THE LOCATION OF METASTASES FROM THE URINARY TRACT, THE PROSTATE, AND THE THYROID GLAND

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Before determining the type of treatment of definitely malignant conditions of the thyroid gland, the urinary tract, and the prostate, it is very important to determine the presence or absence of metastases from these malignancies. The finding of metastatic lesions by roentgenographic examination may confirm the presence of a primary malignancy in one of these organs.

In order to ascertain what organ harbors the primary lesion, it is necessary to know some of the characteristics of the areas of metastasis. Metastasis may take place by the lymphatic route. This is particularly true in the case of carcinoma, except of the adenocarcinoma type.

Metastases by the lymphatic route, however, can not well be determined by roentgenographic examination because enlarged metastatic lymph nodes can seldom be recognized by this method. We have chosen for discussion, therefore, those tumors which are more frequently disseminated by way of the blood stream on account of the more or less encapsulated character of the masses. In their metastatic growth these tumors appear as rather distinct, nodular, or well-defined masses which are quite similar in appearance. They are easily recognized in the chest as dense tumor masses (Figs. 1, 2, 3, 4, 5 and 6) and in the osseous system as rounded areas of destruction in the bones without any evidence of bone production (Figs. 7 and 8). (Fig. 11). The area in which these tumors grow, completely destroying the bone, is sometimes designated by the roentgenologist as a "punched out area." These punched out areas are characteristic of metastases from adenoma of the thyroid and from the hypernephroid tumors of the kidney and the metastatic lesions may have all the characteristics of the primary growth, while metastases from the prostate are of a different type, which will be described later.

The metastasis of benign tumors was first described by Cohnheim. He used adenoma of the thyroid as an illustration and expressed the opinion that the thyroid gland gives off adenomatous alveoli, which in turn are transplanted to other organs. There is no definite evidence that this takes place, and we believe that if these transplanted growths are found, they must be masses of aberrant thyroid tissue and not true metastases. We believe that all metas-

