THE SUBCUTANEOUS NODULES OF RHEUMATOID ARTHRITIS WITH LIPOID DEPOSITION*

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Introduction

Weber and Freudenthal (1936-7), Weber (1943, 1944, 1947, 1948), and Fletcher (1946, 1947) have noted the rare occurrence of subcutaneous nodules in rheumatoid arthritis which consisted almost entirely of lipid, and have designated such cases by various names to differentiate them from the "common" type of rheumatoid arthritis subcutaneous nodule.

During the clinical examination of seventy cases of chronic rheumatoid arthritis in Cape Town, twenty cases were found to have one subcutaneous nodule or several nodules (Horwitz, 1948, 1949). Eleven nodules were removed by biopsy (from eight cases), and their macroscopic and histological features were examined. One of these nodules was found to differ from the other ten in being composed almost entirely of lipid and thus resembling the two cases described by Weber and Fletcher. The case is described fully below. When the descriptions were compared it seemed that there might be some common pathogenesis of the pathological changes observed in the nodule of this case and in the nodules described by Weber and Fletcher.

Experimental staining with scarlet red of frozen sections of an additional nine nodules (from seven cases of rheumatoid arthritis) showed that lesser degrees of lipid deposition are in fact commonly

present in most "ordinary" nodules in rheumatoid arthritis. It is, therefore, suggested that this lipid deposition forms the basis of the later development of those nodules encountered with grosser degrees of lipid deposition. If so, then there is no justification for using special nomenclature to designate the lipid nodule in the present case, or in the similar cases recorded in the literature.

Review of Literature

Weber (1944) has suggested the term "necrobiotic nodules of the rheumatoid arthritis type" to designate the well-known characteristic subcutaneous nodules of rheumatoid arthritis which were described by Dawson (1933), Collins (1937), and Bennett and others (1940). Weber noted that subcutaneous nodules occasionally occurred which differed in histological structure from the common type of nodules only by the deposition of lipid material, and Fletcher (1946, 1947) has used the term "necrobiotic nodules of the rheumatoid arthritis type with lipid deposition" to indicate this special type of subcutaneous nodule.

Weber has written several papers on this subject. They are largely concerned with periodic reports of a case of chronic rheumatoid arthritis which was first demonstrated by Weber and Freudenthal at the Royal Society of Medicine in December 1936. Further reports on this same case were made by Weber in 1943, 1944, 1947, and 1948. The result has been the unique opportunity of following up

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a case of great interest over a period of twelve years.

The patient, aged 35 in 1936, had rheumatoid arthritis for six months. The arthritis was accompanied by multiple subcutaneous nodules over the elbows, the olecranon ridges, the dorsum of the hands, the buttocks, the greater trochanters, the coccyx, and both acromial regions. Numerous smaller nodules were present on the ears and face, especially over the borders of the lips and nostril. Some of the subcutaneous nodules were reddish in appearance; others were yellowish-red. They were firm in consistency. None of the nodules were painful or tender with the exception of the nodules over the elbows.

A biopsy of one of the nodules was examined and described in detail. The main feature was the presence of large masses of cells forming round or oval areas which were scattered irregularly between the bundles of collagen tissue in all parts of the cutis. These cells were so numerous that their mass exceeded that of the collagen tissue, the bundles of which were pressed aside. The cells were conspicuous by their size, up to four times the size of an epithelial cell. Most of the cells were multinucleated. The cytoplasm was well stained, well defined, and abundant. It was homogeneous and did not have a "foamy" structure. When sections were stained for fat with Sudan III, these cells in some areas showed no fat nor lipid at all; in other areas the cytoplasm was stained a faint red. There was "no double refraction".

