TUMORS OF TENDON SHEATHS

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Tumors of tendons and of tendon sheaths are very rare. This is the reason why no standard division or classification of them has been set up as yet, thus we find no chapters in standard books on pathological anatomy and surgery, which would specially deal with these diseases, excepting some short references.

Recently we had in our Clinic occasion to observe four cases of neoplasms of tendon sheaths. Besides which there was one case observed and given up to us in the Surgical Department of the General Hospital. I am indebted to Professor Ostrowski for the privilege of reporting it.

Case I.—M. O., female, aged twenty-four, complained of a small swelling in her right thumb for one year. The swelling grew slowly, giving no pain. It hindered the flexion of the thumb and the grasping of things.

Examination.—On the palmar side of the right thumb a hard well-defined uneven tumor was found. It was a little larger than a hen's egg, not painful and free of the phalanges and skin which was normal and movable.

The movement of the finger was very limited, the flexion of the joint especially being practically impossible, while the flexion of the phalango-metacarpal articulation was possible only within the extent of 15° to 20°. The tumor appeared to originate in the flexor tendon of the thumb.

Operation (Doctor Janik).—The tumor was exposed under local analgesia and easily separated from the surrounding tissues. Approaching to the base of the tumor it was seen that it was attached to the sheath of the flexor of the thumb. The tumor was removed together with a part of the sheath, which was closed with a single suture.

Macroscopic Examination.—The surface of the tumor removed was broken up into many lobulations. On section some brighter stripes of connective tissue were seen, running from the capsule toward the centre and separating the remaining mass of the cartilage into lobules. The parts lying nearer to the tendon sheath seemed to be more opaque, hard and resistant to cutting. The specimen measured 4 x 3 x 3 cm.

Microscopic Examination.—Broad stripes of connective tissue with a small number of nuclei, surrounding lobules of hyalin cartilage. The opaque area was caused by the calcification of the external part of neoplasm (Fig. 1).

Microscopic Diagnosis.—Chondroma with calcification.

Case II.—O. W., male, aged twenty-five, stated that a tumor had been growing for three years on the plantar side of the second toe of the right foot. The tumor gradually increased, without causing any discomfort.

During the last two months the tumor grew rapidly and became painful. The pain increased during walking on account of boot-pressure.

Physical Examination.—On the plantar side of the second toe of the right foot a growth was to be seen, as large as a hen's egg, hard and uneven, which pressed the toe up. The flexion was considerably limited, but the extension of the joints of the toe was not hindered.

The tumor seemed to be connected with the toe-phalanges.

Röntgen-ray examination showed a circular shadow of the tumor, against which the outline of the first and second phalanges of the toe were visible, the shadow being more opaque than that of the soft tissue, and less opaque than that of the neighboring bones. In the middle of this homogeneous shadow, an island of a darker area in the shape of a butterfly was visible, irregularly and sharply outlined. The limits of the bones were normal, a distinct line of demarcation between the spongiosa and compacta, however, was missing. The shadow of the second toe phalanges was more distinct than that of the neighboring bones, because the shadow of the phalanges and that of the neoplasm was intensified. Thus, it did not appear to be in any connection with the phalanges.

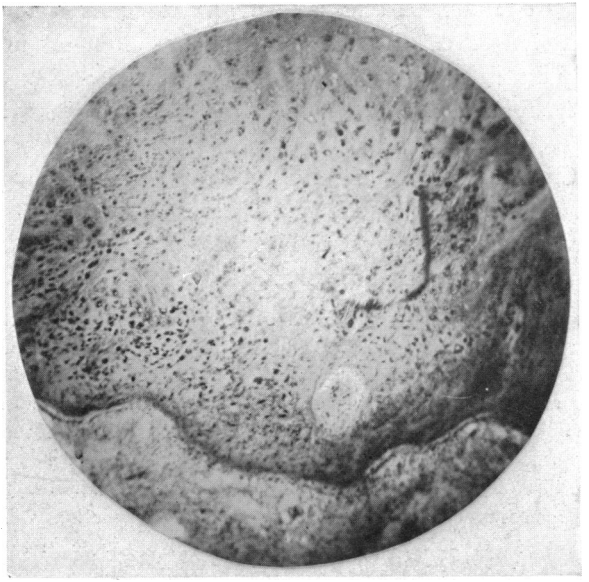

FIG. 1.—Case I. Chondroma of tendon sheath showing calcification.

