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PETHIDINE AND SCOPOLAMINE IN LABOUR

BY

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Pethidine and scopolamine have been used for obstetric analgesia in the obstetric department of the Postgraduate Medical School of London during the past two years. Scopolamine was employed in addition to pethidine in order to secure a more certain analgesia than can be obtained with pethidine alone. The experience of others has demonstrated the safety of pethidine, but at the same time it has become apparent that in a relatively high proportion of cases the analgesia induced by it alone may be inadequate (Barnes, 1947; Cripps, Hall, and Haultain, 1944; Gallen and Prescott, 1944).

Our aim has been to provide rest and sleep during the latter and more painful part of the first stage of labour and to give relief during the second stage without impairing the patient's power of co-operation. There has been no hesitation in complementing the pethidine and scopolamine with gas-and-air or "trilene" inhalations if necessary during the second stage or during the actual delivery. There were 2,651 deliveries in the department from Oct. 1, 1946, to Dec. 1, 1947, and in 885 of these the mothers received pethidine and scopolamine; 500 of the latter group were personally observed, and these form the material of this communication.

Except for five cases of toxæmia of pregnancy, one patient with hydramnios and mitral stenosis, and two cases of mild ante-partum hæmorrhage of undetermined origin, all the cases were normal. We do not regard pethidine and scopolamine as contraindicated in toxæmia. In fact, it is only in eclamptic cases that pethidine and scopolamine are not given, because these need a more intensive sedation.

The 500 cases include four twin pregnancies and one set of triplets, making 506 infants in all. There were 378 primiparae and 122 multiparae.

Dosage

When the administration of pethidine and scopolamine was first introduced into this department the following rules were laid down for guidance: (1) Labour must be established before administration of analgesia. Uterine contractions must be of good amplitude and occur at regular intervals. (2) Dilatation of the os uteri must have reached at least three fingers in a primipara and two fingers in a multipara.

The first dose consists of pethidine, 100 mg., and scopolamine, 1/150 gr. (0.43 mg.), intramuscularly. A second similar dose is given one hour after the first, but its administration must be judged according to the merits of each case and in relation to (a) the rate of dilatation of the os uteri, and (b) the degree of dilatation one hour after the first dose. If the os is rather more than three-quarters dilated it is not advisable to give the dose unless pethidine alone is given.

Subsequent doses can be given at intervals of four to six hours; however, if possible scopolamine is not given within two hours (at least) of delivery, as it may promote some non-cooperation of the mother and some respiratory depression of the infant. The maximum dosage of scopolamine in this series was three doses each of 1/150 gr., and it was given over a period of 18 hours together with 400 mg. of pethidine. The labour lasted 33 hours altogether. It has been found that the intervals between the doses are lengthened as time and labour go on, the amount and frequency varying with each patient. The maximum amount of pethidine used in a single case in this series was 500 mg., and this was given over a period of 30 hours together with two doses of scopolamine, each of 1/150 gr.

Route of Administration

The drugs were generally given intramuscularly, but if the patient was suffering unduly and immediate relief was required the first dose was given intravenously, at least three minutes being taken over the injection. Subsequent doses were given intramuscularly. Schumann (1944) recommends intravenous administration if the patient is expected to be delivered in two hours. For three months pethidine has been administered intravenously at full dilatation of the os, and also in the second stage up to within 10 minutes of delivery, without adverse effect on the foetus. The dose of 100 mg. is diluted with either sterile distilled water or sterile normal saline to double its former volume and is given over a period of three minutes or more to avoid the subjective symptoms of nausea, vomiting, and dizziness. This was used to show that women need not be deprived of adequate relief from pain although they might be well advanced in labour on admission to hospital, and this method was found to be very satisfactory. The patient is eased of her pain to a marked degree, and gas-and-air or gas-and-oxygen is given during the delivery if necessary.

Two years' continued use of pethidine and scopolamine as an analgesic during labour has shown that a large percentage of the cases require only the first dose or the first dose plus 100 mg. of pethidine one hour later. An analysis of the dosage given to the 500 cases is shown in Table I. It will be seen that the majority of cases required only the smaller doses of pethidine and scopolamine; this is particularly noticeable in the multiparae, although at least 13 primiparae who received pethidine, 100 mg., and scopolamine, 1/150 gr., would have benefited from another dose of 100 mg. of pethidine.

TABLE I.—*Dosage*

Pethidine	Scopolamine	Primiparae	Multiparae
100 mg.	1/150 gr.	153	70
100 "	1/100 "	77	33
200 "	1/150 "	75	8
200 "	1/100 "	19	6
200 "	1/150 " (twice)	26	5
300 "	1/150 "	12	
300 "	1/150 " (twice)	6	
300 "	1/150 " (twice)	3	
400 "	1/150 "	2	
400 "	1/150 " (twice)	3	
400 "	1/150 " (thrice)	1	
500 "	1/150 " (twice)	1	

Degree of Analgesia Obtained

The degree of analgesia obtained has been classified as follows:

Good.—This includes (a) complete relief from pain and complete amnesia; (b) complete relief from pain and partial amnesia; and (c) almost complete relief from pain and no amnesia.

