fair amount of success has been met with by the employment of safety engineers, who, in addition to concentrating on engineering revision, make a special point of educating the workmen by propaganda and many ingenious and telling methods. If it was possible to ensure that all of the three methods could be carried out simultaneously, it could be imagined that all accidents due to flying particles would be abolished. In theory no accident ought to occur, but actually it is impossible to prevent those due to unforeseen circumstances.

The prevention of eye accidents in the great variety of occupations followed in this country is, on investigation, a much greater subject than might be thought, and it is impossible in a short paper such as this to enter into the detailed study which is necessary for each type of occupation, but it is hoped that enough evidence has been brought forward to show that minor eye injuries have an appreciable importance in industry.

The fact that *three* of such simple everyday occurrences as a foreign body on the cornea are responsible for the loss of a whole working day of eight hours should be sufficient to arouse the financial attention of every employer, quite apart from the suffering borne by the employee. Furthermore, when, in addition, the burden on the hospitals is taken into account, it must be conceded that the time is ripe for some great effort to be undertaken towards the reduction of these apparently trivial accidents. The word elimination would, of course, be preferable to reduction, but this would involve superhuman efforts.

The difficulties in the way are great, and not the least among them is the psychology of the employee, especially when of British nationality. No disparagement of my countryman is here insinuated, but merely a reference to the wonderful spirit of indifference to danger so characteristic of our race, to which may perhaps be added some ignorance of risks run.

THE RESULTS OF INDUCTION OF LABOUR WITH ANIMAL BLADDERS.

BY

G. F. GIBBERD, M.S., F.R.C.S.,
OBSTETRIC REGISTRAR, GUY'S HOSPITAL.

IN 1901 Baumm¹ described the method of induction of labour in which a sterile animal bladder is introduced through the cervical canal, and then partially filled with glycerin. As a semi-permeable membrane the bladder allows water to pass from the surrounding tissues into its cavity, so that its contents gradually increase and the bladder becomes progressively more distended. At the same time a small proportion of the glycerin passes out into direct contact with the uterine wall.

Although the method seems to have been fairly widely used on the Continent, it has attracted little attention in this country, and the figures published here represent the results obtained in the first thirty cases in which the method was tried at Guy's Hospital. I am indebted to the obstetric surgeons at that hospital for permission to publish these results.

The technique used has been modified slightly from that suggested by Baumm. The apparatus that has been found most satisfactory consists of a short piece of metal tube about one inch long to which is attached a piece of rubber tubing about six inches in length. Through this a long metal stylet is passed so that its point projects about five inches beyond the end of the metal tube. The end of the stylet is flexible, and protected at the tip by a smooth knob. The animal bladders, which are obtainable ready sterilized in sealed glass tubes, are of two sizes—a large (pig's) bladder with a capacity of about 500 c.cm., and a small (sheep's) bladder with a capacity of about 200 c.cm. The bladder is tied to the metal tube by means of a silk ligature, and stretched by means of the stylet. It can thus be introduced through the cervical canal in the same way as a Krause's bougie, and when it is completely within the uterine cavity the stylet is withdrawn, and (in the case

of a large bladder) about 200 c.cm. of pure sterile glycerin is injected into the bladder by means of a syringe. The rubber tubing is then clamped. The flexible stylet ensures deflection of the bladder, should it hit against the presenting part, and thus renders the introduction a simple and safe procedure. With care the bladder can be introduced without coming into contact with the skin of the vulva or vagina, and without any undue handling on the part of the operator, but the aseptic technique practically always makes an anaesthetic necessary.

After introduction into the uterus the contents of the bladder gradually increase in amount; at the same time a small amount of glycerin passes out into direct contact with the uterine wall. The uterus is thus subjected to the double stimulus of the mildly irritating glycerin and of the gradually increasing size of the bladder. In the later months of pregnancy a large bladder has been used in the majority of cases. The smaller bladder is more suitable for the induction of abortion in the early months.

In the majority of the cases previous unsuccessful attempts to induce labour with quinine and pituitary extract had been made. Several cases in which abortion was successfully induced in the early months of pregnancy have been excluded. Only cases in which pregnancy had progressed past the twenty-eighth week are considered here. The indications for induction in these cases were either disproportion between the size of the head and the pelvis, or maternal toxæmia. It is not suggested that the results obtained are to be regarded as entirely satisfactory, but for the purpose of comparison they are considered side by side with the results of twenty-three consecutive inductions with bougies or stomach tube, undertaken at Guy's Hospital during the same period and under similar conditions.