Operation (*Doctor Ratajski*).—Under local anæsthesia a longitudinal incision was made, exposing the tumor.

During the operation the difficulty of removing the tumor appeared so great that it was impossible to remove it without exarticulation at the metacarpophalangeal joint.

Macroscopic Examination.—The toe with tumor removed was divided into two halves. The neoplasm was closely attached to the sheath of the flexor and was movable in relation to the phalanges.

The surface of the phalanges was even and distinctly separated from the mass of the neoplasm.

The tumor was well encapsulated, of a cartilagenous consistency, uneven and lobulated. It originated from the external surface of the flexor sheath, being organically connected with it. It surrounded the sheath and the tendon which pierced the tumor running within the canal formed by its sheath.

Microscopic Examination.—Revealed the tumor as a chondroma. The connective tissue stroma surrounded the islets of the hyaline cartilage. The opaque area shown in the skiagram was due to calcification of a part of chondroma.

An examination of the borders of the neoplasm and of the tendon sheath showed close organic connection between the neoplasm and the sheath; the edges of the sheath were uneven and ragged, and the tissue of neoplasm penetrated the sheath in the shape of islands. Thus, there were no distinct and sharp limits between the sheath and neoplasm.

Microscopic Diagnosis.—Chondroma with calcification.

CASE III.—J. C., workman, forty-three years of age, complained of a growth over the dorsal surface of the right forearm. Fifteen years ago he was struck in his forearm with a heavy pole. Three months later he noticed a small swelling in the same place which increased, but gave him no pain. During the past twelve months it became painful, and grew rapidly larger. The movement of the wrist was painful.

Physical Examination.—On the volar surface of the right forearm there was a tumor between the carpal joint and the upper half of the forearm, but not sharply out-

lined, in its distal end very painful. It was hard and free of the skin which was normal, and could be moved a little laterally.

The lymph-nodes in the axilla were not enlarged.

Operation (*Professor Schramm*).—The tumor was exposed by a longitudinal incision and separated from the surrounding tissue. After lifting the neoplasm it was found to be lying on the muscle layer of the forearm, attached to the sheath of the tendon of the flexor carpi radialis. In one place it had grown together with the tendon, and it was difficult to separate the mass from the tendon. Thus, it had to be removed with a part of the tendon.

The patient recovered without any complications.

Macroscopic Examination.—The specimen removed consisted of a large circumscribed, lobulated and encapsulated mass, which measured 18 x 12 x 11 cm. On its surface a number of hard or soft translucid tubercles containing a mucous fluid were seen.

On the section the mass appeared to be composed of a gray tissue which was darker than the tissue of the capsule, and was of various consistency, *viz.* on the periphery it consisted of a whitish, dense fibrous tissue, while the deeper parts were of a more soft consistency and looked brownish.

There were scattered areas of a more opaque appearance, very hard and difficult to cut. The largest of them nearly of the size of a pigeon's egg. There were also empty spaces, *viz.*, dissected cysts.

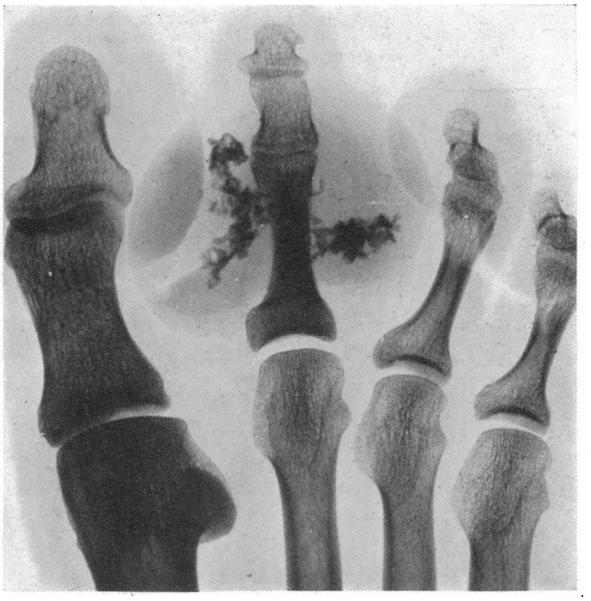

FIG. 2.—Case II. Skiagram showed no evidence of connection of neoplasm with the phalanges.

