Discussion

In most hospitals the routine method for out-patient anaesthesia is nitrous oxide and oxygen, either alone or with trichlorethylene. When nitrous oxide and oxygen are used alone it is not always easy to anaesthetize every patient, and often undesirable restraint has to be used to enable the operation to be performed, the patient remaining in the stage of analgesia throughout. Also, if the operation is prolonged for more than two or three minutes it may be difficult to avoid cyanosis and anoxia. These difficulties can be overcome if the nitrous oxide and oxygen are supplemented with trichlorethylene, but the recovery period is then often prolonged—a characteristic feature of trichlorethylene anaesthesia.

In the out-patient department where this work was carried out these problems were particularly acute because the surgical techniques employed often demanded a longer operating-time than is usual in most out-patient departments. This meant that the full recovery times were often prolonged, with consequent increased demands for post-operative supervision and space for recovery. Therefore, for these reasons and others given below, it was decided to try buthalitone for induction, followed by nitrous oxide and oxygen, in the hope that a more satisfactory anaesthesia could be obtained for the majority of patients.

Thiopentone was not chosen initially for the inducing agent, as, generally speaking, it has not found full acceptance as a suitable routine agent for out-patient anaesthesia, in spite of its use with other types of surgery for many years. Nobes (1955a) was the first in this country to suggest buthalitone as a suitable drug for out-patient anaesthesia because of its apparent shorter duration of action than thiopentone. It was this fact that led to buthalitone being adopted as an inducing agent when a new technique was being considered. The experience gained with buthalitone has led us to reconsider the position of thiopentone in out-patient anaesthesia. We have used the latter in equipotent dosage for a number of cases, but, as yet, our experience is not sufficient to justify a definite comparison between the two drugs. We hope to report on this in a subsequent paper.

On the basis of the results from our three series, totalling 200 cases, we consider that this method of out-patient anaesthesia is a satisfactory alternative to those involving inhalation anaesthesia alone, and, in fact, has some advantages over them.

For the anaesthetist, induction is smooth and rapid, and adequate oxygenation can be maintained throughout the anaesthetic. Satisfactory operating conditions are produced for the surgeon. The speedy recovery ensures that, in a busy out-patient department, the need to provide nursing supervision and space for recovery is lessened compared with that often required by more orthodox inhalation techniques when the operating-time is prolonged.

For the patient, induction is rapid and pleasant, and is usually preferred to methods involving the use of a mask. Recovery is also rapid, and the most striking feature is absence of post-anaesthetic drowsiness and confusion. This latter has been confirmed by spontaneous remarks from patients who have experienced other methods and from the casualty nursing staff, who report that there is less post-anaesthetic nausea and confusion after this method than when nitrous oxide and oxygen combined with trichlorethylene or thiopentone have been used.

Summary

A short review of buthalitone sodium and its use in out-patient anaesthesia is given.

Three series of cases totalling 200 are reviewed and a method of using it combined with nitrous oxide and oxygen is described. The view is put forward that this technique is a suitable method of anaesthesia for use in out-patient departments.

Reasons for suggesting that this technique has some advantages over inhalational methods of anaesthesia, especially when surgery is prolonged, are given.

We thank Professor W. W. Mushin, of the Department of Anaesthetics, Welsh National School of Medicine, Cardiff, for his help in the preparation of this paper.

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MITRAL VALVOTOMY DURING PREGNANCY

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Rheumatic valvular lesions constitute over 90% of all cases of organic heart disease complicating pregnancy (Hamilton, 1954). Predominant or pure mitral stenosis is by far the most common individual lesion. Pulmonary oedema resulting from mitral stenosis is the most important cardiac cause of death in pregnancy (Jones, 1951). It appeared to us that mitral valvotomy might diminish mortality from mitral stenosis complicated by pregnancy. Several reports of valvotomy performed during pregnancy have appeared (Brock, 1952; Cooley and Chapman, 1952; Logan and Turner, 1952; Mulcahy, 1954; Watt *et al.*, 1954; O'Connell and Mulcahy, 1955; Glover *et al.*, 1955; Bailey and Bolton, 1956). However, the published experience of each of these authors is limited.

