reported by Bourne *et al.* (1952). Further reports of the syndrome were published by Currie (1953), Sanger (1953), Wordsworth (1953), Churchill-Davidson (1954), Price (1944), Hegarty (1956), Morris and Dunn (1957), and Prince-White (1957). Though slightly varying estimates were given of the frequency with which the phenomenon occurred, all authors agreed that the condition could temporarily be quite disabling and was not something to be dismissed lightly.

It is known from experiments on human volunteers that the muscular twitchings that precede the onset of paralysis when suxamethonium compounds are given are themselves painful, but the relationship of degree of fasciculation to post-operative pain is still not certain. There does not appear to be a direct relationship, but diminishing the fascicular movements by previously giving one of the curariform drugs or the slow administration of a dilute suxamethonium solution, on the other hand, does lessen the incidence of pain. It has also been established that the syndrome is rarely seen in patients who are confined to bed for some days after their operation. It is most pronounced in those who are ambulant at any early post-operative stage. The general picture that has emerged is similar to that seen in a man of sedentary habits who takes violent exercise, such as a game of squash or tennis; and then, 12 to 24 hours later, finds himself hardly able to move because of the pain and stiffness in his muscles.

Under tropical conditions of heat it is known that the ready-made solution of suxamethonium chloride undergoes decomposition and loses its potency (Keating, 1956; Lewis, 1956; Lomaz, 1956; Rajagopalan, 1956; Rollison, 1958). Bullough (1957) also describes this as having occurred in ampoules of suxamethonium chloride stored in warm surroundings in this country. A detailed investigation of the decomposition of suxamethonium chloride solutions has been made by Earles *et al.* (1954). They state that at room temperatures there is a 4.9% loss of potency in 12 weeks and 19.5% in one year. The risk of decomposition is eliminated by using suxamethonium bromide ("brevdil M"), which is dispensed as a powder to be dissolved just prior to administration. The present investigation was undertaken to determine whether there was any

difference in the incidence of post-operative muscle pain if suxamethonium bromide was employed in place of suxamethonium chloride. That such a difference exists has been claimed by Ruddell (1957). It was thought that there might be some variation, for either of two reasons: (1) owing to the substitution of bromide for chloride as the cation radicle; or (2) owing to the differing methods of marketing of the two substances, with the consequent risk of decomposition in the case of the chloride.

Method and Material

We investigated 250 unselected patients admitted to hospital for oral surgery. The operations performed were removal of impacted wisdom teeth, multiple extractions, removal of dental cysts and unerupted teeth, and apicectomies. The patients were all clinically fit and their ages ranged from early adolescence to the middle fifties, the majority being between 20 and 45 years of age. There were 121 males and 129 females.

All the patients were premedicated with either "omnopon" and scopolamine or morphine and atropine in appropriate doses. The anaesthetic technique was as follows: induction with thiopentone and a short-acting relaxant, followed by endotracheal intubation (most commonly nasal) and insertion of a pharyngeal pack. Anaesthesia was continued with nitrous oxide and oxygen, supplemented when necessary with trichloroethylene or further doses of thiopentone. Post-operatively all patients were ambulant in the ward within 12 to 24 hours, and the majority were discharged from hospital on the day after operation.

So far as was possible, the anaesthetic routine described was used in every case, except that half the patients were given suxamethonium chloride as the short-acting relaxant and the other half received suxamethonium bromide. Dosages used were suxamethonium chloride 50-70 mg. and suxamethonium bromide 60 mg. The records of which drug was given to each patient were kept by the anaesthetist (R. A. L. L.), and the investigation and recording of the incidence of muscle pain and stiffness were made by the dental surgeons (D. S. H.-W. and R. A. J. M.). The latter questioned and examined all patients on the day after operation, before discharge from hospital, and seven to ten days later when they attended as out-patients. The dental surgeons had no knowledge of which relaxant drug had been employed in any patient. All doses of suxamethonium bromide were made up in 2 ml. of sterile normal saline, and the longest period between the making of the solution and its administration was two hours.

Results

There was, in fact, a striking similarity in the incidence of muscle pain and stiffness in the two groups: 46 (36.8%) patients who received suxamethonium chloride were affected and 45 (36%) of those who had suxamethonium bromide. The pain was similar in distribution and character to that previously described. It was commonest in the muscles of the chest, abdomen, and shoulder girdle, and in some cases was also present in the muscles of the limbs and neck. Again we confirm reports by other authors that the intensity of the muscular twitching occurring just before the onset of paralysis appeared to have no significant bearing on the

incidence of pain nor did the age of the patient, the muscular build, or the duration and precise nature of the operation performed.