Weber (1944, 1947) was uncertain what these cells should be called. He hesitated to call them "xanthoma cells" or "foam cells", as this name usually denotes that the cells are loaded with lipid droplets. In the sections the cells showed either no lipid or lipid present in a diffuse form. There was no actual proof of the presence of cholesterol. He tentatively suggested that they might be "prexanthoma cells" at an "intermediate stage in development" towards typical "foam cells". His alternative explanation was that the cells were "at the height of their development", but contained some "special lipid" which was responsible for their peculiar appearance. Weber (1944) at first designated this case as "a Syndrome of Rheumatoid Arthritis combined with Multiple Xanthomatous Connective Tissue Infiltrations". The serum cholesterol was 230 mg. per 100 c.cm. of blood and 350 mg. per 100 c.cm. on two separate occasions, and was 110 mg. per 100 c.cm. after the patient was treated with a "fat-poor diet".

The patient was next seen in 1941. He still had symptoms due to his arthritis, but there were "only remnants of the nodules on the hands and about the elbows". In 1943 the patient had "functionally almost

recovered" except for some residual stiffness of the right hip. Nodules were still detectable over the knuckles and the elbows. The latest report was made by Weber in 1948. The patient was back at work, felt quite well, and his weight had risen from 7 to 10 stone. The nodules on the elbows had been spontaneously absorbed, but a number were still present on both hands.

Weber (1948) has stated that he now prefers to call the patient's illness by the term "lipoid rheumatism".

Fletcher (1946, 1947) has described another case of rheumatoid arthritis with subcutaneous nodules in which there was marked lipid deposition but which differed in certain respects from Weber's case.

The patient was a male, aged 42. Nodules first appeared four years after the onset of arthritis. They appeared in very many sites—over the occiput, the scapular spines, the pelvic bones, the elbows, the wrists, the fingers, the greater trochanters, the knees, and the feet. There appear to have been about forty nodules according to the description given. The nodules were "pale" in colour. There was marked deterioration in the general health.

Biopsy examinations were made of four nodules situated over the olecranon process, the forearm, and the fingers. Widespread necrosis was the most striking feature in all the nodules. One nodule had the histological picture which is usually encountered in the characteristic nodules of rheumatoid arthritis, that is, central necrosis surrounded by mononuclear cells arranged in a palisade manner. Around most of the necrotic areas in the other nodules was a broad cellular band composed of typical "foam cells". The cells were large and pale, and contained numerous very distinct vacuoles. These "foam cells" gave a positive Schultze test for cholesterol and showed fine orange-red droplets in sections stained with Sudan. Stained granules could be seen in the cells and filling the spaces between connective-tissue bundles. Cholesterol was also demonstrated by the Schultze test in the greater part of the necrosis and in the immediate surrounding tissues, that is, it was intracellular and extracellular. Multinucleated giant cells of the "foreign-body type" were frequently present. In some nodules the central necrotic zones were surrounded both by the characteristic mononuclear cells in palisade manner and by "foam cells". Surrounding the cellular zone of "foam cells" or of mononuclear cells were connective-tissue bands which contained numerous lymphocytes, plasma cells, and well-defined "foam cells". The blood vessels in the neighbourhood of the nodules, and in the nodules, often showed inflammatory changes.

Fletcher stressed that the basic histological

reactions of focal necrosis, cellular proliferation, round cell infiltration, and vascular lesions were present in these nodules, and that they differed from the nodules described by Collins (1937) largely in the altered cytology. The essential difference was the presence of cells which showed vacuoles, which contained cholesterol by Schultze's test, and which stained decisively with Sudan III. Fletcher suggested the term "necrobiotic nodules of the rheumatoid arthritis type with lipoid deposition" to describe his case, and he has classified it separately (1947).

The serum cholesterol was recorded twice in Fletcher's case; the results were 135 and 154 mg. per 100 c.cm. of blood.

Weber and Fletcher could find no records of previous descriptions of similar cases in the literature, with the possible exception of a case described by Layani (1939) and by Layani and others (1939). Layani referred to his case as "xanthomatous chronic deforming rheumatism", and Graham and Stansfield (1946) have summarized his descriptions.

