The Early Appearance of Coin Lesions*

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When we talk about coin lesions, we mean small, round lesions and we practically always mean lesions that have been detected by means of an x-ray film survey in asymptomatic patients. Over the past 20 years or so, there has been a gradual shift in the thinking about such surveys, their purpose and their value. The original intention was to find tuberculosis in the early curable stage in which it was asymptomatic, or nearly so. It was hoped that as a secondary yield, early cancer of the lung and heart disease might be uncovered in addition to early tuberculosis.

The next stage was characterized by a considerable drop in the incidence of tuberculosis. This was accelerated when effective means of chemotherapy became available. These factors combined to make the yield in active tuberculosis smaller. At the same time, cancer of the lung became increasingly a matter of public and medical concern. Statistics from most chest surgical centers showed that the only hope of significant salvage of patients with carcinoma of the lung rested with a diagnosis in the asymptomatic stage and that means with the diagnosis by means of survey films.

The next development which took place approximately in the last decade is characterized by the work of Rigler and others showing that many carcinomas of the lung exist for fairly long periods, that is for a matter of months or years, as small, round lesions before they metastasize and become symptomatic. In fact, Rigler was able to collect a number of cases of carcinoma of the lung in which he was able to retrace the course of the disease by means of previous x-ray films of these patients on which the carcinoma could be identified in retrospect, but which had been erroneously considered to be negative.

There is still another important aspect to this problem which also has developed in the last decade. This is the recognition by Garland and others that in x-ray film survey work, human error enters on a scale vastly larger than had been suspected. Garland published in 1959 results showing that as many as 30 per cent of positive findings were missed with usual survey methods.

What can be achieved in chest x-ray film survey work depends on how long the lesions are visible with a chance of being diagnosed before they enter into the disseminated stage, when the possibility of cure rapidly approaches zero. Rigler tried to answer this question by tracing the previous x-ray films of known cancer patients. We have used a different approach, taking advantage of the fact that in our institution there is a large group of employees and also a large group of long-term patients whose chests have been surveyed at regular intervals for many years. We investigated all cases of coin lesions and selected for this presentation those cases in which we had previous x-ray films back to the time before the lesion existed. We have found nine such cases. They are equally divided into three groups. Three cases of carcinoma, three cases of tuberculosis and three cases which were not operated upon and who therefore are not diagnosed, but who may be presumed to represent tuberculomas. We were interested in three questions. First, what is the duration of the lesion? That is, how long is the lesion visible as a small round lesion (by small we mean 2 cm. or less, as shown in the illustrations). The second question is, what is the appearance of these lesions; particularly, what is their x-ray appearance when they are first detectable...
on the film, which is usually earlier than they are actually found and reported? The third question we investigated was, what change is there from the first appearance to final appearance?

A. Duration: The duration was longest in the three cases which are undiagnosed. This has nothing to do with the biology of the lesion. It is simply because these were lesions occurring in elderly people or people otherwise unsuited for surgery. The duration in these cases was nine, seven and seven years. In the six operated cases, the duration was one, two, two, two, three and three plus years respectively.

B. Appearance: On theoretic grounds, one would expect the lesion to be at first small, say 3 mm., and barely detectable and then to grow gradually in spheric fashion until the late stage of secondary changes and irregular growth. Some of the cases published by Rigler actually show such an increase in size over the period of observation. Six of our cases, including two of the carcinomas, one tuberculoma and the three undiagnosed lesions did not change at all in size. They presented as rounded lesions from the date of the first observation, measuring between 1 and 2 cm., and maintained that size. However, they appeared as faint lesions, showing little contrast against the surrounding lung tissue and, as time went on, became much more dense and therefore easier to see. The one remaining carcinoma did seem to originate from a rather small lesion and grew at first, but did not increase in size over the last year of observation. However, this lesion showed not only umbilication, the so-called Rigler sign, but actually central cavitation. That leaves only two tuberculous lesions, one of which remained constant in size from the time it was first visible without becoming more dense, while the other did increase in size over a period of two years to a slight degree.

Presentation of Cases

Case 1 is an 87-year-old man with Karskoff's psychosis. In 1953, his chest x-ray was negative, and in 1954, there was a faint round density hidden behind the crossing of two ribs. It was extremely faint and measured 14 mm. in diameter on the original film. In 1957, it measured 18 mm. in diameter, but had become much denser. In 1960, it was still unchanged.