Microscopic Examination.—Sections taken from this growth show a neoplasm composed of rather mixed tissue. Chiefly it is composed of numerous spindle-shaped cells running in stripes in different directions, with a small quantity of intercellular substance.

In its whole this part of tissue corresponds to a typical picture of fusocellular sarcoma.

Apart from the fact that that tissue formed the main part of the neoplasm, it formed also nests and stripes amid the other substance, *viz.*, cartilage of a homogeneous hyaline appearance. This cartilage had cells, irregularly arranged and of different sizes. Amidst that cartilagenous tissue there were areas of calcification, irregularly distributed. The trabeculæ of cartilage in these places were calcified, and the periphery had a true bone picture. In some other places the islets of cartilage showed at their peripheries attenuation of the tissue, assuming gradually a mucous character. Somewhat further there were areas of what may be considered as myxoma.

Between all these tissues there were spaces filled with connective tissue running in irregular stripes. It was of a considerable density, and showed hyaline degeneration.

Thus, the whole was a mixed neoplasm composed of tissues of fusocell, sarcoma, fibroma, myxoma, chondroma, and osteoma.

A more exact revision of the section showed that the cartilagenous tissue constituted

in this neoplasm the material from which two other tissues, *viz.*, the myxomatous and osteoid ones took their origin.

It was endeavored to ascertain under the microscope the relation of the neoplasm to the tendon, because during the operation it was found that the tumor was connected not only with the sheath, but also the tendon itself. It was therefore important to decide, if the neoplasm originated from the tendon or from the sheath. It was seen in many sections that the tendon tissue is separated distinctly from that of the neoplasm which stood off from the tendon, which suggested that no organic junction existed between the tendon and the neoplasm.

Microscopic Diagnosis.—Fibrochondromyxoosteosarcoma.

CASE IV.—Z. E., a married woman, aged forty, was admitted to the Surgical Clinic complaining of a growth over the volar surface of the right forearm. It appeared five years ago, and has been increasing in size, gradually but slowly, without causing any pain.

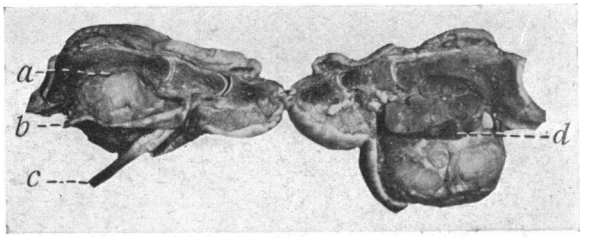

FIG. 3.—Case II. Longitudinal section of neoplasm. *a.* Distinct limit between the phalanges and neoplasm. *b.* The tendon sheath, of the external surface of which the neoplasm came out. *c.* Flexor of the toe. *d.* The canal within the neoplasm in which the tendon runs.

During the last year the woman began to feel pain, and the tumor increased greatly, and hindered her work.

The patient did not remember having injured her forearm.

Physical Examination.—On the volar region of the right forearm, above the carpal joint, there was a swelling about the size of a fist; it was sharply limited and freely movable laterally, less, however, in the axis of the extremity. It was elastic, and the skin around it was normal. The limits of the tumor were sharply outlined while straining the flexors.

Between the skin and the tumor one could feel the tendon of m. palmaris longus.

The movement in the carpal joint was normal.

Operation (Doctor Janik).—The tumor was exposed in local anæsthesia. It was attached to the sheath of the flexor digitorum sublimis and surrounded the tendon for the space of 5 cm. The tendon was separated from the neoplasm which was excised together with a part of the sheath (Fig. 7,a).