Results.

	Animal Bladder.	Stomach Tube or Bougie.
Failures ...	3 (16%)	2 (9%)
Successes ...	27 (93%)	21 (91%)
Induction interval:		
Longest ...	72 hours	96 hours
Shortest ...	2 hours	2 hours
Average ...	13 hours	35 hours
Less than 24 hours ...	23 (85%)	8 (40%)
Less than 12 hours ...	17 (63%)	4 (20%)
Less than 6 hours ...	11 (41%)	2 (10%)
Puerperal morbidity ...	4 (15%)	3 (14%)
Complications:		
Separation of placenta ...	1	1
Malpresentation ...	1	Nil

The three cases in which the method failed may be considered separately. In the first, a patient with albuminuria of pregnancy, since no pains had occurred eighty-eight hours after the bladder had been introduced, this was removed and a stomach tube was inserted instead, after which a further thirty-eight hours elapsed before the onset of labour. The puerperium was morbid on account of pyelitis. In the second, a patient with a contracted pelvis, labour pains started and the bladder was expelled after forty-eight hours. After this the pains ceased entirely, and pregnancy then ran a normal course until it was terminated by Caesarean section ten days later. In the third patient the bladder was expelled with a few pains, which ceased almost immediately afterwards. The patient refused any further intervention and was discharged from hospital. She was admitted in labour four weeks later, and delivered with difficulty, by the forceps, of a dead foetus, death being due to intracranial haemorrhage. A normal puerperium followed.

Although all three cases must be regarded as complete failures in that the object of the operation was not attained, yet it is satisfactory that the attempt did not

influence unfavourably the results of subsequent treatment. Of course, the fact that a foreign body has been introduced into the uterus must add considerably to the risks of sepsis if further intervention is necessary subsequently, but in the three cases in this series this danger was fortunately not manifest.

The twenty-seven cases in which the method succeeded will next be considered. The chief advantage of the method lies in the comparatively short time in which labour started in the majority of cases. The "induction interval"—that is, the interval between the introduction of the bladder and the onset of pains—is often of considerable importance. In pre-eclamptic patients it may be a matter of urgency that labour should start within a few hours. In all cases an interval of more than thirty-six hours is, at least, a cause for some anxiety. The comparative figures which have been quoted amply justify the conclusion that the induction interval with animal bladders is very much shorter than with the stomach tube or bougies.

Quite apart from the question of efficacy in inducing labour, certain dangers associated with the method must be considered. The injection of large amounts of glycerin between the membranes and the uterine wall is said to be followed by alarming toxic symptoms. In the method here described only a small amount of glycerin can pass out of the bladder, and that very slowly. Nothing suggestive of a toxic effect has been noted in any case in this series.

The presence of any foreign body in the lower segment must tend to displace the head from the pelvic cavity. With animal bladders displacement of the head was noted several times, and on one occasion it caused a breech presentation with a prolapsed cord. The child suffered no harm, but this fortunate result does not, of course, lessen the seriousness of the condition, which must in this case be attributed to the method used. The only other accident which occurred was separation of the placenta in one case. Since the bladder and stylet are passed for a distance of about five inches into the uterus, it is evident that this accident may occur if the placental edge is less than five inches from the internal os. It would probably be sufficient to rupture the membranes and reinsert the bladder within the amniotic cavity in such an emergency; but in the case in which it did happen a smaller (sheep's) bladder was inserted, and no further haemorrhage occurred.

In four cases the puerperium was morbid (British Medical Association standard), but in one of these the rise in temperature was considered to be due to a urinary infection, and in another to an attack of influenza. In the other two cases there was evidence of uterine sepsis of a mild type. The danger of sepsis must exist whenever a foreign body has been introduced into the uterus, but this danger will be minimized in methods which allow of a good aseptic technique. An animal bladder can be inserted without any undue handling on the part of the operator, and without coming into contact with the vulva or vagina.

Apart from the cases in which a macerated foetus was delivered, all the infants in this series were born alive.