Case 2 is a 51-year-old engineer who had a negative chest x-ray film in 1950, although there is a question in retrospect about the presence of a faint lesion. It was again seen in 1953 and has become only slightly more definite in 1961. He has asthma and chronic glomerulonephritis and his chest also was not explored.

Case 3 is a 37-year-old man with dementia praecox who had a negative chest x-ray film in 1952, a questionable pulmonary density in 1953, a faintly visible lung lesion five months later

![Figure 1](A AND B): Undiagnosed lesion.
Figure 2 (A to E): Carcinoma.
EARLY APPEARANCE OF COIN LESIONS

Figure 3 (A to D): Carcinoma.
measuring 11 mm. in diameter (Fig. 1A). It was still seen unchanged in size, but increased in density in August, 1960 (Fig. 1B). It was diagnosed in 1957. He was not explored because the lesion has remained stable for so long.

The next group of cases had tuberculomas.

Case 4 is now 47 years old, and had a depressive psychosis. In 1952, he had a negative chest x-ray film. On readmission in 1957, he showed a round density which had elements of calcification. This was practically unchanged in 1959. He had a right upper lobectomy in May, 1959. The lesion was found to be a tuberculoma. It is the only case here reported containing calcium.

Case 5 was a 44-year-old laboratory technician who had negative chest x-ray films up to January, 1958, although in retrospect, this film may have shown the lesion. It was definite in April, 1958, was again seen in January, 1959, unchanged in size, and was seen again in January, 1960. He had right upper lobectomy and died postoperatively, probably of embolism. The lesion was found to be active tuberculosis.

Case 6 is a 43-year-old nursing aid. He had a negative chest x-ray film in July, 1957, a faint lesion covered by a rib six months later. The lesion became more distinct in March, 1959 without increasing in size and was again seen unchanged in August, 1960 and in January, 1961. Tomograms in February, 1961 showed it to be a solid tumor without calcification. He had a wedge resection of the lesion which was classified as tuberculoma, active.

The last group are three cases of carcinoma.

Case 7 was a 45-year-old electrician whose lesion was discovered when he was admitted for an unrelated condition. We were able to obtain a miniature x-ray film dating back to January, 1957 (Fig. 2A). It shows a small, round lesion which evidently was not considered significant. Our first x-ray film of April, 1959 (Fig. 2B) showed the lesion which was coin-shaped, but with a central translucency. This case was considered for exploration, but when the x-ray survey film was located, which showed the lesion already present two years earlier, it was felt that the patient should be observed (Fig. 2C). In April, 1960 the lesion had grown slightly (Fig. 2D) and again showed the central translucency. This was confirmed by tomograms (Fig. 2E). Because of the slight changes in size and structure, he was explored almost a year after he had first come to our attention and three years after his x-ray survey film. Left pneumonectomy was done. At operation, there seemed to be hilar involvement, but the surgeon felt he was able to remove all tumor bearing areas. The lesion proved to be alveolar-cell carcinoma. He received postoperatively 5000 r by means of cobalt radiation. He has remained well to date. This is the only case here reported for whom we do not have a previous negative film. This lesion was present for an unknown length of time prior to 1957.

![Figure 4 (A and B): Carcinoma.](image-url)
Case 8 is a 61-year-old man with chronic brain syndrome and CNS syphilis. He had a negative chest x-ray film in 1955 and a questionable density in 1957 (Fig. 3A). The lesion had become more definite later in 1957 and in September, 1958 (Fig. 3B) it was not felt that it had increased in size. In March, 1959, it was still found unchanged (Fig. 3C, D). He had right pneumonectomy and has now survived for two years without evidence of recurrence. The histologic diagnosis was epidermoid bronchogenic carcinoma.

Case 9 is a 69-year-old man with chronic brain syndrome, CNS syphilis and a great variety of other diseases for which he has been subjected among other things to a subtotal gastrectomy and portocaval shunt. He had a negative chest x-ray film in April, 1956. A faint lesion could be seen in January, 1957 (Fig. 4A). In May and November of that year, it was possibly more distinct, without having increased in size. In December, 1957 (Fig. 4B) it had become still more dense. He had left upper lobectomy in January, 1958 and was found to have squamous-cell carcinoma. He is living without evidence of recurrence three years after the operation.

DISCUSSION

In our three cases of carcinoma, the time of visibility as a coin lesion ranged from one to three or more years. This means that if carcinomas are to be detected at this stage by means of x-ray surveys, chest films must be made at yearly intervals at most and probably a nine month interval would be preferable.