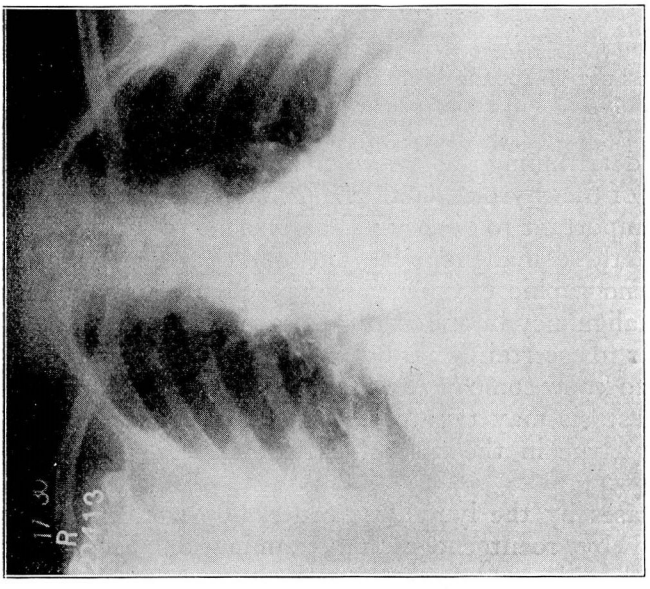

Fig. 2

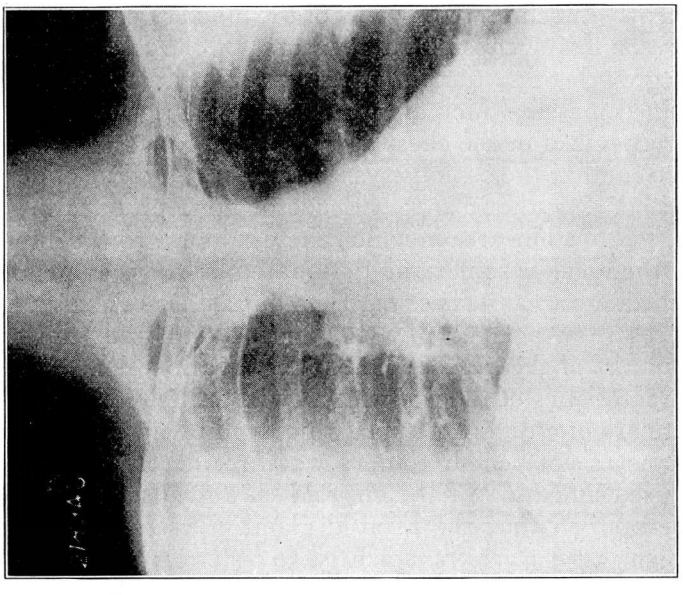

Fig. 1

tases from the thyroid are malignant, and therefore the finding of metastases, particularly in the chest, aids greatly in establishing the diagnosis of a suspected carcinoma of the thyroid.

In the case of malignant condition in the kidney, the character of the metastatic lesion may direct attention to the kidney as the primary focus when such a malignancy has not been previously suspected, and in many cases the finding of the metastases will confirm the suspicion of the presence of a kidney tumor, and may also show definitely that the growth is malignant. This is an interesting example of chest and skeletal metastases through the blood stream which closely simulates thyroid metastases.

In many cases of malignant hypernephroid tumors of the kidney, there is no hematuria or other urinary symptoms that would lead to the suspicion of a malignant condition in the kidney, a so-called silent kidney lesion. Likewise, many small hypernephromata may metastasize before a palpable tumor of the kidney can be recognized, and in such a case pylography is the only means of confirming the presence of the suspected lesion. These metastatic lesions, particularly skeletal metastases, were formerly thought to be adrenal rests, while in reality they are usually carcinomatous renal metastases. A bone tumor of this type may be only a single growth, the removal of which in some cases has resulted in no return of metastases. A single lesion of this kind in bone probably should be removed together with the primary growth.

Tumors of the prostate may be easily found by palpation. However, simple hypertrophy of the prostate may simulate a tumor, and in a doubtful case the finding of metastases in the bones or chest may definitely confirm the diagnosis of a tumor of the prostate.

A small tumor of the prostate with little or no urinary symptoms may metastasize early, and roentgenographic examination of the spine or bony pelvis may show metastases as the first evidence of prostatic malignancy. The tumor mass lodges in the venous sinuses of the bones and produces an osteitis, marked osteoplastic activity, and also osteoclastic stimulation (Figs. 9 and 10). The osteoplastic activity, however, being more pronounced, results in considerable formation of bone, usually with wide dissemination and little or no tendency to the formation of discrete nodular tumor masses, as in the case of tumors of the kidney or the thyroid.

It is well known that metastases from the thyroid gland and the urinary tract have frequently been overlooked, particularly in their early stages, because of the fact that a roentgenographic examination of the probable areas of metastases has not been made. Of course, it is impossible to make a roentgenographic examination of the