Since 1950, 404 patients under the care of one of us (J. F. P.) have had mitral valvotomy; 274 were women of child-bearing age, and 18 of these had the operation performed during pregnancy. Our experience with these cases is summarized below.

Clinical Features

The clinical features are summarized in Table I. The majority of the patients had been supervised during their pregnancy at an antenatal clinic, but despite careful medical management had undergone rapid deterioration at various times between the 6th and 36th weeks of gestation.

The 12 multigravidae had suffered from dyspnoea requiring prolonged bed rest during one or more previous pregnancies. Only one of the primigravidae had significant disability before the onset of pregnancy, but dyspnoea was noted in each toward the end of the second month and increased rapidly in severity.

In each case the physical signs at the time of presentation indicated a diagnosis of pure mitral stenosis with severe pulmonary congestion or actual pulmonary oedema. The rhythm was regular; the first sound at the mitral area was slapping in quality and there was a rumbling mitral diastolic murmur with pre-systolic accentuation; an opening snap was usually heard; the pulmonary second sound was

moderately or greatly accentuated. In no instance was there clinical evidence of aortic valve disease or of mitral incompetence. Crepitations were audible over the lung bases, and in a few cases pleural transudates were detectable.

Electrocardiograms showed unequivocal evidence of mild to gross right ventricular hypertrophy in six cases; there was no evidence of left ventricular hypertrophy in any record. Chest radiograms showed moderate to gross increase in hilar vascularity and increased vascular markings throughout the lung fields, and in a few cases pericardial and pleural effusions were noted.

In several instances fluoroscopy was not performed, since these patients were operated on when still in pulmonary oedema a few hours or days after admission; in the remainder the appearances were characteristic of pure mitral stenosis with gross pulmonary congestion.

The occasional necessity for emergency operation is illustrated by Case 1 (previously reported—Pantridge *et al.*, 1953).

A woman aged 34 noted rapidly increasing dyspnoea on exertion since the onset of pregnancy. On admission on December 4, 1952, during the 34th week of pregnancy, she was in *extremis*, with acute dyspnoea, cyanosis, and tachycardia. She had the signs of pure mitral stenosis. Crepitations were audible over both lungs and there was an extensive left-sided pleural effusion. Despite rigorous medical measures, deterioration continued. Operation was undertaken in the upright position. The lungs were sodden, pleural and pericardial effusions were present, and the mitral valve orifice would not admit a finger-tip. Both commissures were easily split with the finger and there was immediately a striking improvement in the patient's condition. Her baby was born two days later and survived. Convalescence was uneventful and she is now well.

In patients whose condition on admission was less critical, operation was not immediately undertaken; they were treated with complete bed rest, rigid salt restriction, and mercurial diuretics.

Cardiac catheterization was performed in two cases after an initial period of rigorous medical treatment (Table II). In view of the persistent marked increase in "pulmonary capillary-venous pressure" despite medical treatment, operation was considered mandatory. In the remaining patients in this group, persistence or recurrence of pulmonary congestion after periods of one to four weeks indicated the necessity for operative treatment.

TABLE II.—Mean Pressures in mm. Hg, with Reference to the Sternal Angle

Case No.	Main Pulmonary Artery	Pulmonary "Capillary" (Resting)
8	45	29
13	39	29

Results of Mitral Valvotomy

Standard techniques were employed. The findings at operation and the effectiveness of the procedure are shown in Table I.

Valvotomy was undertaken at various times between the 12th and 36th weeks of pregnancy. In Cases 1 and 3 premature infants were born two days after operation and one of these failed to survive. Two patients recently submitted to operation (Cases 17 and 18) were still pregnant at the time of writing; the remainder continued without incident to term, and with one exception (Case 16) were fit for normal household duties and free from dyspnoea on ordinary activity.

The women invariably noted symptomatic relief within 24 hours of operation. Significant post-operative complications were few and had no relationship to the pregnancy; one patient had a small pneumothorax, a second had localized surgical emphysema, and two others developed atrial fibrillation which proved refractory to quinidine therapy.

