

A NEWLY MODIFIED METHOD FOR DETERMINING THE AREA OF THE PELVIC INLET BY X-RAY PELVIMETRY

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IN 1922, the author described a method by which x-rays could be used in determining the outline of the inlet or superior strait of the pelvis.¹ Since that time we have used the method repeatedly in our work at Grace Hospital with uniformly successful results. At the present time, however, the technic formerly described has been considerably simplified by the introduction of a lead screen, the use of

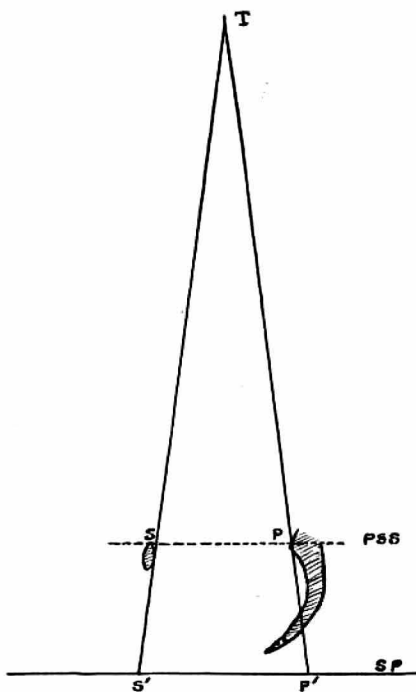


Fig. 1.—*T*, Target or tube; *PSS*, Plane of superior strait, *SP*, sensitive plate, *S*, symphysis; *P*, promontory of sacrum.

NOTE. If the plane of the superior strait is parallel with the sensitive plate, the rays from the target will project the outline of the superior strait to points *S'* and *P'* on the plate. The outline of the superior strait will be thus outlined equally enlarged in all directions. If a screen composed of squares, each representing a square centimeter, is placed in the same plane as the superior strait, it is obvious that the transmitted image will give the amount of enlargement of the superior strait. In other words, each square seen on the sensitive plate represents one square centimeter at the superior strait and readings may be made accordingly.

which is described below. This addition obviates the use of both the pelvimeter and the reducing-camera described in the previous communication.

The method as it is now being used is here set forth. The underlying principle is best understood by studying Fig. 1. It is obvious that if the plane of the superior strait is made parallel to the sensitive plate, an outline of this plane may be obtained upon the latter which will be enlarged equally in all directions. If after taking this picture we introduce in the exact position as that occupied by the superior strait, a screen composed of small squares of lead, each one centimeter square, we may project upon another sensitive plate a series of squares

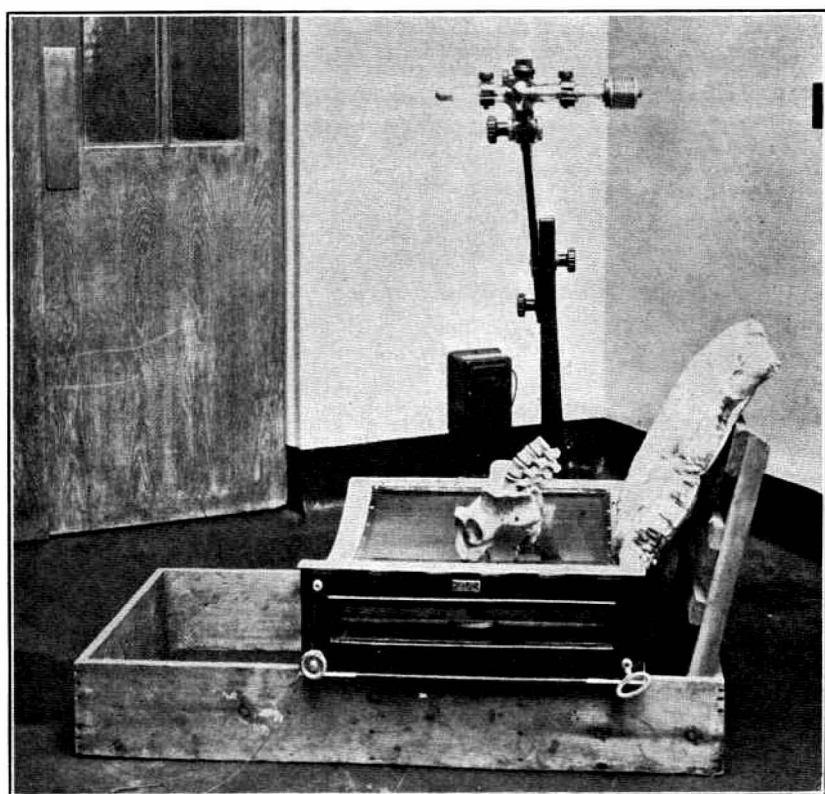


Fig. 2.