The patient was a female of 46 years with chronic polyarthritis of fifteen years' duration. There was gross disorganization of the joints. She developed xanthoma *planum et tuberosum*, angina pectoris, prolonged jaundice with hepatomegaly, and marked hypercholesterolaemia. There was no autopsy report, and it is uncertain what the nature of the disease was. Probably it was a coincidental combination of rheumatoid arthritis with generalized primary xanthomatosis and xanthomatous biliary cirrhosis (Thannhauser, 1940).

Graham and Stansfield (1946) have described a case which presented with clinical features of polyarthritis resembling rheumatoid arthritis.

Cutaneous nodules appeared and increased progressively in size and number, and ill-defined nodules also developed in the subcutaneous tissue and in the muscles. Radiological examinations revealed patchy bone destruction of many parts of the skeleton. The histological examination of the nodules revealed widespread involvement by histiocytes with "foamy" cytoplasm. The microchemical tests for fat, lipoid, and glycogen in these cells were negative. After two to three years a nodule in the right axilla increased rapidly in size and assumed the appearance of a malignant tumour. The patient died, and the histological appearances of this tumour were those of a "polymorphic-celled sarcoma". There was extremely widespread infiltration of certain mesodermal tissues by similar cells to those encountered in the original biopsy.

The authors suggested that this case should properly be classed among the lipoidoses, and they referred to it as "a case of a hitherto unrecognized lipoidosis simulating rheumatoid arthritis". Bywaters (1949) agrees that their case was an

example of a granulomatous infiltration of bones, joints, and tendons mimicking rheumatoid arthritis.

Raven and others (1948) described a case of rheumatoid arthritis with numerous subcutaneous and visceral nodules at autopsy. Frozen sections, stained for fat, showed intracellular sudanophil droplets in the cells surrounding the necrotic foci and extracellular granules throughout the central necrotic area. With the polarized light some of the intracellular lipoid appeared doubly refractive.

Kersley and others (1946) described various types of lipoid deposition in three nodules in a series of cases of rheumatoid arthritis. The main features of these nodules were as follows:

1. The nodule from their twelfth case had a typical histological appearance in part of the tissue characteristic of the "usual" necrobiotic nodule. Elsewhere in the nodule the structure was quite different. The central necrotic zone was heavily infiltrated by cholesterol, and the material yielded abundant cholesterol crystals when it was scraped. Foreign-body giant cells were seen in the tissues adjacent to the areas of lipoid infiltration, and appeared in some cases to be attempting to engulf adjacent cholesterol. No "foam cells" were seen. The surrounding fibrous tissue was more hyaline and less cellular than elsewhere.

2. The nodule from their thirteenth case showed a characteristic necrotic focus in one small area. The rest of the nodule consisted of two foci of cholesterol surrounded by numerous layers of dense hyaline eosinophilic fibrous tissue. Perivascular and paravascular-cell infiltrations were noted in the fibrous tissue and in the subcutaneous tissue.

3. The nodule from their fourteenth case was a "sausage-shaped" mass, which consisted of a fibrous capsule enclosing a "soft yellow greasy necrotic material". Sections showed, in addition to granular amorphous debris, areas of "foam cells". These "foam cells" were large, rounded, or polygonal cells with small darkly stained nuclei and well-defined cell membranes. The cytoplasm was vacuolated. Cholesterol clefts were present in hyaline fibrous tissue.

Case Report

The patient was an elderly European male aged 78 years, who had suffered from chronic rheumatoid arthritis for forty-three years. The proximal interphalangeal joints, metacarpophalangeal joints, wrists, elbows, shoulders, and knees were affected. These joints were constantly painful and stiff. He had never experienced a remission since the onset of the disease, but the degree of pain and swelling fluctuated. He considered that he was "at his worst" twelve years earlier. He lost 15 lb. in weight at the onset of the disease, but there was no further decrease in weight. Nodules developed painlessly on both elbows approximately twelve years ago. They attained the size of "walnuts", but have since decreased considerably in size.