Satisfactory.—Here the pain was relieved to such an extent that although the patient could feel it to a mild degree her labour seemed easy.

Fair Only.—In this group the patient gained some relief, but not enough to make the labour easy. Frequently this was due to the fact that the patient had not received enough pethidine and scopolamine; these cases are mainly primiparae who had pethidine, 100 mg., and scopolamine, 1/150 gr., only, and occurred in our early trials.

All the patients came under one of these headings, so that all of them obtained some relief (Table II). This classifica-

TABLE II.—*Degree of Relief Obtained*

Relief Obtained	Primiparae	Multiparae
Good	306	105
Satisfactory	55	14
Fair only	16	2
Difficult to assess	1	1

tion of the degree of relief has been compiled from personal observations of the patients during labour and from their own opinion the next day when questioned. They were encouraged to describe the relief in their own way, and not to give answers to leading questions. The two cases under the heading "difficult to assess" are here described:

A 1-para aged 31 was hysterical on admission. She became settled for a few hours after an intramuscular injection of pethidine, 100 mg., and scopolamine, 1/150 gr., but at full dilatation of the os she became unmanageable again and a forceps delivery was necessary.

A primigravida aged 33 was hysterical on admission. She slept after an intramuscular injection of pethidine, 100 mg., and scopolamine, 1/150 gr. The pethidine was repeated with effect. However, she became very uncooperative on reaching the second stage of labour and forceps were applied because of this.

Co-operation of the Patient during Labour

The majority of the patients were co-operative, and even though a large proportion of them were sleepy in the second stage they would "push down" when encouraged. However, it was noticed that patients allowed to lie quietly on their side would push down automatically when the second-stage pains occurred even though they were very sleepy, and labour proceeded without any encouragement from the midwife.

An analysis of the varying degrees of co-operation in the 500 cases showed that 466 patients were co-operative, 27 fairly co-operative, and 7 non-cooperative.

Of the 27 fairly co-operative patients nine became non-cooperative and tired in the second stage where mechanical difficulties impeded the advance of the head, and all ended

as forceps deliveries; one was a primipara breech delivery; 16 would have been more co-operative if more pethidine had been given to increase the degree of analgesia; and one had had three 1/150-gr. doses of scopolamine, which is regarded as a large amount, and she was completely disorientated.

The 7 non-cooperative patients were as follows: One was a Russian who did not speak English. The foetal head was held back by a rigid perineum. When questioned the next day she did not remember anything of her labour. One had a reaction to scopolamine although only two 1/150-gr. doses were given. Two were hysterical on admission, and have been described. Three had a reaction to scopolamine after only one dose of 1/150 gr. They had complete amnesia.

The Excitement Factor in Scopolamine Administration.

It has been explained that four cases were non-cooperative during labour owing to the administration of scopolamine. In these cases the dosage was comparatively small. Three other patients were completely disorientated during the first stage of labour and tended to wander about the labour ward, but they were quite amenable to treatment and have been grouped under the heading of "fairly co-operative" in the second stage. It has seemed to me that the patients who became excitable after the administration of scopolamine were those who had a naturally excitable nature. Therefore the scopolamine is given according to the temperament of the patient and her reaction to the first dose. Complete amnesia is not the object of good analgesia; in fact, it is best if the mother can remember the major part of the labour. The most satisfactory result is where she realizes what is happening but does not feel the pain. Scopolamine is given only to increase the effect of the pethidine and not to produce the marked amnesia of the old twilight sleep.

Condition of the Infants at Birth

Since the introduction of pethidine and scopolamine into the obstetric department of this hospital there has not been an increase in the foetal mortality, and in cases of foetal morbidity the cause could not be attributed to the analgesia given during labour. Among the 506 infants there were three foetal deaths and 37 cases of foetal asphyxia.

Foetal Deaths.—There were two stillbirths and one neonatal death. One stillbirth, the second of twins, had a very rapid delivery, breech presentation; the first twin was in good condition. The other stillbirth was involved in a long second stage (3 hours 20 minutes) and the cord was tightly round its neck. The mother had had 400 mg. of pethidine and two 1/150 gr. doses of scopolamine over a period of 20 hours; the last dose of pethidine was given 3 hours 35 minutes before delivery. The neonatal death occurred in a premature infant of 34 weeks; it was very feeble at birth and lived only 11 hours.