The principle underlying all instrumental methods of induction of labour is essentially crude, but in the present state of our ignorance as to the cause of the onset of labour we have to rely on these crude methods in many cases. We must not, therefore, expect entirely satisfactory results from an essentially unsatisfactory operation, but until we are in possession of a more rational principle there can be no objection to attempting to improve the details of an instrumental method of induction.

In publishing these results stress has been laid on the disadvantages and dangers, equally with the advantages, and although it may seem that attention has been drawn to an imperfect method of inducing labour, there is no doubt that it has some advantages over other methods in common use. The lessening of the induction interval is a very real advantage of the animal bladder method, and at the same time the disadvantages associated with it seem to be no greater than with other instrumental methods of induction.

REFERENCE.

- ¹ Baumm, P.: *Zentralbl. f. Gynäk.*, 1901, xxv, 1059.

THE PRESENT POSITION OF X-RAY THERAPY IN MALIGNANT DISEASE.*

BY

F. HERNAMAN-JOHNSON, M.D., D.M.R.E.,
RADIOLOGIST TO THE FRENCH HOSPITAL, LONDON; PHYSICIAN IN CHARGE,
X-RAY AND ACTINOTHERAPEUTIC DEPARTMENT, CROYDON GENERAL
HOSPITAL.

THE present time appears opportune for a review of the position of x-ray treatment in malignant disease. Anyone who has followed the progress of radiotherapy during the past twenty-five years cannot have failed to note what might be termed a periodicity in the favour shown to x rays and radium respectively. Just before the war radium was beginning an era of popularity.

At the Annual Meeting of the British Medical Association in 1914 the Section of Radiology arranged a debate, which I had the honour of opening, on the relative value of x rays and radium in malignant disease. The chief points claimed in favour of x rays were availability, unlimited quantity, and, most important of all, evenness of distribution in the tissues, owing to its being possible to use an x-ray tube at a considerable distance from the patient. On the other hand, the advantages of radium were set forth as follows: It could be brought into intimate relation with malignant growths, either by its introduction into cavities such as the oesophagus, or by actually burying radium tubes, or by inserting multiple needles—the latter procedure having been advocated by Professor Joly of Dublin in May, 1914, and a little later by Dr. Stevenson, also of that city. It was, moreover, claimed that, apart from questions of quantity, distribution, etc., radium rays—by which were chiefly meant gamma rays—were qualitatively of more value than x rays. There was said to be a further advantage in the standardization of dosage, or rather of output, which in the case of radium depended only on the quantity of radium and thickness of filter used; whereas the x-ray tube of that period was difficult to control. To some extent the upholders of the x rays admitted the impeachment, but claimed that, with technical advances, the output of x-ray tubes excited at a high voltage would more nearly approach the gamma ray in quality, and that exact control of output would also be secured.

It is interesting to note that radium, although in a sense the most dynamic of the elements, must, as a therapeutic agency, be regarded as static. By this I mean that the radium in use to-day is the same agent precisely as was in use twenty years ago, although the mode of its application may differ. Not so with x rays. Despite the war, the prophesied developments of the x-ray tube did in fact occur. The introduction of the hot cathode tube by Coolidge in America made the control of output easy, and later developments gave us x-ray bulbs capable of standing up to a quarter of a million volts for continuous running.

Working with voltages of this order, the directors of the gynaecological clinic at Erlangen claimed a high percentage of "cures"—three to five years—in cases of carcinoma of the cervix uteri such as previously had been dealt with by panhysterectomy. Their claims as to the value of their treatment in other forms of cancer were very modest, but an idea was unfortunately promulgated in this country that the "new x rays" were of almost equal value in all forms of cancer. The technique as originally introduced required the administration of a so-called "lethal dose" at a single sitting. With the outputs then available this meant seven or eight hours' continued exposure. Severe anaemia and violent sickness were often produced, and many patients died from the effects of the treatment. It is to the credit of British radiologists in general that they were not carried away by this craze; in fact, a joint letter was sent to the *Times* warning the public against exaggerated hopes.

The doctrine of the "lethal dose," which was the *therapia sterilizans magna* of Ehrlich applied to cancer, was bound to be discredited, for it disregarded the part

* Abstract of an address to the Croydon Division of the British Medical Association, May 1st.