He was found to be in a fair state of general health. All the affected joints were slightly swollen and slightly tender, with limitation of movement. There was some ulnar deviation of the fingers, with wasting of the thenar and hypothenar eminences. There were no gross deformities or contractures. While he was under observation during 1947-8 he had an attack of coryza with acute pharyngitis, followed by an exacerbation of the features of the polyarthritis. The affected joints became very painful and more swollen. Several months later he had largely "recovered" from the relapse.

Subcutaneous nodules were present over both elbows. Two nodules were present on the left side, the proximal one being situated over the proximal end of the radius, and the distal one along the posterior border of the ulna, 2 inches distal to the tip of the olecranon process (Fig. 1). The nodules were each half an inch in diameter. The nodule over the head of the radius was soft in consistency, and the nodule over the ulnar border was firm and adherent to the underlying periosteum.

A soft mass was visible and palpable over the right olecranon process in the situation of the olecranon bursa. It consisted of soft tissue and did not fluctuate. In it could be palpated one discrete, firm, pea-sized nodule, and five tiny nodules, each the size of a pin's head, which were loosely adherent to each other.

No other abnormalities were noted with the exception of arteriosclerosis and slight hypertension. The urine and the blood count were normal.

The diagnosis was confirmed radiologically by the demonstration of characteristic changes in the hands and wrists. Some secondary osteo-arthritis changes were also detected.

The results of special investigations were as follows: sedimentation rate 40 mm. in 1 hour (Westergren); serum uric acid 3.5 mg. per 100 c.cm.; serum cholesterol 139 mg. per 100 c.cm.; blood urea 35 mg. per 100 c.cm.; serum albumin 4.6 g. per 100 c.cm.; serum globulin 2.7 g. per 100 c.cm.; thymol turbidity 7; colloidal gold 5; thymol flocculation 4; Congo Red test, 61 per cent. of dye remained in the serum after one hour; fractional test meal normal; Wassermann reaction negative; Brucella agglutination negative.

Biopsy of Subcutaneous Nodule.—The mobile nodule over the proximal end of the radius on the left side was removed (Fig. 2, upper specimen). Its surface was rounded and smooth and it felt fluctuant. A cross-section showed that it had a cyst-like structure. Its centre contained a large amount of yellow, greasy material which was partially detached from the wall of the nodule (Fig. 2, lower specimen). The yellow, greasy material consisted of characteristic cholesterol crystals (Fig. 3A), of debris, and of sudanophil lipid droplets (Fig. 3B). A frozen section stained with Scarlet red showed the presence of large amounts of sudanophil lipid in the tissues adjacent to the central area of cholesterol and lipid (Fig. 4).

Fig. 5A illustrates a cross-section of the nodule under very low power. One of the poles and two of the side-walls of the nodule can be seen surrounding an empty space. It is this empty space which was filled with debris

and the cholesterol crystals seen in Figs. 2 (lower specimen), 3A, and 3B. Two other similar but very much smaller spaces can be seen near the pole of the nodule situated in necrotic foci (Fig. 5A).

Fig. 5B illustrates a cross-section under a higher magnification. It can be clearly seen that the wall of the nodule is composed of two parts: (a) an outer layer of concentric connective tissue fibres, and (b) an inner layer which is undergoing necrosis and degenerating, and which merges with the debris in the centre of the nodule.

A few large foreign-body giant cells were seen at the junction of the inner and outer layers. No "foam cells" were seen.

Some small blood-vessels in the connective tissue at the periphery showed perivascular infiltration with lymphocytes. The sections were not examined with polarized light.

Discussion

This case is certainly an example of "lipoid deposition" in a nodule of rheumatoid arthritis. The lipid deposition was so extensive that it comprised the major part of the nodule. Only a shell of fibrous connective tissue surrounded the large amount of cholesterol and sudanophil lipid. From a survey of Figs. 2 to 5 the evolution of the changes which occurred may be surmised. The nodule had been present for a long time (twelve years) in a case of chronic rheumatoid arthritis. The original areas of necrosis which are present characteristically in these subcutaneous nodules (as in Fig. 6A) probably underwent liquefaction and lipid material was deposited. The lipid deposition proceeded to such an extent that the lipid areas coalesced and came to occupy the entire centre of the nodule with a rim of fibrous tissue round it. The two small spaces seen in Fig. 5A are probably the sites of similar lipid deposition in small necrotic foci at an earlier stage.