each representing one square centimeter at the plane of the superior strait. By viewing the two plates (or films) together in a view box, the area of the pelvic inlet in terms of centimeters becomes at once apparent.

The Position of the Patient.—This is best understood by studying Figs. 2 and 3. In the former a Bucky diaphragm is shown mounted on a chair-like frame upon which the patient sits. A bony pelvis is shown in the position occupied by the patient's pelvis and the tube or target is placed above the center of this. Fig. 3 shows the patient in

position for the exposure. It is necessary, however, to fulfill two conditions before the exposure may be made, namely, the superior strait must be made parallel or nearly so with the sensitive plate, and the distance of the superior strait from the latter measured. This is accomplished in the following manner: For purposes of identification a small tab of adhesive is placed on the patient's skin at a level with the upper border of the symphysis in the midline, and another tab in the depression under the spine of the last lumbar vertebra. It will be



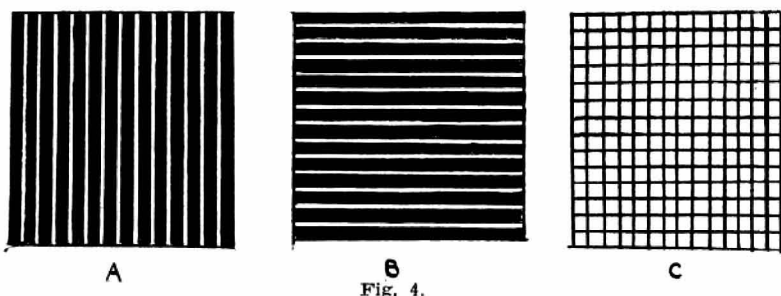
Fig. 3.

remembered that an imaginary line passing through these two points follows the course of the anteroposterior diameter of the superior strait. The patient is now placed on the frame in the manner shown by the illustration. She is asked to arch her back as much as possible and it will be noticed that the posterior tab tends to become equidistant from the sensitive plate with the anterior tab. In other words the plane of the superior strait has become horizontal or nearly so. If the posterior point is slightly below the anterior point (which may happen in an occasional case) the result will not be measurably af-

fect. Careful measurements of the distance of these two points above the center of the Bucky diaphragm is now made. This is done in order that the screen may be set in the same plane for the second exposure which is explained later.

The Exposure.—It is quite obvious that with the patient in this position an unusual amount of tissue must be penetrated and, therefore, an exposure somewhat as follows must be employed. A seven inch spark gap is used. A superspeed film with the Bucky diaphragm is necessary. The tube is placed at least 36 inches above the latter and an exposure of 120 ma.sec. used. This latter varies somewhat, of course, with the size of the patient.

The Lead Screen.—It is apparent that if ordinary wire screen of centimeter mesh is used that the result on the sensitive plate would be a series of impermeable black squares through which nothing could be viewed. The problem, therefore, in the preparation of the screen is one of an opposite character. That is a screen composed of tiny lead or metal squares each representing a square centimeter. This



would be extremely difficult and is quite unnecessary. A board is mounted with lead strips so placed that the interspaces are exactly one centimeter apart (Fig. 4). It is obvious that if an exposure is made through the screen in position *A* and another exposure on the same plate made with the screen in position *B* the result on the sensitive plate will be that shown at *C*, namely, a series of lines enclosing squares each representing one square centimeter.

Use of the Lead Screen.—Following the exposure made of the patient's pelvis, the screen is placed over the Bucky diaphragm in the same plane as that occupied by the superior strait. This is determined by the measurements previously taken of the points marked by the adhesive tabs. That is the distance from the center of the diaphragm to each point when the patient is in position for exposure. The exposure of the screen is as follows: Tube in same position as that for patient. Spark gap $3\frac{1}{2}$ inches, slow film, each exposure $\frac{1}{4}$ second running 5 m. a.