Our three proved tuberculomas were visible for two and three years without much change and might have remained stable for much longer, just as our undiagnosed lesions did, which probably also represent granulomas. It was surprising to find that seven of these nine lesions did not change in size and the other two did not change much, but that seven of these lesions did at first present themselves only very faintly and changed in the sense of increasing density and contrast.

This would suggest that in reading an x-ray survey chest film, the radiologist will have to adopt an attitude of greater suspicion of even small, faint lesions and he should not hesitate to reject films which do not fall into the optimal contrast range.

Concerning the problem of missed positive findings, it has been suggested that films be dual read. This, according to Garland, results in an only moderate improvement. We would suggest instead to increase the frequency of surveys. This would mean that instead of one chest film being read twice, two chest films would be read once, but with the added advantage that the later chest film might show more distinctly a lesion which was missed the first time. We realize that the lesion may have become incurable in the interval, but if the interval is short, there is the possibility that the second examination will show cases which could not possibly be detected on the first examination or which have developed in the interval. This would work statistically to the overall advantage of the group of patients examined.

Lastly, it seems that the emphasis in survey work has shifted from an epidemiologic measure concerned with tuberculosis to a means for early diagnosis of carcinoma. This implies that most coin lesions which are found will have to be attacked surgically. Even though the risk of surgical exploration for coin lesions has been dramatically reduced over the past two decades, the number of deaths might well rise if the number of noncarcinomatous coin lesions found increases, and the number of explorations increases accordingly.

This points up the desirability to distinguish radiologically, or by other means, malignant lesions from non-malignant ones. Rigler and others have made valuable contributions in this regard, but it must be admitted as Pischnotte and Sammons put it, that there is a “need for thoracotomy to establish a positive diagnosis in almost all cases . . .”

CONCLUSIONS

1. When coin lesions first become recognizable, they measure 1 to 2 cm. in diameter.

2. Regardless of their histologic nature, most of them remain nearly stationary in size for a number of months or years.
Absence of growth cannot be relied on to exclude malignancy.

3. Increase in density or structural change, rather than increase in size, is common both in tumors and in inflammatory lesions in the first months to years of their development.

4. Usually, the x-ray shadow does not allow one to distinguish a malignant or benign tumor from an inflammatory lesion.

5. Case-finding by means of periodic x-ray films is, under present circumstances, the only measure which could improve the salvage rate of carcinoma of the lung.

6. The interval between surveys should be nine months but certainly not more than one year.

**RESUMEN**

1. Cuando las lesiones redondas (en moneda) aparecen por primera vez miden de 1 a 2 cms. de diámetro.

2. Cualquiera que sea su naturaleza histológica, la mayoría permanecen casi estacionarias en este tamaño por un número de meses o años. La falta de crecimiento no debe servir de apoyo para excluir la malignidad.

3. El aumento de densidad o el cambio estructural más bien que el aumento de tamaño es común tanto en tumores como en lesiones inflamatorias en los primeros meses o años de su desarrollo.

4. Generalmente la imagen a los rayos X no permite distinguir una lesión maligna de una benigna o de una inflamatoria.

5. El descubrimiento de los casos por medio de las radiografias periódicas, bajo las circunstancias actuales, constituye la única medida que puede mejorar la proporción de rescatados del carcinoma pulmonar.

6. El intervalo entre los exámenes debe ser de nueve meses, pero no exceder un año.

**ZUSAMMENFASSUNG**


4. Für gewöhnlich läßt sich an Hand einer röntgenologischen Verschattung keine Unterscheidung treffen zwischen einem bösartigen oder gutartigen Tumor oder einer entzündlichen Läsion.

5. Fallsuche mittels periodischer Röntgenaufnahme ist unter den gegenwärtigen Umständen die einzige Maßnahme, die die Überlebensrate der Lungenkarzinome verbessern würde.

6. Der Zeitabstand zwischen den Untersuchungen sollte 9 Monate betragen, auf keinen Fall aber mehr als 1 Jahr.

**REFERENCES**


**ANNUAL OTOLARYNGOLOGIC ASSEMBLY**

The University of Illinois College of Medicine, Department of Otolaryngology, will offer an intensive postgraduate basic and clinical program under the direction of Dr. Emanuel M. Skolnik. This assembly for practicing otolaryngologists offers a condensed program of one week of daytime and evening sessions, October 20 through 26. It is designed to bring to specialists a wide variety of current advances in management, therapy and philosophies. Interested physicians may receive the details by writing to: Department of Otolaryngology, University of Illinois College of Medicine, 1853 West Polk Street, Chicago 12, Illinois.