Following mitral valvotomy it became evident that one patient (Case 16) had an associated tricuspid valve lesion. Cardiac catheterization demonstrated an end diastolic gradient of 10 mm. Hg across the tricuspid valve. This patient was awaiting tricuspid valvotomy.

Three patients have undergone subsequent pregnancies. One of these (Case 7), the only patient in whom valvotomy was not technically satisfactory, required prolonged bed rest. The others (Cases 5 and 8) had uneventful pregnancies.

Discussion

During pregnancy increased demands are made on the cardiovascular system owing to salt and water retention, rise in blood volume, and increased cardiac output. In healthy women these changes are readily tolerated. Patients with severe mitral stenosis can, however, maintain the

TABLE I

Case No.	Age	No. of Pregnancy	State of Pregnancy at Operation (Weeks)	Clinical Features	Size of Valve	Valvotomy	Present Condition
1	34	2	34	Pulmonary oedema, pleural effusions. Appeared moribund	Less than finger-tip	Good split—both commissures	Unlimited activity
2	27	1	20	Pulmonary oedema	Finger-tip	" " " "	Fit for normal housework
3	30	1	32	" "	Less than finger-tip	" " lateral commissure	" "
4	34	2	26	Pulmonary oedema, repeated haemoptysis	Finger-tip	" " " "	Fit for all housework
5	25	1	16	Pulmonary oedema	Easily admitted finger-tip	" " " "	" " " "
6	32	1	16	Pulmonary congestion and orthopnoea	Finger-tip	" " " "	" " " "
7	27	1	18	Pulmonary oedema. Recent haemoptysis	Easily admitted finger-tip	Fair split—medial commissure only	Fit for most housework
8	25	2	28	Pulmonary congestion and orthopnoea	Less than finger-tip	Good split—both commissures	Unlimited activity
9	25	1	20	Pulmonary oedema, repeated haemoptysis	" " "	Good split—medial commissure (knife)	" "
10	33	3	36	Pulmonary congestion and orthopnoea	Finger-tip	Good split—lateral commissure	" "
11	30	3	18	Pulmonary oedema, pleural effusions	Less than finger-tip	" " " "	Fit for all housework
12	34	3	12	Pulmonary congestion and orthopnoea	" " "	" " " "	Unlimited activity
13	25	2	24	Pulmonary oedema, haemoptysis	Admitted forefinger	" " " "	" "
14	26	4	18	Pulmonary congestion, orthopnoea	" "	" " —both commissures	" "
15	33	4	22	Pulmonary congestion, orthopnoea, haemoptysis	Less than finger-tip	" " " "	" "
16	36	3	22	Pulmonary congestion, orthopnoea	Admitted distal phalanx	" " lateral commissure	Awaiting tricuspid valvotomy
17	31	4	20	Pulmonary oedema	Less than finger-tip	Good split—both commissures	Pregnant. No dyspnoea
18	27	4	20	Pulmonary congestion, orthopnoea, haemoptysis	Admitted forefinger	" " medial commissure	" " "

altered circulatory state only at the expense of a considerable rise in left atrial and subsequently pulmonary capillary-venous pressure. Hence, pulmonary oedema during pregnancy is a not uncommon event. As previously noted, Morgan Jones (1951) found pulmonary oedema to be the most important cardiac cause of death in pregnancy.

In four of our cases (Nos. 13, 14, 16, and 18) the stenosis was only moderate, the valve orifice admitting the index finger to the proximal interphalangeal joint. Nevertheless, these women presented with pulmonary congestion or oedema which persisted or recurred despite treatment with salt-free diets, complete bed rest, and mercurial diuretics. In one of the patients in whom cardiac catheterization was performed the resting pulmonary "capillary" pressure was still 29 mm. Hg after two weeks' such treatment. It is clear that moderate stenosis in the presence of the raised cardiac output and hypervolaemia of pregnancy can produce the same effects as tight stenosis in the non-pregnant patients, and that pre-operative assessment of the size of the valve orifice in many cases is a matter of great difficulty.