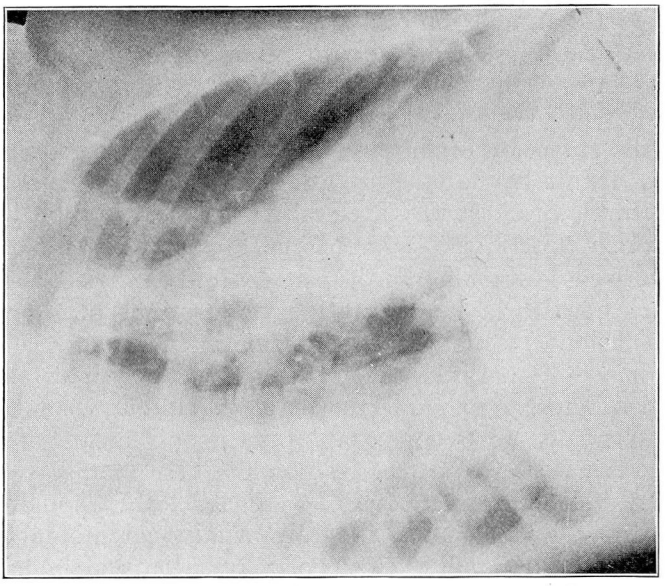

Fig. 4

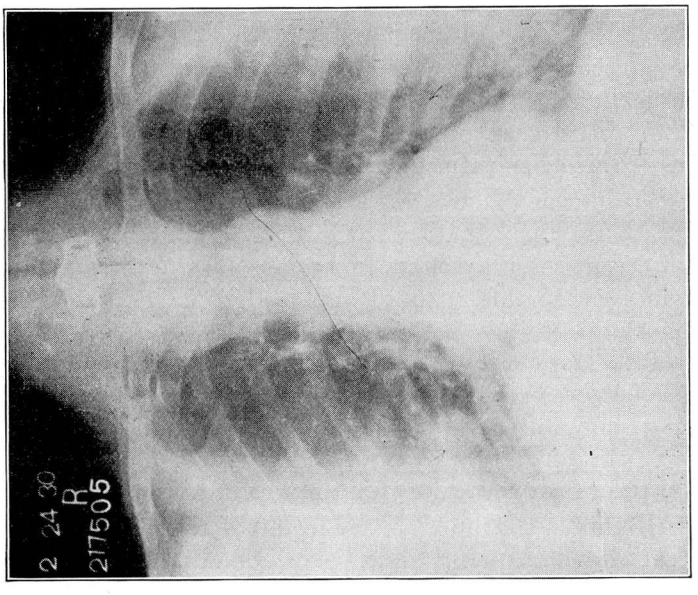

Fig. 3

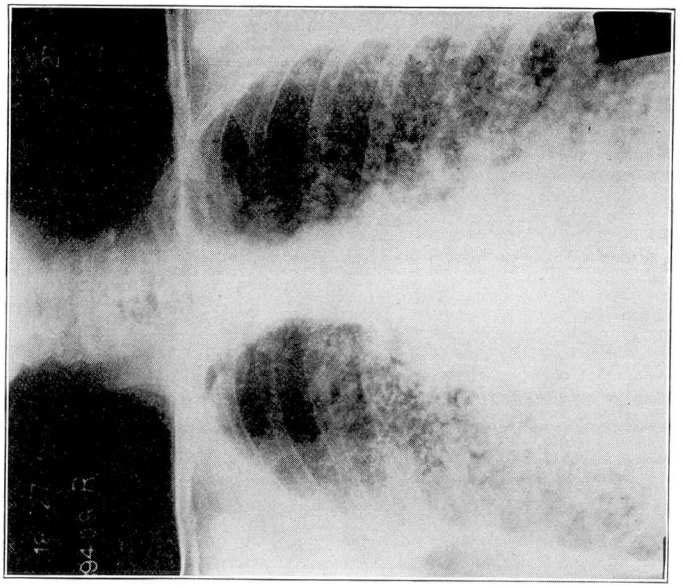

Fig. 6

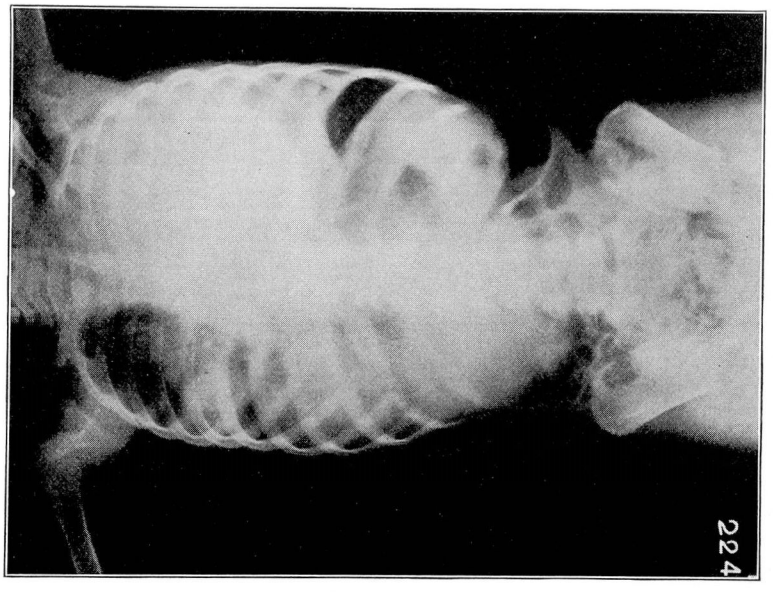

Fig. 5

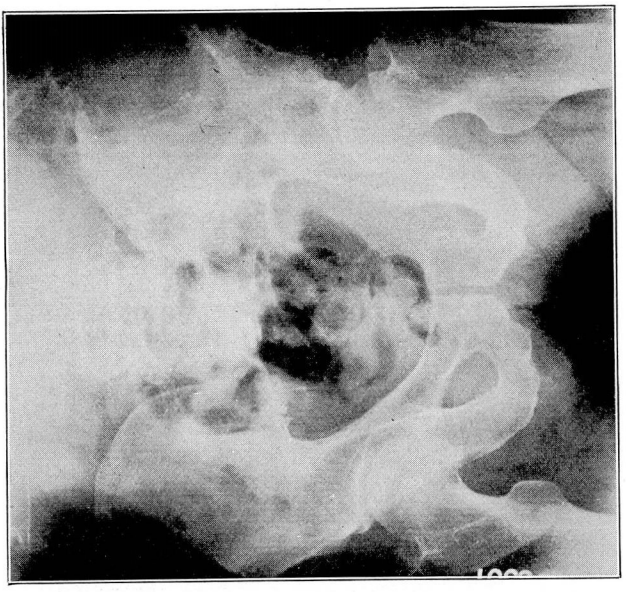

Fig. 8

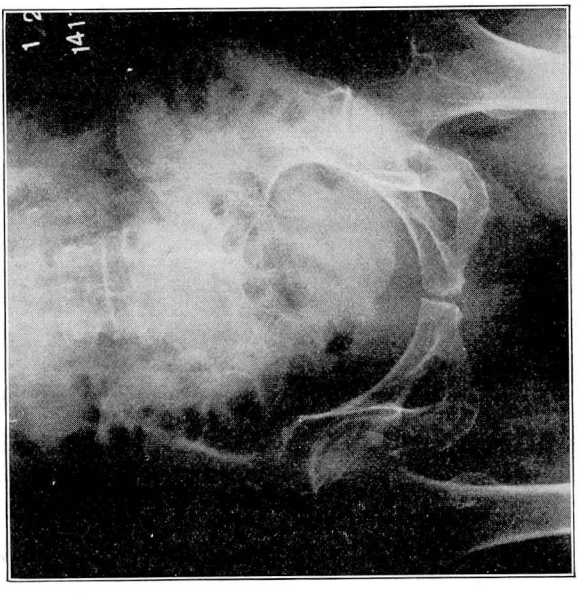

Fig. 7

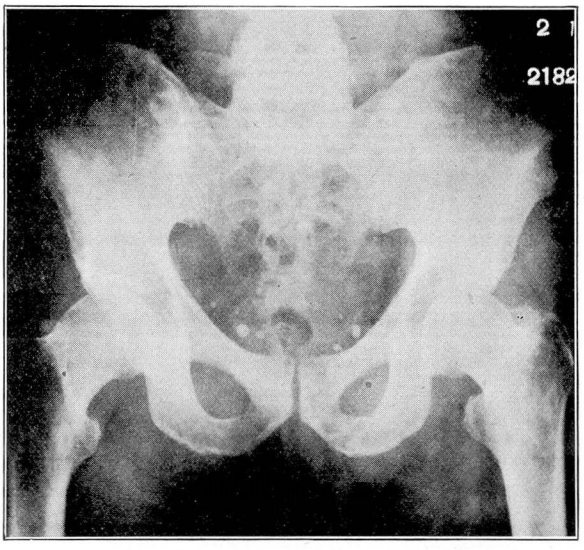

Fig. 9

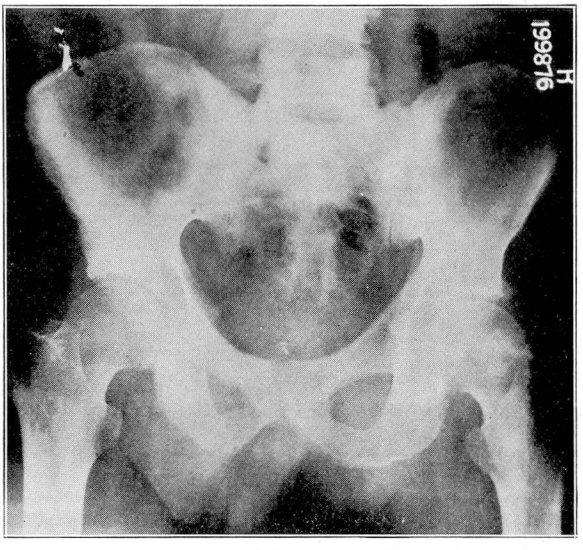

Fig. 10

entire body in every case of suspected metastases. Therefore it becomes imperative that a knowledge be gained of the areas of the body to which metastases are most likely to extend, and of the order of their frequency. This knowledge is of material aid in making the roentgenographic examination. If metastases are found

Fig. 11

Roentgenogram showing metastatic destruction of the outer end of the left clavicle from a primary carcinoma of the prostate.

while examinations are being made for other chest or bone pathology, their probable primary focus can also be deduced.

With these ideas in mind, we have made a survey of our cases of metastases from the urinary tract, the prostate gland and the thyroid gland in order to determine the frequency and location of

such metastasis, together with the character of the lesion, in the hope that the roentgenologist could thus render a more efficient service to the clinician and to the surgeon.