There was, however, a remarkable sex variation. In both groups the incidence of pain and stiffness in females was almost exactly double that in males; the precise figures were:

Suxamethonium chloride	..	16 males	30 females
Suxamethonium bromide	..	14 "	31 "

This variation was mentioned by Currie (1953) and Hegarty (1956), but not by other authors. Two factors that may possibly have a bearing on this seem worth considering. First, assuming the analogy given in the last sentence of the second paragraph to be accurate, women, particularly married women between the ages of 20 and 40, tend to take less strenuous physical exercise than men, and on this ground one might expect an increased incidence. Secondly, a woman, particularly a married one with a young family, will in all probability have to take some exercise, in the shape of housework and other domestic duties, soon after discharge from hospital. She is thus likely to be exercising her muscles sufficiently to cause her to notice her symptoms. She is not in such a convenient situation as her husband, who can easily take a few days off work after his stay in hospital.

It is also of interest that few patients in each group (in fact, only seven in each) complained of pain in the first 24 hours. That the pain occurred only after leaving hospital does, in some measure, suggest that early ambulation plays an important part in its production.

Discussion

While there is no exact knowledge of the precise mechanism of production of this syndrome, we would fully agree with other authors that it does represent a not inconsiderable drawback to the use of depolarizing relaxant drugs in patients such as those who formed the material for this investigation, where early ambulation and discharge from hospital is the accepted practice. The clinical descriptions given by many of our patients follow very closely those recorded by Morris and Dunn (1957). On a few occasions patients have called in their general practitioner on account of the severity of the pain, especially when it has affected the chest and upper abdomen. In these situations it has often assumed a pleuritic character, leading to a diagnosis of pleurisy or even pneumonia. Some patients did, in fact, receive a course of antibiotic therapy on these grounds. Price (1954) states that in his experience the pain in the neck and back muscles has been so severe that a diagnosis of poliomyelitis or meningitis has provisionally been considered.

Some method of prophylaxis is to be desired. The most successful is alleged to be that advocated by Morris and Dunn (1957). They advocate the giving of small doses of gallamine triethiodide or D-tubocurarine chloride two to three minutes prior to the induction of anaesthesia with thiopentone and the short-acting relaxant. Using gallamine triethiodide, they give 40 mg. and with D-tubocurarine chloride 5 mg. This has the effect of diminishing the response of the muscle fibre to the depolarizing drug as regards the intensity of the muscular twitchings. They state that the incidence of pain and stiffness is thereby reduced to around 5%. The

use of two relaxant drugs which act through different pharmacological mechanisms simultaneously is, however, open to objection. As Hodges (1957) has pointed out, any variation from the expected response of the patient to either drug will produce a situation which will, at least, be inconvenient to the anaesthetist and, at worst, may be one of extreme danger to the patient. In addition the use of gallamine and D-tubocurarine does not completely abolish the post-operative pain. Further work is necessary if a most convenient and useful anaesthetic technique is to be made free from undesirable side-effects from the patient's point of view.

Summary and Conclusions

Suxamethonium bromide was used as the relaxant for endotracheal intubation in 125 patients undergoing oral surgery, and the incidence of post-operative muscle pain was compared with a parallel series in which suxamethonium chloride was used. No significant difference in the incidence was noted.

In both series women showed a greater incidence than men, and a suggested reason for this fact is given.

Agreement is expressed with the views of other authors that the likelihood of post-operative pain represents a serious disadvantage to the use of short-acting relaxants in patients where early ambulation is desired.

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Six students from the Westminster Medical School have recently returned from a scientific expedition to the Belgian Congo. The work they did included a general medical survey of the village of Yalolia on the North bank of the Congo River. There were 203 members of the forest-dwelling Turumbu tribe in the village, and a representative quarter—51 men, women, and children—were examined. The incidence of various pathological conditions in this sample was filariasis (*perstans*) 37 (74%), ankylostomiasis 25 (50%), tinea skin infections 17 (34%), onchocerciasis 11 (22%), scabies 9 (18%), *Enterobius vermicularis* infection 8 (16%), yaws 7 (14%), M.T. malaria (proved by blood examinations) 5 (10%), tropical ulcers 4 (8%), leprosy 2 (4%), eosinophilia 44 (88%), hepatomegaly 32 (64%), splenomegaly 23 (46%), monocytosis 7 (14%), anaemia 40 (80%).