relative infertility was a factor. It is apparent from Table V that of the 12 patients who had no further pregnancy adequate explanation was found in 5: one had proved tuberculosis of the tube; one had bilateral salpingectomy performed at the time of operation; one had hydrosalpinx of the remaining tube; in one

TABLE V.—Analysis of Interviews by Years Married Before (Ectopic) First Pregnancy (Figures in Parentheses Indicate Age at Time of First Ectopic Pregnancy)

Years	Inter-viewed	Further Pregnancies	No Further Pregnancy
<1	3	2 had 2 (20-24) 1 .. 3 (20-24)	—
1-2	3	1 .. 2 (20-24) 1 .. 1+1 abortion (25-29)	1 (25-29)
2-3	8	2 had 1 (25-29)	1 tuberculous salpingitis } (20-24) 1 bilat. salpingectomy } 1 hydrosalpinx } 1 (30-34) 2 (40-44)
3-4	2	1 had 2 (20-24) 1 .. ectopic after 2 years (30-34)	—
4-6	3	1 had 1 after 3 years (30-34) 1 had ectopic after 3 years (30-34)	1 salpingitis (25-29)
6+	5	1 had 1 after 18 months (25-29)	1 (25-29) (trying only 6 months) 1 (30-34) 1 (35-39) 1 (40-44)

salpingitis was found at subsequent laparotomy; and one had been trying for only six months for further pregnancy. Of the remaining seven where no lesion could be demonstrated, one was in the 25-29 age group, two were in the 30-34 age group, one was in the 35-39 age group, and three were in the 40-44 age group. Six of the seven were thus over 30, and three of the seven had been married for over six years before the first pregnancy was achieved.

It appeared, therefore, that in younger women who failed to have a further pregnancy there was evidence of a pathological lesion of the tube in almost every case. The majority of the younger women, however, had a successful pregnancy following the ectopic pregnancy, the reason for the original ectopic pregnancy being apparently a temporary defect of some kind in the reproductive mechanism.

The women who failed to conceive again despite the absence of any obvious lesion in the pelvis were mostly over 30 years of age, and as a result had probably become rather infertile.

Discussion

Aetiology.—About two-thirds of patients with ectopic pregnancy have had one or more previous intrauterine pregnancies. In some cases resultant sepsis, more particularly salpingitis, may have been an important predisposing factor, although there is not always a clear clinical history of this. The most novel finding in the present investigation has been that the incidence of ectopic pregnancy increases steadily with the age of the mother, particularly in primigravidae. Seventy-five per cent. of the primigravidae had been married for more than two years before the ectopic pregnancy occurred, suggesting some degree of infertility. It is not easy to explain how age operates. It may lead to a general lowering of the functional efficiency of the sex hormones, uterus, and tube, or to a defect in the ovum itself. On the other hand, physical changes such as uterine or tubal fibrosis or minor degrees of

endometriosis may be present. In the younger women, definite pathological conditions, especially of the tube, are often the cause. This is in line with the fact that, in populations with a low standard of living and a high incidence of gonococcal and tuberculous salpingitis, tubal pregnancy is relatively common in young women.

Conclusion

As can be seen from the analysis presented, the younger the patient the better the prognosis.

Bender (1956) found that another pregnancy occurred in 44% of cases of tubal pregnancy (made up as follows: another ectopic pregnancy, 7%; a live child, 32%; an abortion, 5%). The conception rate was 54% in women under 30 and 34% in those over 30. The outcome of the subsequent pregnancy was unaffected by whether or not the patient had had an intrauterine pregnancy prior to the ectopic pregnancy. These findings are confirmed in the present study.

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COMBINED LOCAL AND GENERAL ANALGESIA FOR CATARACT OPERATIONS

BY

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"He now put his head betwixt his forelegs, and raising it slowly again he fell over on his side. His eye immediately became fixed. . . ."

Charles Waterton made these observations in 1812, describing his first experiment on a "medium-sized dog" with "wourali poison" (Aldington, 1949). It was not until 1947 that ocular akinesia by curare was used in eye surgery. Five years later Kirby (1952), who introduced the method, reviewed his experience with it in nearly 600 cases. His conclusions were that the relaxation during cataract surgery produced by curare, after sedation, analgesia, and local anaesthesia, is superior to, and has not been produced by, that induced by any other agent and that it is one of the pleasing features of the akinesia of curare that the surgeon can work efficiently and expeditiously and in a most delicate manner when he and the patient are relaxed.

Kirby's work stimulated others, many of whom were enthusiastic. Cordes and Mullen (1951), after using curare in 85 cases, finally came to the conclusion that curare should be used in every case of cataract extraction, for once the patient has squeezed and extruded vitreous it is too late for any relaxation-producing measures.

