SOME NOTES ON THE USE OF THE RADIOPHGRAPH IN PREGNANCY.

By MAJOR J. C. A. DOWSE, M.C.
Royal Army Medical Corps,
AND
MAJOR R. B. MYLES, O.B.E.
Royal Army Medical Corps.

THIRTY years ago the doctor had to rely mainly on his sense of touch and his manipulative skill in the treatment of fractures which occurred in his practice.

The advance of the X-ray made diagnosis much more accurate and assisted the surgeon very markedly in his treatment of such cases, by giving him a positive picture of the relative positions of the broken bones.

To-day, even though we have at our disposal a greatly developed science of radiology and excellent X-ray outfits, at any rate in larger centres, capable of taking splendid radiographs, we still rely on our powers of touch and manipulation to decide the "presentation" of the unborn infant or to diagnose pelvic deformities. We have recourse to complicated methods to determine the size of the pelvis, and we submit our patients to invariably unpleasant, sometimes painful, examinations, necessitating when too painful a general anaesthetic, to arrive at our conclusions. Having taken all these precautions we are faced with a possibly unreliable result. Even such an authority as Whitehead Williams remarks that a series of examinations must be made, even in expert hands, to arrive at an accurate idea of measurements by internal pelvimetry. How often is it not a matter of extreme difficulty, even to the expert, to be absolutely certain of a diagnosis of multiple pregnancy in a stout subject. In short, conditions in any individual may be present which can cause great difficulty at childbirth, and the after-results may be a life of invalidism if the case is not adequately prediagnosed and treated.

With an up-to-date X-ray apparatus and a Potter Bucky diaphragm at our disposal a considerable number of these difficulties are overcome at once, and a very good idea of what the obstetrician has to deal with becomes apparent.

To enumerate a few: The radiograph shows the exact lie of the foetus in relation to the mother. It demonstrates the position of the presenting part (i.e., under-flexion of the head, occipito-posterior positions, breech presentations, etc., are seen at once). Twins can be beautifully demonstrated from the eighteenth week onwards. There are methods of measuring the pelvis at least as accurate as ordinary pelvimetry.

Pelvic bony deformities are at once demonstrated and, most important
of all, the relative size of the essential foetal measurements to that of the maternal bony structures can be gauged. In other words, the X-ray in maternity work can render tremendous assistance to the harassed medical man, and it can frequently take the place of the expert obstetrician in deciding points in the multisided cases that occur in the general practitioner's practice.

These notes are not intended to imply that in the employment of the X-ray the obstetrician or the general practitioner has found a panacea for all his troubles, but are merely a plea that more use should be made of the radiograph in antenatal work. During the recent general meetings of the British Medical Association at Cardiff, in the lectures and speeches of many of our leading authorities, merely casual mention was made of the X-ray as an aid in obstetrics and antenatal work.

Since March of 1928 it has been the custom in Poona Military Families Hospital to send to the radiologist for his report every woman registering at the antenatal clinic. All women are asked to come and "book in" as soon as they realize or imagine that they are pregnant. The patients are not submitted to manual examination until later on in their pregnancy; notes of dates, etc., are taken, the radiologist’s report added, and the result is an accurate idea of the woman’s condition.

By the early booking system a good radiograph of the pelvis is obtained before the increasing size of the uterus and its contents fogs the view. Further examinations are made at the middle and towards the end of pregnancy, and oftener if any abnormal condition makes this advisable. During these later examinations the comparative size of the foetal head and the maternal pelvic openings can be estimated, and it is at these later visits only that manual examination of the abdomen is made; this is necessary to determine the position, rhythm, rate, etc., of the foetal heart and to satisfy oneself as to the absence or otherwise of abnormalities not shown by the X-ray, such as hydramnios, etc., and finally to decide the probable date of delivery. In cases shown to be abnormal, i.e., malpresentations, contracted pelvis, etc., more frequent examinations are made, if necessary, so that a definite opinion can be formulated as to the exact method of procedure that should be adopted as full term approaches.