Foetal Asphyxia.—There were three cases of "white asphyxia" and 34 cases of "blue asphyxia." The cases of "white asphyxia" were as follows: (1) The mother was the Russian referred to above. Pethidine, 200 mg., and scopolamine, 1/150 gr., was given. (2) There was a show of meconium-stained liquor in the early stage of labour although the foetal heart was satisfactory until the end of the second stage. (3) This case was due to a very rigid perineum. All three recovered in a few hours. The "blue asphyxia" babies were quiet at birth and rather slow to breathe, or respiration was impeded by the presence of mucus in the air passages. Thus any baby who did not breathe and cry spontaneously at birth has been included in this group. They all recovered completely within 10 minutes. The probable causes of the asphyxia were as follows: prematurity, 4; cord round the neck several times, 4; rigid perineum, 2; forceps delivery for some mechanical obstruction, 11; triplets, 1; and mucus in the air passages in considerable quantities, 10. The maternal mortality was nil. However, some patients suffered from either all or some of the

subjective symptoms which occur after the administration of pethidine—i.e., nausea, vomiting, and dizziness—but the proportion was very small. There were no other reactions suggesting idiosyncrasy to pethidine.

Effect on Length of First and Second Stages

Comparisons have been made between the length of the first and second stages of normal cases receiving pethidine and scopolamine analgesia and similar patients having only gas-and-air or trilene inhalations. They have been classified

TABLE III.—Duration of Labour

Date		No.	Mean Hours	Difference Between Means	S.D. of Diff. Between Means	t
<i>Primiparae, First Stage</i>						
1944-5	Gas, etc.	816	15.99	3.04	0.57	5.33†
1946-7	Gas, etc.	563	12.95	3.13	0.54	5.80†
1946-7	Pethidine and scopolamine	619	16.08			
<i>Primiparae, Second Stage</i>						
1944-5	Gas, etc.	816	1.005	0.016	0.040	—*
1946-7	Gas, etc.	563	0.989	0.120	0.044	2.73†
1946-7	Pethidine and scopolamine	619	1.109			
<i>Multiparae, First Stage</i>						
1944-5	Gas, etc.	946	9.17	1.29	0.31	4.16†
1946-7	Gas, etc.	737	7.88	3.18	0.54	5.89†
1946-7	Pethidine and scopolamine	199	11.06			
<i>Multiparae, Second Stage</i>						
1944-5	Gas, etc.	946	0.323	0.012	0.105	—*
1946-7	Gas, etc.	737	0.335	0.046	0.024	1.92*
1946-7	Pethidine and scopolamine	199	0.381			

* Not significant. † Significant at 1% level.

as follows: (1) All cases receiving pethidine and scopolamine between Oct. 1, 1946, and Dec. 1, 1947. (2) Patients having gas-and-air or trilene inhalations only during the same period of time. (3) Patients receiving gas-and-air or chloroform, using the Young Simpson inhaler, between Oct. 1, 1944, and Dec. 1, 1945; during this time pethidine and scopolamine were not used in the department. Each group has been divided into primiparae and multiparae. The results are shown in Table III.

The four groups of patients seem to follow much the same pattern, and will be considered together. The significant difference between the mean of 1946-7 patients receiving gas, etc., and that of the 1946-7 patients receiving pethidine and scopolamine seems at first to show that the latter combination lengthens labour. But the difference between the mean of 1944-5 patients receiving gas, etc., and that of 1946-7 patients receiving gas, etc., suggests that in fact the 1946-7 patients receiving gas include an unduly large proportion of short labours. Hence the pethidine-and-scopolamine group contains a correspondingly increased proportion of cases of long labour. When the 1944-5 patients are compared with the combined 1946-7 patients, it appears that the combined mean labour time of the latter would be less than that of the former. Thus there is a suggestion that pethidine and scopolamine in fact have the effect of *shortening* labour, if anything. To prove this an experiment designed to show up this effect on its own would be required.

The length of the third stage in the 500 deliveries has been grouped and is shown in the form of a graph (Fig. 1). The incidence of post-partum haemorrhage was 15, two

following forceps deliveries, and there were three retained placentas requiring manual removal.

Other Effects

Effect on Uterine Contractions.—In order to investigate the effect of pethidine and scopolamine on the frequency and amplitude of uterine contractions recordings were made on a kymograph with the aid of an abdominal

FIG. 1.—Showing the duration of the third stage of labour in 500 cases.

tambour. The abdominal method was used in preference to the intrauterine in order to avoid any false stimulus to the uterus. In some cases the recordings showed a lengthening of the time interval between the first two or three contractions after the injection of pethidine and scopolamine, but there did not seem to be any alteration of rhythm or amplitude. The patient became quieter and

FIG. 2.—Showing the uterine contractions during the first, second, and third stages of labour in a primipara. The relief obtained after the injection of the pethidine and scopolamine was good, the patient was co-operative in the second stage, and the baby was in good condition at birth. The third stage was normal.

slept after the injection, so there were fewer extrauterine excursions recorded on the drum and the picture presented a smoother appearance. When a recording was being made the majority of the initial doses were given intravenously in order to produce the maximum effect in a short time. Figs. 2 and 3 are typical of the results obtained from 35 patients.