Macroscopic Examination.—The mass removed measured 6½ x 3½ x 1 cm. and had the shape of an egg. Its surface was even and grayish. On one of the surfaces a canal was seen, covered with the tendon-sheath which had been excised together with the mass. The canal corresponded to the course of the tendon.

The tumor was hard and whitish in the periphery (on the section), soft and reddish in the centre. The tissue had a spongy appearance and blood could be squeezed out of it.

The capsule of the neoplasm was thick and hard.

Microscopic Examination.—The sections taken from the periphery of the neoplasm showed a fibrous connective tissue with scanty blood-vessels and cells. The nuclei of the cells were spindle-shaped and the fibrillæ ran in different directions.

In some places accumulation of cells could be noted, however, without any signs of malignant degeneration.

The capsule was thick, and showed hyaline degeneration.

On the sections taken across the middle of the tumor, numerous large and small spaces filled with blood were noticed, encroaching into the fibrous tissue. The red cells of the above-mentioned spaces preserved their unchanged appearance. There were no deposits of blood pigment. The walls of these spaces were covered with endothelium, and were sharply limited from the surrounding tissue. There was no evidence whatever

of any formation of new tissue which would tend to organize these spaces. This part of the tumor had an angiomatous appearance.

In the nearest neighborhood of these angiomatous spaces the fibrous tissue had become loose and resembled a myxomatous tissue. There were, however, no characteristic star-cells.

At the first glance one had an impression that this was an organized hæmatoma. But there were other signs which proved to the contrary: The clinical course (gradual growth), no connection with the surrounding tissue (the tumor was well encapsulated and even), macroscopic picture (on section taken immediately after the operation areas filled with fresh, not coagulated blood), finally the microscopic appearance (spaces bordered with their own walls contained unchanged blood, and absence of old pigment). All this proved that the tumor was a hæmangiofibroma.

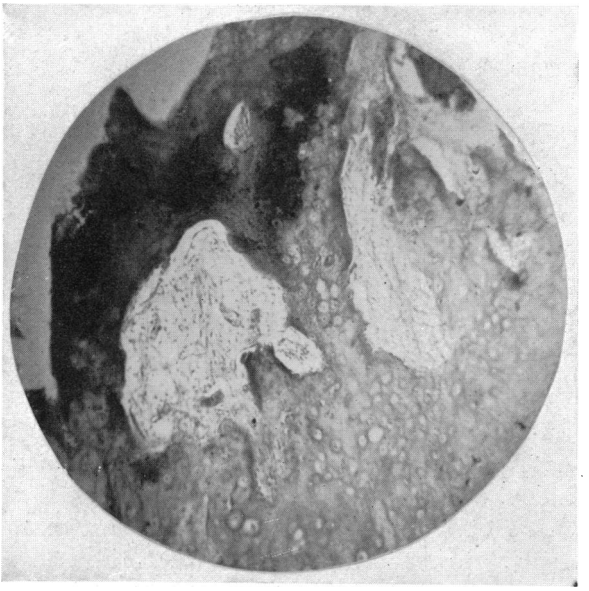

FIG. 4.—Case II. Chondroma of tendon sheath showing calcification.

CASE V.—H. G., a female, aged thirty-two, noticed about eight years ago, a light swelling on her left forefinger which was painful and became larger in last six months. The patient stated that the swelling was originally on the palmar surface of the finger, and later deviated gradually to the radial side of the finger.

Physical Examination.—Disclosed a swelling about the size of a walnut, localized on the radial surface of the left forefinger, near the interphalangeal joint. It was tender on pressure, free of the skin, and movable laterally especially towards the palmar side.

It moved when the finger was flexed, but it did not hinder the normal movement of the finger.

Operation (*Doctor Gruca*).—The tumor was excised in local anæsthesia. It was attached by a long pedicle to the sheath of the flexor of the finger mentioned.

Microscopic Examination.—A section of the tumor showed a varied appearance. The mass of the neoplasm was composed chiefly of a dense fibrous connective tissue which at some places showed hyaline degeneration.