The problem arises as to the relationship of this case to those cases described by Weber and Freudenthal (1936-7) and Weber (1944, 1947, 1948); by Fletcher (1946, 1947); and by Kersley and others (1946). The macroscopical appearances of this nodule are not quite like those either of Weber's case or of Fletcher's case as no "foam cells" were seen and as all the lipid appeared to be extracellular.

The nodule appears to be similar in some respects to the nodules described by Kersley and others (1946). The cholesterol deposition in their twelfth case differs only in degree from this case—the cholesterol deposition in their case was still restricted to certain areas of the nodule, whereas the deposition of cholesterol and of sudanophil lipid in this case was so extensive that it practically replaced the entire nodule. Both nodules have the same

FIG. 1.—A man, aged 78 years, who had had rheumatoid arthritis for 43 years. Two subcutaneous nodules had been present on the left elbow for twelve years.

FIG. 2.—Biopsy of proximal subcutaneous nodule seen in Fig. 1. The nodule was cystic and on section was found to contain a large amount of yellow, greasy material.

FIGS. 3A (left : unstained) and B (right : Scarlet red).—The yellow greasy material in the centre of the nodule consisted of debris, of numerous characteristic cholesterol crystals (Fig. 3A), and of sudanophil lipid droplets (Fig. 3B). (Note that in Fig. 3B cholesterol crystals are not stained by Scarlet red.)

FIG. 4.—Large amounts of sudanophil lipid are present in tissues surrounding the central mass of cholesterol and lipid. (Frozen section: Scarlet red, $\times 95$.)

surrounding hyaline fibrous tissue, and a few foreign-body giant cells were noted in both. Similarly, the nodule from their thirteenth case had a small central area of cholesterol and a thick surrounding wall of fibrous tissue, whereas the nodule of this case had a very large area of cholesterol and a thinner fibrous tissue wall. The macroscopic appearance of the nodule from their fourteenth case (the "sausage-shaped mass") was strikingly similar to the features noted in this case, but numerous "foam cells" were present in addition on histological examination in their case. These "foam cells" were similar to the cells noted by Fletcher in his case.

On reviewing the cases described by Weber, by Fletcher, and by Kersley and others, it seems that a variety of lipid changes may occur in these subcutaneous nodules of rheumatoid arthritis, and the present case is important as it helps to illustrate the sequence of events which may be occurring.

The problem becomes simplified if one postulates that the primary change is the deposition of a small amount of cholesterol or other lipid in the central necrotic area of a focus in the nodule. Dawson (1933) had noted that cystic degeneration sometimes occurred in the necrotic areas of old nodules and was sometimes followed by the deposition of numerous cholesterol crystals, and Bywaters (1949) noted the common occurrence of cholesterol crystals in the central necrotic areas and of "foam cells" in the palisade layer. Raven and others (1948) quoted

Professor Russell's opinion that sudanophil substances might be expected in the rheumatoid arthritis nodules with central necrosis. The subsequent appearance of the nodule probably depends merely on the amount of lipid which is deposited; on the site of deposition, and on the reaction of the surrounding tissues to the presence of the lipid. Kersley and others noted that foreign-body giant cells attempted to engulf lipid in the nodule of their twelfth case.

Any or all of the following changes could conceivably then occur: presence of cholesterol crystals or of other lipid material in small, moderate, or large amounts extracellularly; and presence of "foam cells" containing lipoids in variable amounts intracellularly. The resulting macroscopic and microscopic appearance of the nodule would depend on the extent to which these changes had occurred. Thus:

(a) In Weber's case the lipid, of undetermined type, was situated wholly intracellularly, producing cells somewhat resembling "foam cells".

(b) In Fletcher's case the lipid was situated partly intracellularly, producing "foam cells", and partly extracellularly in the connective tissue.