It is obviously foolish to attempt to draw any dogmatic conclusions from a series of cases as small as the series under review, but even in this small number, some fifty-six cases, a number of interesting points have been noted:

1. Early radiographs give a good idea of the size, shape and symmetry of the mothers’ bony parts.
2. Embryos are first shown at sixteen weeks on the average of the present series, the earliest being in the twelfth week of amenorrhoea.
3. Multiple pregnancies may be demonstrated at the above-mentioned period.
Notes on the Use of the Radiograph in Pregnancy

(4) Early embryos may be seen in almost any conceivable position, i.e., there being no "normal" position at this stage.

(5) The normal lie from the twenty-fourth week onwards appears to be with the head down, but 10 per cent of our series showed other lies, mostly frank breeches.

(6) The fetus may change position any number of times right up to the last few days; for instance, breech presentations may become vertex presentations and vice versa. The fetus may revolve on its vertical axis either during these changes or apart from them. In one case a first breech position changed to a first vertex.

(7) Nature has remarkable powers of remedying, unaided, apparent defects. One case seen first on October 12, 1928, was an obvious brow presentation, on December 20 it was a face presentation and on December 24, whilst being X-rayed, it changed its position to an L.O.A., and was delivered as such six days later.

(8) Two cases shown with posterior positions of the occiput were diagnosed and treated as such from the start of labour, which in both cases was prolonged, but eventually gave no trouble. Vaginal examination to determine the exact presentation would have been necessary had not the X-ray given the required information.

(9) The final radiological examination gave positive information of the lie of the fetus. The fontanelles could be seen and a reasonably accurate picture of the relationship between the presenting part and the pelvic inlet was obtained.

The information is so definite, when properly interpreted, that the use of the X-ray in maternity work appears to be strongly indicated, and further research into the methods of employment, to bring results down to absolute mathematical exactness, will pay by improving our knowledge of the difficult and trying art of obstetrics.

The following was the radiological routine employed by us to obtain as far as possible a standard series of pictures. It will be seen that no attempt was made to make actual measurements of the pelvis. The relative position and size of the fetus to the pelvis were the chief factors in arriving at the diagnosis.

In apparently normal cases not more than three radiological examinations are made:—

(1) On first reporting, say sixteen weeks: To show the general size shape, and symmetry of the pelvis, to determine the presence of an embryo, and to check as far as possible the estimated duration of the pregnancy to date.

Calciﬁed glands (mesenteric) are fairly frequently seen in this examination, and a calcareous tumour would show up, if present. If necessary this examination is repeated at fortnightly intervals until the presence of an embryo is demonstrated. (A negative picture at say twenty weeks would
be indicative of another cause rather than true pregnancy for the continued amenorrhoea.) As far as our present experience goes, the presence of an embryo is verified about the fourteenth to sixteenth week in most cases, and it need hardly be stated this is the earliest and at the same time the most reliable and definite sign of pregnancy.

(2) At about twenty-eight weeks: To determine the lie of the foetus, to demonstrate any marked abnormality, and to enable any obvious correction to be attempted. The word attempted is used advisedly; to abhorrence of a vacuum nature would appear to add intolerance of uninvited assistance where no vacuum exists.

(3) At thirty-six to thirty-eight weeks: To confirm the lie and to estimate the approximate relationship between the pelvic bony passage and the foetal head. If the head is not presenting normally the examination is repeated as required (each case being treated on its merits) until it does so, either naturally or after artificial aid.

PREPARATION OF THE PATIENT.

(1) Steps are taken to have the bowels adequately emptied, not by the use of a metallic purge, which in itself may cast "shadows." A loaded colon may mask an early embryo or alter the position of a foetus later on.

(2) The subject is warned not to appear for examination wearing silk clothing on the body, or any corset, belt, or other article containing indiarubber, or carrying hooks or buttons. This is important for two reasons. In the first place, the cases are practically all out-patients, and the existence of facilities for disrobing in a military radiological department depends entirely on the ingenuity of the radiologist.

Secondly, the power of pure silk to obstruct the roentgen ray is most striking and should never be forgotten when women are to be examined. The innate feminine desire to appear to the best advantage before the "doctor," though scarcely within the scope of these notes, is universally recognized, and the distress occasioned by the edict that the most alluring garments must be shed and replaced by an entirely shapeless hospital crepe wrapper is quite pathetic.