Barraquer Moner (1953), of Barcelona, summarizing his experience of 1,500 cases, said that the direct results of the excellent akinesia and hypotension produced by

curare are: (1) simplification of all operative manipulations, and (2) decrease in the number of accidents. Other writers reported disquieting drawbacks with the method, mostly arising from respiratory difficulties.

Bamford (1955) abandoned the use of curare after 88 cases, having had a patient who became rapidly cyanosed and unconscious. Flagg (1952), the anaesthesiologist working with Kirby, recommended that every ophthalmic surgeon using curare should be familiar with laryngeal exposure and intubation. There is therefore some justification, in spite of the manifold local advantages of curare akinesia, for Stallard (1958) writing that the practice of administering curare to a conscious patient with local anaesthesia of the eye has been abandoned in Britain.

General anaesthesia with a relaxant and intubation has been strongly advocated for cataract operations, notably by Cridland (1955), Sandiford (1955, 1957), and Condon (1956). However, most ophthalmic surgeons find it difficult to dissociate general anaesthesia from the possibility of coughing, straining, and vomiting. Despite recent advances, no anaesthetist can guarantee that these hazards will not arise. Perhaps extubation is the most critical moment: Sandiford recommends it should be done "smartly," whereas Condon states that "the tube is slowly removed. In this way the likelihood of a cough on extubation is diminished."

To avoid possible difficulties with general anaesthesia and yet eliminate apprehension and tenseness, Burn *et al.* (1955) have used the "lytic cocktail" of chlorpromazine, promethazine, and pethidine, combined with local analgesia but without any relaxant; Healy (1955) substitutes dimenhydrinate ("dramamine") for promethazine and adds tubocurarine. Good results have been reported, but again there are disadvantages. Burn (1955) writes that the pain threshold is undoubtedly raised, but it can be exceeded and the patients react sometimes in a less controlled manner than under phenobarbitone sedation. There may be a considerable fall of blood pressure, with a gradual return to pre-operative levels in six to eight hours. Emergence from this sedation usually takes up to 10 hours. On the table there is marked pallor of the face and bloodlessness of the lips, which may be alarming unless it is expected, and the skin is noticeably cold to the touch.

Gibson Moore (1955), using chlorpromazine only for sedation during four pre-operative days, has also remarked on the pallor that accompanies the full effect of this drug.

Croydon Eye Unit Technique

If the pharyngeal and laryngeal reflexes are likely to become impaired, general anaesthesia must be used. But such conditions are not a necessity in cataract surgery; what is required is an analgesic patient, in control of his own protective reflexes and yet with complete ocular akinesia and hypotonia.

A method has been developed which meets these needs and avoids the disadvantages of the techniques previously outlined. Comparatively small doses of sedative and curarizing drugs are used and general analgesia is induced with nitrous oxide before local analgesics are injected. Neither a facepiece nor an artificial airway is employed; the gas is delivered by means of a simple appliance which has been designed for the purpose. It consists of a stiffly flexible rubber-lined tube which is clamped at shoulder level to the

side of the theatre table and then connected to the Boyle's machine. Near the upper end of this metal tube a small instrument tray has been attached. This serves three purposes: it supports the sterile towel as a tent above the nose and mouth, it locates the delivery tube and makes displacement less likely, and, finally, it has sufficient stability to carry the instruments used in ocular surgery.

During operation the patient lies quietly, half asleep and without restlessness or any respiratory embarrassment. His eye is invariably soft, and after removal of the lens the iris falls back on a concave vitreous surface. When the principal corneo-scleral suture has been tied the nitrous oxide is stopped and the patient is sensible and talking before leaving the theatre.

Details of Method

The night before operation the patient is given 25 mg. of chlorpromazine and an appropriate dose of amylobarbitone sodium or quinalbarbitone sodium. One and a half hours before operation he has an intramuscular injection of 25 mg. of chlorpromazine, 500 to 750 mg. of methylpentynol ("oblivon") by mouth and cocaine drops at five-minute intervals to his cornea. He comes to the theatre conscious and usually calm and co-operative. It is explained to him that he will be given a relaxing injection in the back of his hand and that a tube will be placed in front of his nose to help his breathing when under the towels.

On the table, his head is placed in the hollowed part of a rectangular sponge-rubber pillow. The nozzle of the delivery tube is adjusted so that it is 1 in. (2.5 cm.) above the chin and directed at the nasal septum (see Fig.). Neither the tube nor the towels touch the lower

Photograph showing position of appliance.

half of the patient's face. Nitrous oxide at 6 litres a minute is turned on. Pethidine, from a 5-ml. syringe containing 50 mg. diluted to 5 ml., is injected with a No. 20 needle into a vein on the dorsum of his left hand or forearm (15 to 25 mg. being the usual initial dose), and the syringe is left strapped in position. After an interval of three minutes the local injections are given by the surgeon. These consist of (1) 1.5 ml. of lignocaine 2%, with adrenaline 1 in 80,000 and hyaluronidase, placed within the cone of the recti muscles, and (2) a further 1 ml. at the outer orbital margin. The patient will look up on command, but the analgesia already developed is such that wincing is seldom seen.