(c) In the thirteenth case (in the series of Kersley and others) the extracellular cholesterol deposition formed a *small* focus surrounded by dense fibrous tissue.

(d) In the twelfth case of Kersley and others' series the cholesterol was deposited extracellularly in *some* of the necrotic areas.

FIG. 5A.—The empty space between the edges of the nodule contained the mass of cholesterol crystals and lipoid seen in Figs. 3A and B. Two very similar but much smaller spaces are detected near the left pole of the nodule. (Haematoxylin and eosin, $\times 10$.)

FIG. 5B.—Wall of nodule consisting of an outer concentric fibrous tissue layer and an inner layer which is partially necrotic. (Haematoxylin and eosin, $\times 130$.)

FIG. 6A.—Illustrates a typical focus commonly seen in the subcutaneous nodules of rheumatoid arthritis. It consists of a central zone of necrosis, surrounded by a palisade-like zone of radially-arranged mononuclear cells, and an outer zone of connective tissue. (Haematoxylin and eosin, $\times 95$.)

FIG. 6B.—An example of a focus in which lipoid is demonstrable (with Scarlet red) at the periphery of a necrotic area. (Scarlet red, $\times 95$.)

FIG. 6C.—An example of a focus in which lipoid is demonstrable throughout the necrotic area. (Scarlet red, $\times 95$.)

(Figs. 6A, B, and C are illustrations of sections from different nodules.)

(e) In the fourteenth case of Kersley and others' series there was lipid deposition intracellularly, producing "foam cells"; and also extracellularly, producing a large area of "soft, yellow greasy material" in the centre of the nodule.

(f) In the present case there was a *very extensive* extracellular deposition of cholesterol and sudanophil lipid, which attained such a great size that it comprised more than three-quarters of the entire nodule. There was no intracellular deposition and no "foam cells" were noted.

If this theory is accepted it will link together all these cases with their variable degrees of lipid deposition.

It is of interest to note that "lipoid deposition" may occur in gouty tophi. Chauffard and Troisier (1921) described the presence of cholesterol in tophi, and Kersley and others (1946) have noted the presence of "foam cells" containing cholesterol in a tophus of one of their cases with gout. They remarked on the resemblance of the "foam cells" of their case to the "foam cells" described by Fletcher (1946, 1947) in the nodule of his case mentioned above.

The occurrence of cholesterol deposition in gouty tophi, and the presence of "foam cells" in the case described by Kersley and others, lends further support to the hypothesis put forward to reconcile the diverse findings with regard to lipid deposition in rheumatoid arthritis nodules. If both free cholesterol crystals and "foam cells" can occur in a gouty tophus, then it is understandable that either, or both together, might occur in rheumatoid arthritis nodules and produce a variety of histological appearances.

Conclusion.—The suggested conclusion is that the "special" nodules described by Weber and by Fletcher are possibly interesting variants of a fairly common pathological process, that is, the deposition of lipid in the necrotic areas of the subcutaneous nodules. Bywaters (1949) has expressed the view that there seems to be no reason for separating such cases from the ordinary type of rheumatoid arthritis with nodules showing only a small amount of cholesterol.

Routine Examination of Rheumatoid Arthritis Subcutaneous Nodules for the Presence of Lipoid

After this case with marked lipid deposition in the nodule was encountered it was decided to make routine examinations of other rheumatoid arthritis nodules for the presence of lipid. Thus, frozen sections from an additional nine nodules (obtained by biopsy from seven cases) were stained with Scarlet red in the same manner and examined. They were compared with

corresponding sections fixed in formalin and stained with haematoxylin and eosin.

The results were striking and interesting. Of the nine nodules examined in this manner there was sudanophil lipid demonstrable in eight nodules, and no lipid in one case. There was thus a high incidence of lipid histologically in rheumatoid arthritis nodules as determined by this technique.