FIG. 3.—Showing the uterine contractions of the first, second, and third stages in a multipara. The patient co-operated well, the baby cried before the shoulders were born, the placenta was expelled satisfactorily, and effective analgesia was obtained.

Blood-Pressure Changes.—In a number of cases blood-pressure readings were taken at intervals of one and two minutes before, during, and after the administration of pethidine and scopolamine, some patients being given intravenous injections and some intramuscular. These records show a short elevation varying between 5 and 30 mm. Hg. in the systolic and a smaller rise in the diastolic pressure. After 10 minutes the blood pressure returned either to normal or to a slightly lower level (Fig. 4). Hori and Gold (1944)

FIG. 4.—Typical graph showing blood-pressure changes on intravenous administration of pethidine and scopolamine during labour.

found that pethidine and scopolamine caused a fall of 40 mm. Hg in the systolic pressure and an acceleration of the pulse rate when given intravenously. Perhaps these occur with rapid intravenous injection, as such fall in blood pressure and rise in pulse rate are common to any form of rapid intravenous assault.

Respiratory Changes.—According to Batterman and Mulholland (1943) respiratory depression is rare in patients treated with ordinary doses of pethidine. In the present series no maternal respiratory depression was noticed, and Fig. 5 shows the respiratory excursions of a

FIG. 5.—Showing the respiratory excursions before and after administration of pethidine and scopolamine. When the patient was sleeping the abdominal respiratory movements were quieter but she showed no signs of respiratory depression.

patient who had received pethidine and scopolamine. These are typical of the results obtained.

Incidence of Forceps Deliveries.—In the 500 cases there were 23 forceps deliveries. The reasons for instrumental

delivery were: obstetric causes, 19; maternal distress, 3—2 were hysterical and 1 was of pre-eclamptic toxæmia; and foetal distress, 1—on delivery it was found to be a deep transverse arrest and a lateral placenta prævia. Meconium-stained liquor was the first indication of foetal distress. In none of these cases could the application of forceps be said to be due to the analgesia.

Conclusions

Observations made on the analgesic effects of pethidine and scopolamine during labour have shown that this method is very effective in relieving the pains of childbirth. Provided that labour is established and the dosage is given according to the stage and the rate of progress of the labour no untoward results occur. The addition of scopolamine increases the effect of the pethidine, and its usefulness far outweighs the very occasional excitement which may occur. If the dose of scopolamine is small, co-operation can be elicited from most patients in the second stage with a little encouragement from the midwives. The fact that the midwives working in the labour ward in this hospital have been and are most enthusiastic about the administration of pethidine and scopolamine during labour shows that their work has not been complicated by uncooperative patients and asphyxiated babies.

The results from both the maternal and the foetal aspects are gratifying, and a large number of women have expressed their delight at childbirth being made so pleasant. It is important to emphasize that the amount of pethidine and scopolamine given should be the minimum that will afford effective relief, and each patient is judged according to her reaction to the first dose. Encouraging words and an explanation of what is being done go a long way towards making the analgesia a success.

Summary

A series of 500 cases receiving pethidine and scopolamine during labour have been observed. The degree of relief obtained was good in 82.2%, satisfactory in 13.8%, and fair only in 3.6%. Two patients were difficult to assess. The results do not show any increase in either maternal or foetal mortality rates, and the incidence of post-partum haemorrhage is not raised.

I would like to express my gratitude to Professor James Young for permission to publish these cases and for the advice and encouragement he has always given. I am indebted to my assistant, Sister K. Kane, midwife-analgesist to the department, whose conscientious and loyal help has made this investigation possible, and to the nursing staff of the labour ward, who have shown themselves anxious to relieve the pain of childbirth. My thanks are due to Dr. Wootton, of the Department of Biochemistry, for help and advice with statistics.

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The International Hospital Federation has invited Capt. J. E. Stone, consultant on hospital administration and finance to King Edward's Hospital Fund for London, to become honorary secretary and treasurer, and the Fund has agreed. The Federation's secretariat will be established temporarily in the Fund's offices at 10, Old Drury, London, E.C.2. The Federation is an international organization established to collect national literature on hospital work and hold congresses, set up commissions, and publish reports in order to improve hospital development and administration. The first international hospital congress will be held in Holland in June, 1949.