The Results.—The two films are developed, dried, and viewed. The first film shows the outline of the inlet of the patient's pelvis equally

enlarged in all directions and the second film shows a series of lines encompassing a series of transparent squares. By superimposing one film on the other in the view box, the plane of the superior strait will be shown divided into squares each representing one square centimeter. The measurement in centimeters of the area or any diameter of the superior strait becomes at once apparent. (See Fig. 5.)

COMMENT

We have in the foregoing described a technic for measuring the superior strait of the pelvis which offers to the obstetrician many advantages over the ordinary methods of pelvimetry. An authority has

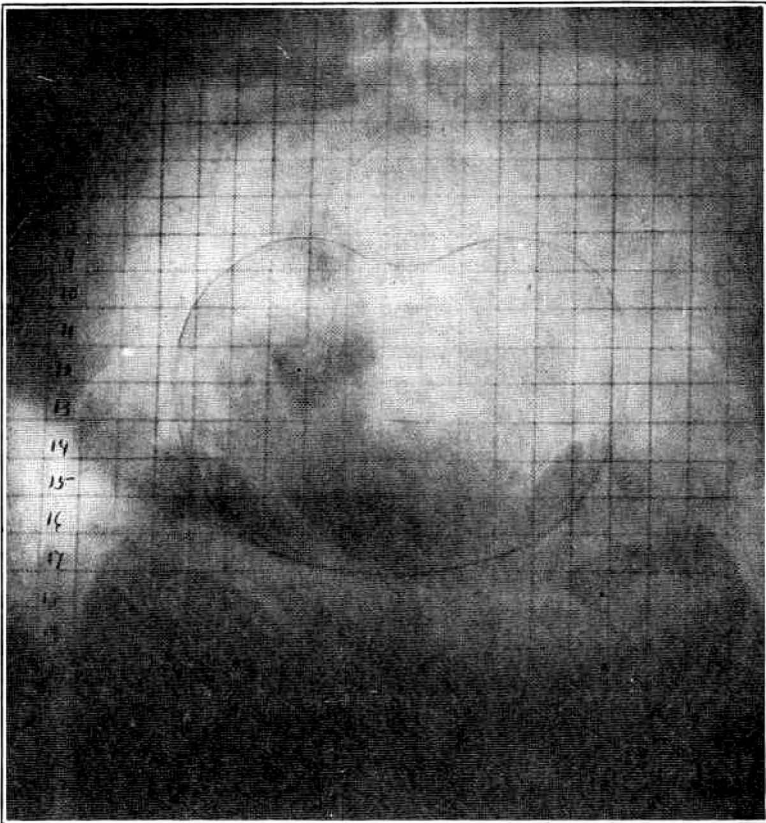


Fig. 5.

suggested that x-ray methods are not applicable in the latter months of pregnancy. This, however, has not been our experience as we have secured satisfactory pictures for mensuration even up to and including the last month of pregnancy. In this connection it has been suggested that the fetal head would interfere with obtaining a good outline of the pelvic rim. It will be remembered that with the patient

in the position here described the fetal head is much further away from the plate than when taking the ordinary anteroposterior picture. Furthermore, with the materially increased lime salt content of the mother's bones over that of the fetus it becomes apparent why in our pictures during the latter part of pregnancy the fetal head is often represented as not more than a very faint outline.

I have found the method of very great usefulness in women presenting themselves in early pregnancy with external measurements slightly under normal. It is in these cases at this time that exact knowledge of the area and shape of the pelvic inlet is greatly appreciated and it is in just these cases that one is so often surprised at the amount of pelvic room present.

It is apparent that such a screen may be used for other purposes of mensuration than that of the pelvic inlet or pelvic bones. At present we are working to use the technic in measuring the size of the fetal head, particularly the biparietal diameter in those cases which present slight or moderate overriding at term. At a later date in the near future these results will be published. In conclusion, I again wish to thank L. H. Wheatley of New Haven for the opportunity he has afforded in the use of Roentgenological Department of Grace Hospital and for his very valuable help in working out the exposures and points in x-ray technic with which I am unfamiliar.

REFERENCE

Thoms, Herbert: AM. JOUR. OBST. AND GYNEC., 1922, iv, 257.

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(For discussion, see p. 715.)