The distribution of the lipid was confined to the areas of necrosis. Usually the lipid was found in the peripheral part of the areas of necrosis (Fig. 6b), and occasionally the lipid was present in both the peripheral and central parts of the necrotic areas (Fig. 6c). All these eight nodules in which lipid could be detected had the characteristic histological appearances with multiple necrotic foci (as in Fig. 6a) when examined after staining with haematoxylin and eosin; whereas the one nodule which contained no lipid consisted almost entirely of connective tissue with only a minute area of necrosis when examined in the same way. The occurrence and the distribution of the lipid are therefore closely related to the presence and distribution of the necrotic foci in the nodules. (The histological appearance of a characteristic focus with its central necrotic area surrounded by a "palisade" of mononuclear cells is seen in Fig. 6a.)

The presence of the lipid was noted in nodules which originated outside the olecranon bursa as well as in nodules which originated in, or were attached to, the olecranon bursa.

With a knowledge of the high incidence of lipid present microscopically in the nodules, it appears very probable that the lipid can increase in extent as the necrotic areas merge and coalesce with each other. Ultimately the lipid could occupy a large part of the nodule. "Foam cells" might appear if the lipid was intracellular. Thus the lipid deposition which occurs frequently in the necrotic areas is probably the starting point in the evolution of the nodules described by Weber (1944, 1947, 1948); by Fletcher (1946, 1947); by Kersley and others (1946); and in the evolution of the nodule described above in the present case.

The results of the investigation therefore tend to support the suggestions offered of the pathogenesis of the nodule in the present case and of similar nodules described in the literature.

The *serum cholesterol* was within normal limits in the present cases and in Fletcher's case, and it was slightly raised on one occasion in Weber's case.

These findings are not surprising as the local deposition of cholesterol in various conditions (for example, in inspissated pleural effusions, in hydrocoele fluid, or in hydatid cysts) is neither due to, nor dependent on, hypercholesterolaemia.

Summary

1. A subcutaneous nodule removed from a case of rheumatoid arthritis was found to consist of a rim of fibrous tissue enclosing a large central

collection of cholesterol crystals and extracellular sudanophil lipid.

2. The literature of other examples of rheumatoid arthritis nodules with lipid deposition was reviewed, and the findings were compared with those in the above case.

3. Frozen sections were made from an additional nine subcutaneous nodules, and in eight instances the presence of lipid could be demonstrated histologically in the characteristic necrotic foci in the nodules.

4. It is therefore suggested that the subcutaneous nodules of rheumatoid arthritis with lipid deposition which have been described are not distinct entities, but are merely different histological end-results of a process with a common pathogenesis, that is, the deposition of lipid in the necrotic foci in the nodules.

There seems, then, to be no special reason for separating such cases by special nomenclature from the ordinary type of rheumatoid arthritis with nodules containing little or no lipid.

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Nodules Sous-cutanés avec Dépôts Lipoidiques dans l'Arthrite Rhumatismale

RÉSUMÉ

On a trouvé qu'un nodule sous-cutané dans un cas d'arthrite rhumatismale consistait d'un pourtour de tissu fibreux renfermant un gros amas de cristaux de cholestérol et une substance lipéide extra-cellulaire.

La littérature concernant d'autres cas d'arthrite rhumatismale avec des nodules contenant des dépôts lipéides fut revisé et les résultats furent comparés avec ceux du cas mentionné.

On examina des coupes de neuf autres nodules sous-cutanés et dans huit cas la présence de grandes ou de petites quantités de substance lipéide peut être démontrée histologiquement dans les foyers nécrotiques caractéristiques des nodules. On suggère donc que les nodules sous-cutanés de l'arthrite rhumatismale avec dépôts lipéides décrits antérieurement ne sont pas des entités distinctes mais qu'ils constituent seulement des produits histologiques finaux différents d'un processus ayant l'étiologie et la pathogénie communes, c.-à-d., le dépôt de la substance lipéide dans les foyers nécrotiques des nodules.

Il semble donc qu'il n'existe aucune raison spéciale pour qu'on sépare de tels cas par une nomenclature spéciale du type ordinaire de l'arthrite rhumatismale avec des nodules contenant peu ou pas du tout de cholestérol et de substance lipéide.