When these injections are completed, gallamine triethiodide ("flaxedil") (40 mg., diluted to 5 ml. in a 10-ml. syringe) is slowly injected through the needle used for the pethidine, the initial dose being 8–16 mg. The facial expression is watched; it becomes relaxed and "ironed out"; often mask-like. This may not happen until an extra millilitre or two of the diluted gallamine has been added, but the dose of 40 mg. is not often needed and is never exceeded.

When placing the sterile towels, it is possible to cover the complete face, leaving only the one eye exposed. Two litres a minute of oxygen is now added to the nitrous oxide and the corneal incision made. Should the regular respiration quicken, a further 10 mg. of pethidine is added; this may be repeated, but never more than a total of 50 mg. is used. Occasionally the patient will snore; a hand under the towels and a finger supporting the chin quickly corrects this.

Lowered Intraocular Tension

The muscle relaxant, the pre-operative chlorpromazine, and the retrobulbar lignocaine all combine to produce a very soft eye. Most ophthalmic surgeons now agree that this is essential for a safe intracapsular extraction, and even when an extracapsular extraction is performed low tension is of advantage provided the surgeon is prepared to alter his technique to allow for it.

The great majority of the cases in this series were intracapsular extractions, the earlier ones using Arruga capsule forceps, while those undertaken in 1958 were with the mechanical erisophake. Recently, enzymatic zonulolysis with alpha-chymotrypsin by the method of Barraquer Moner (1958) has been used. In this procedure the decreased tension is felt to be essential.

When the towels are removed, the patient not infrequently says he has been dreaming and is surprised to learn that his operation has been completed. On returning to the ward he sleeps quietly. Nausea, vomiting, or restlessness is rarely reported.

Results

Since July, 1956, this method has been used for 155 cataract extractions. The ages of the patients ranged from 21 to 89, 83% being over 65. Many were hypertensive, diabetic, emphysematous, or bronchitic; two had congestive heart failure and one was hemiplegic. Two did not understand English or any common language.

In the immediate post-operative period there was an occasional complaint of feeling faint; three were restless and had to be given a sedative; only one vomited in the 24 hours following operation.

Ophthalmic complications did develop in a proportion of the cases, but it was not considered that general analgesia was responsible for any one of these.

Discussion

Gallamine Triethiodide.—Sufficient proof has accumulated to show that tubocurarine is a valuable aid in intraocular surgery, but the risk of respiratory impairment has restricted its wide acceptance in this field. Mushin *et al.* (1949), working with conscious volunteers, found that gallamine triethiodide had a similar action to tubocurarine in first affecting the eye muscles; they also found that in doses of 40–70 mg. there was no demonstrable decrease in pulmonary ventilation and that it had a shorter period of action

than tubocurarine. In the present series, the total time for each operation rarely exceeded 15 minutes. It was for these reasons that gallamine was chosen. With the small doses employed we have not found troublesome tachycardia, increased salivation, or the congested eyes reported by others.

Intravenous Pethidine.—This might have been expected to increase the liability of post-operative vomiting. We attribute the low incidence in our series to the chlorpromazine given with premedication.

Nitrous Oxide Analgesia.—Various devices have been described (Marshall, 1936; Kulvin, 1956), even when local analgesia alone was used, to prevent obstruction of the airway by the sterile towels; with the introduction of curare an additional supply of oxygen was widely recommended. The appliance described is useful for both these purposes. When the method was first employed nitrous oxide was used very cautiously, the aim being to keep the patient in Guedel's first stage but believing that the second stage of delirium might easily be entered. As experience increased it was found to be surprisingly easy to keep patients in this analgesic and half-asleep plane, with regular respirations and bright pink colour; none have developed excitement or uncontrolled movements. A similar finding has been recently described in dental anaesthesia, and Klock (1955) in a paper entitled "New Concepts in Nitrous Oxide Anaesthesia" has given the name "amalgasia" to "a very precise and well-defined plane of general anaesthesia in the first stage. It exists between what is recognized as the analgesic plane and the excitement stage." He states that it is "surprisingly wide and easily controlled."

Summary

A technique designed to produce relaxation and general analgesia or "amalgasia" in cataract operations, without heavy sedation, intubation, or respiratory embarrassment, is described.

It has been used in 155 cataract extractions and has given conditions, for both patient and surgeon, comparable to those obtained with general anaesthesia. No complications attributable to the method have arisen.

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