THE RADIOLOGICAL INVESTIGATION OF THE ACCESSORY NASAL SINUSES BY THE “UPRIGHT” METHOD.

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It has been pointed out by Dr. Graham Hodgson that the value of radiology as a diagnostic aid in diseases of the accessory nasal sinuses has in the past not been appreciated to anything like its proper extent. That this has been the case cannot very well be denied, the fault being due largely to the adoption of a technique in skull radiography, that has become standardized, but which fails to give the best possible results.

The object of these notes, therefore, is to suggest a method of carrying out the Graham Hodgson technique in Army X-ray departments by means of an easily made and inexpensive piece of apparatus.

It has always been the aim in radiological work to produce films taken in standard positions in order to obtain comparative results, and hence the so-called “nose-chin” and “nose-forehead” positions were adopted with the patient lying prone. These are not in fact “standard” positions at all, as the widely varying facial contours of the patients are not taken into account. In addition, the fact that the nasal sinuses are air-containing cavities was lost sight of. Pathological conditions, such as hyperplasia of the mucosa or the presence of fluid or pus, could not be differentiated.

With the patient in the prone position the presence of fluid often escaped detection as it spread out over the anterior aspect of the cavity in a thin layer which was invisible on a radiograph. The best that could be done in these circumstances was to report that a sinus was “opaque” or “dim,” the reason for this condition being left to the medical officer in charge of the case to ascertain for himself.

The interpretation of radiographs taken by this method was rendered difficult, not only by the lack of standardization of position, but also by the fact that in dealing with the accessory nasal sinuses the superposition of a multiplicity of bony structures varying in density and in distance from the film caused a confused picture.

By placing the patient in the erect position and by the adoption of a system of radiography that ensures the taking of films in standardized positions, many of these difficulties can be overcome, and fluid if present can be demonstrated as a fluid level, an undoubted advance on the old method.

The chief obstacle in attempting to carry out this work in X-ray departments has been the cost of the stand necessary, which is considerable.
Fig. 1 illustrates the device employed in the Q.A. Military Hospital, viz., a strong frame made of 4 by 2-inch wood with a firm base to ensure complete rigidity. It is essential to have a head-rest and it is desirable to use a Potter-Bucky diaphragm, the frame being so made that the head-rest and diaphragm are readily detachable.

Cassette holders of three-ply wood to fit into the Bucky tray and an adjustable operating theatre stool or music stool complete the necessary equipment.

The wooden frame depicted and five cassette holders of various sizes, were made for the total sum of four pounds by the hospital carpenter. I have no hesitation in saying that this money has been well spent and that the cost has been repaid in the value of more accurate diagnosis.

The value of the stand is not restricted to radiography of the nasal sinuses, for by using variously sized films valuable results can be obtained in such matters as the effect of weight bearing on joints, and the use of Uroselectan B in diverticula of the bladder, etc. Excellent lateral views of the spine and sternum can be obtained and also enlarged lateral views of the skull. Stereoscopic views can be obtained when necessary.

The technique is based entirely on that of Dr. Graham Hodgson.

The patient is seated on the operating stool and, with the exception of the position necessary for the view of the sphenoidal sinuses, faces the Potter-Bucky.
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The Potter-Bucky diaphragm should be lightly engraved with a cross-marking to ensure correct centring.

The surface markings of the patient used to ensure correct angulation of the head to the film are the outer canthus of the eye and the external auditory meatus, called, for ease of reference, the "orbito-meatal" line.

The vertical movement of the patient is regulated by means of the adjustable stool.

![Image of frontal sinuses](image)

**Fig. 2.—** View of frontal sinuses, taken with patient in the "chin-nose" position, showing no abnormality.

**Position 1.**

Patient faces the Potter-Bucky diaphragm, head clamped in the bi-temporal position, orbito-meatal line perpendicular to the film. Tube centred just below the external occipital protuberance.

View obtained: Anterior ethmoid cells superimposed on the posterior ethmoid cells and the sphenoidal sinuses. A view is also obtained of the...
maxillary antra, but not a good one. It will be noted that the shadow of
the petrous bones is seen well above the antra.

Position 2.
Patient faces the Potter-Bucky diaphragm, head clamped as in
Position 1, orbito-meatal line at an angle of $45^\circ$ to the film, with the face
tilted upwards.

![Image of a skull showing frontal sinuses](image-url)

**Fig. 3.**—View of frontal sinuses of same patient taken in the "upright" position showing
fluid level in the left frontal sinus.

Tube centred over the external occipital protuberance.
Views obtained: Frontal sinuses, maxillary antra, anterior ethmoid
cells. Shadow of petrous bones seen below the antra.

Position 3.
Should fluid be detected or suspected in either the frontal sinuses or
the maxillary antra, a confirmatory view can be obtained by clamping the
head as in Position 2, having first given the head a lateral tilt.
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Fluid if present will conform to the new position and show a horizontal level accordingly.

In practice it is found to be more satisfactory if the side suspected is placed on the higher level, when it will be found that the altered position of the fluid level is more readily demonstrated.

![Image of fluid level in maxillary antrum](image)

**FIG. 4.** Fluid level left maxillary antrum taken in the "upright" position.

**POSITION 4.**

Patient seated with back to Potter-Bucky, head extended back as far as possible with the plane of the face roughly at right angles to the film, and held in position with the head clamp.

Tube centred just below the chin.

View obtained: Sphenoidal sinuses.

**POSITION 5.**

Patient seated facing Potter-Bucky, head extended slightly with the orbito-meatal line at an angle of 35° to the film, then head rotated to either right or left 39° (read off scale on head clamp).
Tube centred just behind mastoid process.

View obtained: Posterior ethmoids, projected on radiograph in and below orbit. In this view also the optic foramen is well seen.

**Position 6.**

Standard lateral view of skull to show this aspect of the nasal sinuses.

Space forbids the illustration of all the results so far obtained, which have been interesting and instructive. In those that have been investigated the results are encouraging. In this connection an interesting feature is that transillumination is found not to be a certain method of diagnosis, the radiological findings frequently showing abnormalities not indicated by that method.

Fig. 2 represents a view taken in the "chin-nose" position, from which a definite diagnosis of any pathological condition would be difficult to make.
Fig. 3 is a view of the same case taken in the upright position in which a clearly seen fluid level in the left frontal sinus is apparent.

Fig. 4 is a reproduction of a radiograph in which the left maxillary antrum can be seen to be half filled with fluid.

The alteration of the fluid level on tilting the head is seen in fig. 5.

Other pathological conditions which can be shown by the Graham Hodgson technique are antral polypi, new growth involving the walls of the nasal sinuses, hyperplasia of the mucosa, etc. The importance of the adoption of standardization in carrying out this work cannot be too greatly stressed. Standard positions and standard conditions being essential to obtain uniform results and an accurate standard of comparative radiographs.

The possession of a Potter-Bucky diaphragm, though in my opinion desirable, is not essential, excellent radiographs being obtainable without its use. A small cone on the X-ray tube is advisable and good results can be obtained using roughly the following conditions, K.V. 70 to 80, M.A. 30. Tube film distance twenty-eight inches. Exposure time four to five seconds, varying with the thickness of the part to be radiographed.

With practice this method is readily and quickly carried out and it is considered that much useful research remains to be undertaken by means of “upright” radiography.

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REFERENCES.
