Roentgenographic Scanning of the Chest

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Of all the roentgen examinations, that of the chest is best. Its position is the easiest; it seldom requires contrast media, it is by far the most productive in demonstration of abnormalities; and with the exception of bone films it offers the greatest detail. It has been such a tremendously important tool to medicine that there is a tendency to consider it infallible. However, in the comparison of surgically removed lungs with x-rays taken immediately before operation we find that roentgen examination is frequently fallible (Fig. 1). The flat plate by itself may record a coincidence of shadows which can assume a pathological pattern (Fig. 2), and even in the stereoscopic view, lesions may remain hidden or masquerade as normal or other misleading patterns (Fig. 3).

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Fig. 1: A surgically removed lung and roentgenogram of the same lung taken the day before operation. The large dense tumor cannot be seen in the film.
The greatest reason for this fallibility is lack of scale in the x-ray emulsions and wave lengths of radiation which do not offer the maximum tissue differentiation. The chest is composed of both very radiolucent and radiopaque areas. In exposing for the "thin" parts, the more dense areas are greatly underexposed, while exposure for the "heavy" parts badly overexposes the radiolucent portions. Consequently the most diagnostic films are those taken by a compromise exposure. The compensation factor of a radiolucent area equalizing a radiopaque part would not be found in stereoscopic films if there were greater scale to record them properly. It is unfortunate that the two parts needing the closest examination—the apex and the hilum—have the greatest tangles of black and white.

Since it is imperative for a thoracic surgical service to learn as much as possible about any abnormality, we have resorted to a comparison stereoscopic method to better evaluate pathology in extent and position.

Fig. 2: Portions taken from each film of a stereo pair. Although the hilar region of each flat plate presents the appearance of abnormality, the lung was innocent by stereoscopic examination.
Fig. 3: One film from a scanning stereo of the apex of a referred patient. The right half clearly shows cavity in the unoperated side. Even stereoscopically the left half failed to demonstrate cavity.

Fig. 4: One film from a scanning stereo of the right lung.
Considerations

Scanning, properly defined, is to “examine point by point”. All binocular vision is, in a sense, scanning, but the conscientious artist, barber, pathologist, or surgeon will change his viewpoints in the close examination of an interesting area. Exercise of this ability should not be denied the roentgenologist. In viewing stereorontgenograms, if comparison can be made only by changing the film sets, the lag in memory renders the comparison uncertain. Therefore, it has been valuable to make comparison stereos on the same set of films, to be viewed simultaneously. In this way the eyes are permitted frequently to wander back and forth, checking the different presenting shapes and positions of abnormalities against the relative anatomical landmarks.

The visual sense has been trained from infancy in evaluation of opaque matter. Probably primarily for this reason the interpretation of depth and shape in the transparent image is especially dependent upon peripheral borders. Consequently, it becomes of increased importance to have a comparison of these changed peripheral borders in order to gain a more comprehensive knowledge of any transparent or semi-transparent image.

![Fig. 5: Blocks and supports on the plate changer.](image-url)
Stereoscopic scanning is indicated for those cases which still have doubtful areas after fluoroscopy and routine chest films have been seen. Comparisons can be made of the apex or of one entire lung. Angulation between the two positions comprising such a comparison examination should be sufficient to make visible the mediastinal portions of the lung, but not so great as to make comparison difficult. When the area is small or intricate, the angle between the patient-positions should be narrow. When the portion to be examined is large and gross, as in a large tumor or an extensive pneumothorax, the angle can be less acute.

**Equipment**

The only equipment needed is two pieces of lead or leaded rubber, one 17 x 7 inches, the other 14 x 8 1/2 inches and improvised supports (Fig. 5). If a stereoscopic Bucky is not available, a Lysholm grid is frequently useful.

**Procedure for Apex**

Preparation for scanning stereos of the apex is simply done by blocking off the lower half of the front surface of the plate changer. The patient is placed in the postero-anterior position, then turned slightly into either anterior oblique position. Regular stereoscopic procedure is carried out. The cassettes are inverted and interchanged. The patient is then placed in the opposite anterior oblique position and stereo taken.

**Procedure for Lung**

The plate-changer is prepared by covering either long half with the 7 x 17 inch block. The patient is placed in the anterior oblique position and stereo taken. The block is then moved to the other side and the cassettes interchanged. The patient is then placed in the posterior oblique position and stereo taken. The interchange of cassettes renders this second image in the pseudoscopic position, making it more comparable with the first image (Fig. 4).

**Variations and Combinations**

If scanning stereos have been taken of a lung and abnormalities have been shown in only one view or shown so poorly in the complementary view as to be of no value, the area can be scanned in the preferable oblique position.

In especially intricate areas such as the sub-thoracoplasty lung, information frequently can be gained by using both blocks and taking four scanning views of the one questionable portion. In such a case it is often preferable to use a horizontal tube-shift.

In Figure 3, since the greater interest was in the unoperated
right side, right anterior and right posterior obliques were used. In this case, the cassettes were inverted but not interchanged.

CONCLUSIONS

1) The standard, flat roentgenogram of the chest can be inaccurate and misleading.
2) The single stereoroentgenogram of the chest is not always entirely comprehensive.
3) A comparison method of stereoscopically scanning an anatomical area may provide a check against error.
4) A comparison method of stereoscopically scanning an anatomical area can possibly demonstrate pathology not noted in another view.
5) The areas of pathology seen in both views will afford a comparison evaluation of extent, position, and shape.

CONCLUSIONES

1) El roentgenograma llano corriente del tórax puede ser inexacto y engañoso.
2) El estereoroentgenograma aislado del tórax no es siempre enteramente comprensivo.
3) Un método de comparación de escudriñar estereoscópicamente una zona anatómica, puede suministrar un control para evitar el error.
4) Un método de comparación de escudriñar estereoscópicamente una zona anatómica posiblemente puede demostrar procesos patológicos que no se notan en otra proyección.
5) Las zonas patológicas que se observan en ambas proyecciones permiten una apreciación comparada de la extensión, posición y forma.