It will be at once apparent that in a survey of this kind all cases of metastases can not be represented, as many of these patients die with unrecognized metastatic lesions. We have therefore considered only the areas in which the presence of metastases was definitely determined at the time of the original examination or in a postoperative survey.

Our series includes 268 cases of thyroid malignancy, 55 of which showed metastases. In 34 of these 55 cases the metastases were distributed in the bones and chest as follows:

Chest	22
Pelvis	4
Sternum	2
Clavicle	2
Skull	1
Spine	1
Ribs	1
Knee	1

From these findings it will be seen that the chest is the most frequent site of metastases from the thyroid gland malignancies and that the pelvis, sternum and clavicle are next in frequency.

Of 276 cases of prostatic malignancy, 70 showed metastases to the chest and bony skeleton, distributed as follows:

Chest	5
Pelvis	43
Spine	19
Ribs	2
Humerus	1
Scapula	2
Clavicle	1
Tibia	1
Fibula	2

Of 127 cases of kidney malignancy, 27 showed metastases, 16 of which were in the chest and bony skeleton, distributed as follows:

Chest	11
Spine	2
Skull	1
Ribs	1
Radius	1

Here again it will be seen that the greatest number of cases metastasize to the chest, as in the case of the thyroid.

SUMMARY

In cases of suspected metastases from malignancies of the thyroid gland and the urinary tract, a roentgenographic examination should always be made of the chest first, as being the most likely site of metastases. The pelvis should be examined next and then the lumbar spine. After that, the roentgenologist must be guided in his examination by the evidence of symptoms in the bony skeleton. It must be borne in mind that in cases of metastasis the symptom of pain may be present before the evidence of metastasis can be demonstrated by roentgenographic examination. This is particularly true in the spine, but pain gives the most important information for unusual locations of metastatic lesions in the bony skeleton.

Location of Original Growth	*Thyroid*	*Prostate*	*Bladder*	*Kidney*
Total Cases in Series	268	276	340	127
Total Cases with Evident Metastases	55	70	15	27
Location of Metastases				
Abdomen	1	2	..	..
Bone				
Skull	1	..	..	1
Spine	1	19	1	2
Sternum	2	..	..	..
Ribs	1	2	..	1
Scapula	..	2	..	..
Clavicle	2	1	..	..
Humerus	..	1	..	..
Radius	..	..	..	1
Pelvis	4	43	..	..
Femur	..	4	..	..
Knee	1	..	..	..
Tibia	..	1	..	..
Fibula	..	2	..	..
Chest	22	5	1	11

The above table shows a review of malignancies in the thyroid, the prostate, bladder and kidney, and the frequency with which metastasis was demonstrated by roentgenographic examination.