The matter is made the more striking by the astonishing number of other men's wives who "have nothing but silk!"

TECHNIQUE.

All radiographs are taken with the tube overhead and the patient lying face downward with the abdomen on the Potter-Bucky diaphragm, and the shoulders raised on a fairly high pillow, so that the patient may raise the upper part of the body further to decrease discomfort, especially in the later examinations.

Before an exposure is made the patient is given a little instruction in the art of holding the breath, and rehearsals are carried out with the object of commencing each exposure one full second after the warning, "Take a little breath in—hold it." Some radiologists aver that the words used
Notes on the Use of the Radiograph in Pregnancy

should be "Stop breathing," as a patient told to hold her breath gives an involuntary start. The pause of one second, however, allows for this start—which is actually a slight rebound of the chest and abdomen due to the voluntary cessation of their movement, and would occur even if no "word of command" was given—and it must be admitted that "hold it" is a much more satisfactory order when it has to be shouted across a room over the noise of a mechanically-rectified transformer.

At First Examination.

The anterior superior iliac spines are placed one inch above the horizontal centering line of the Potter-Bucky diaphragm, and the radiographs are made on 12 by 10 inch films.

In the first view the central ray is directed vertically on the intersection of the cross-lines of the Potter-Bucky diaphragm at a target distance of 25 inches from the films.

In the second the tube is brought down to 20 inches and moved sufficiently far down the couch to enable the central ray to be directed on the intersection of the cross-lines, with the tubes tilted through an angle of 40°.

By this manoeuvre it is hoped that the direction of the central ray will be perpendicular to the bisector of the angle between the plane of the pelvic inlet and that of the pelvic outlet, thereby giving the best possible idea of both inlet and outlet at the same time.


In these radiographs the embryo is much more likely to be seen in the tilted view than the straight one, as the tilt removes from the paths of the ray the sacrum which, from its configuration and density, is apt to mask a feebly ossified skeleton such as is presented in the early months of pregnancy.
The exposure and tube setting are the same as those used in investigation of a suspected vesical calculus.

Second Examination.

One film, 15 by 12 inches, is usually sufficient with the central ray perpendicular to the couch and the patient in the same position as before. The tube may be slightly harder and the exposure longer for obvious reasons.

Final Examination.

The anterior superior iliac spines are on or slightly below the horizontal line of the Potter Bucky diaphragm for the first radiograph, when a 15 by 12-inch film is used with the central ray directed vertically as before. For the second view a 12 by 10-inch film is used in the same way as in the second view first examination. The tilt used is practically the same, but the tube has to be moved further down the table and raised a little.

The first of these views shows the lie and descent of presenting part, and if a vertex presentation the degree of flexion of the head. The second is the view showing the comparative space available for the fetus to pass through. The penetration and exposure required are as for transverse view of the lumbar spine.

The shortness of the exposures now employed with an up-to-date apparatus would seem to do away with the fear of damage to the brain-cells of the fetus, even when two or three examinations are made during the course of pregnancy.

The idea of making use of radiography in maternity and antenatal work is not claimed as original,—there are numerous books on the subject, many giving technique for the actual measurement of the fetal head and maternal pelvis,—but what we do suggest is that a much fuller use should be made of the facilities afforded by its employment.

In a highly-organized community such as the Army, with its excellent hospitals and well-run antenatal clinics, there is every opportunity of keeping the expectant mother under observation from the commencement of her pregnancy to the birth of her child. There should be no difficulty therefore, at any rate in the larger centres, in taking advantage of the help of the radiologist and in the careful checking of results.

If a method such as the one outlined in these notes could be extended to the larger antenatal clinics throughout the country, as a matter of routine and not merely when an abnormality is suspected, there can be little doubt that a considerable number of the unfortunate accidents of child-birth could be prevented and meddlesome midwifery would become a bogey of the past, to the advantage of the patient, obstetrician and radiologist alike.

We are indebted to Major E. A. P. Brock, R.A.M.C., Officer Commanding, Connaught Military Hospital, Poona, for permission to publish these notes.