Opinions are still divided concerning the indications for mitral valvotomy in pregnancy. Burwell and Metcalfe (1954) state that surgery of the mitral valve should be avoided if at all possible and that the operation should be carried out only when "the safer procedure of interruption is not practicable." It is their opinion that most women who undergo valvotomy during pregnancy "would probably do well without an operation if the medical supervision was adequate" and that the operation is more hazardous during pregnancy.

It is true that pulmonary congestion and mild pulmonary oedema occurring in pregnant women with mitral stenosis are often easily controlled by medical means. However, in the cases reported here several of the patients were admitted *in extremis* and remained so despite therapy. The others showed pulmonary congestion or oedema uncontrolled by a fair trial of medical measures. It is apparent that patients in this state demand valvotomy. This is particularly so since the experience recorded here indicates that the operative risk is no greater during pregnancy than in the non-pregnant state.

In two patients (Cases 1 and 3) the operation was apparently the cause of premature labour at the 34th and 32nd weeks; one of these infants failed to survive. The remaining pregnancies, however, continued without incident. Since valvotomy was undertaken at the 18th week or later in all but three cases, it might be held that the incidence of post-operative abortion would be higher for operations performed earlier in pregnancy. However, all seven cases reported by Watt *et al.* (1954) had their operations between the second and fifth months of pregnancy; in none of these was there "any hint of threatened abortion." Several authors (Glover *et al.*, 1955; Bailey and Bolton, 1956) recommend that when surgery is likely to be required it should be undertaken as early as possible in pregnancy.

Summary

Mitral stenosis is an important cause of morbidity and mortality during pregnancy. The principal hazard is pulmonary oedema, which may develop with dramatic suddenness. Moderate mitral stenosis during pregnancy may produce the same effects as tight stenosis in the non-pregnant patient.

In the past six years 18 patients have undergone mitral valvotomy during pregnancy. The indications for the operation and the results are reported. The operation was undertaken in some as an emergency and in the remainder after a fair trial of medical treatment. There was no maternal death or any important post-operative complication. One foetus, born prematurely, failed to survive.

In suitably selected cases mitral valvotomy is preferable to termination of pregnancy.

We are indebted for the co-operation of Mr. T. B. Smiley, who performed valvotomy in 14 of the cases, and that of Mr. J. A. W. Bingham, who performed the operation in four cases.

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NYDRANE IN THE TREATMENT OF EPILEPSY

BY

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Epilepsy is a disease which presents a continual challenge to the skill of the physician. He has waged war against this disease throughout the centuries, using whatever therapeutic weapons were at his disposal and influenced by the prejudice and state of knowledge of his era. Epileptics were subjected to treatment which embraced the whole gamut of empirical medicine. They were exorcised for devils, blistered, and bled according to the prevailing fashion.

Many remedies were tried and discarded, such as borax, amylene hydrate, zinc, chlorbutol, urethane, simulo, hydrotherapy, and serotherapy. The first measure of any importance was the introduction of bromides by Laycock just over a century ago. These drugs were applied with such enthusiasm during the ensuing years that Spratling (1904) mentions bromide acne as being the hall-mark of the epileptic.

Modern drug therapy was ushered in in 1912 by the synthesis of phenobarbitone, a drug which has established itself firmly in the treatment of epilepsy right up to the present day. Hydantoins were introduced in 1938 and proved effective in the control of grand-mal convulsions, while drugs of the oxazolodine : dione series have been in use since 1945 in the treatment of petit mal. Biochemists in different parts of the world have been intensifying their researches recently, and their efforts have brought to light several new compounds which have been shown to possess anticonvulsant activity. This modern empiricism reminds one of the biblical admonition that "many are called, but few are chosen"; nevertheless it is to the advantage of the patient that the physician should have at his disposal as many useful drugs as possible and each new drug must be studied carefully, so that its uses and limitations may be assessed.

It was with these considerations in mind that a trial was begun of a recently introduced anticonvulsant called "nydrane." It has the chemical composition of N-benzyl- β -chloropropionamide and was originally discovered in America, where it was marketed as "hibicon." Experimental studies on laboratory animals have shown that nydrane raises the electrical threshold and