In some places, there was a large quantity of cells grouped in nests and cords. The nuclei of the cells were spindle-shaped.

The above-mentioned nests of cells finally flowed together in a homogeneous mass of sarcomatous tissue. In these places there was no further evidence of the density of the fibrous tissue.

The whole tumor appeared to be a fibroma with malignant degeneration in some places. The arrangement of cells resembled the early period of proliferation of an endothelioma. Dilated lymphatic spaces covered with a visible endothelium, however, were missing.

Microscopic Diagnosis.—Fibroma sarcomatodes.

Before we proceed to discuss tumors of tendon-sheaths, let us say a few words about the tumors of the tendons themselves.

They are very rare and some writers as Ombredanne, Buxton, believe they do not exist at all, and maintain that the cases described were not examined minutely enough, they should rather be considered as secondary growths, originating from the tendon sheaths, and only later encroaching on the tendons. Thus, in order to separate the tumor we must, during the operation, remove also a portion of the tendon. The microscopic examination shows then sharp limits between the neoplasm and the normal tendon tissue.

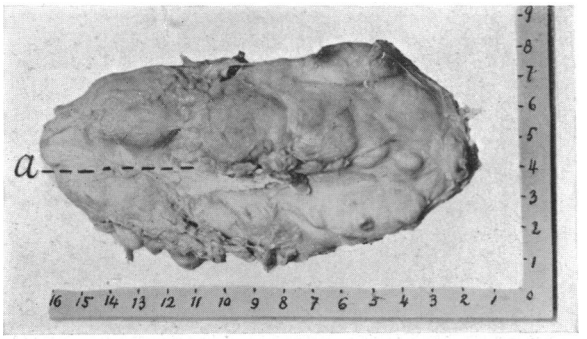

FIG. 5.—Case III. Fibrochondromyxosarcoma. *a*. The canal on the surface of the tumor in which the tendon ran.

The cases of tendon neoplasms known so far, are: fibromata, osteomata, and sarcomata (Schultz, Weir, Montprofit, Schwöbel, Lagrange, Hayem-Graux, Broca and others).

The neoplasms of tendon sheaths are more common than those of the tendons. The former, arising from the sheaths, and especially from the external surface do not limit the movement of the tendon, except when their size is considerable and when they surround the tendon on a larger area. It should be pointed out that neoplasms which originate in the internal part of the sheath lead to an early limitation of the movement of the tendon.

Malignant tumors having an inclination to infiltrate the neighborhood rapidly produce the same state.

The clinical diagnosis in such cases is not easy, because such growths can also imitate the neoplasms of muscles or of the connective subcutaneous tissue, or some inflammatory diseases. We will return to this question later.

The classification of the primary neoplasms of tendon sheaths is as follows:

I. Fibroma, grows slowly, rarely reaching large dimensions. It is generally hard. The clinical diagnosis is difficult, as the same course can be taken by giant-celled myeloma, and only the microscopical examination is decisive. So far, only thirteen cases of fibroma of tendon sheaths have been described (Nelaton, Buxton, Petzold, Sendler, etc.).

II. Lipoma is more frequent, and occurs in two forms: as lipoma arborescens and simplex. Clinically both can not be distinguished from one another. They may both grow within the sheath, surrounding the tendon, or outside it, connected with the sheath directly or by means of a pedicle (Strauss, Tichon, Sendler, Sprengel, Billroth, etc.).

III. Chondroma is very rare, of a small size and hard consistency. When

examined microscopically, it appears usually to be composed of islets of hyaline cartilage, lying between areas of fibrous tissue. In the centre of such islets places of calcification and even of ossification are often visible.

During the physical examination it is necessary to ascertain as far as possible, (a) whether the tumor does not arise from the bone in which case the X-ray examination shows the changes in the structure of the bone, the exact connection of neoplasms with the bone being found by palpation; (b) whether the tumor does not arise from the muscles, (as in cases described by Erichsen, Gibson, etc.), or from connective subcutaneous tissue; (c) whether it is not a ganglion which is usually of cartilagenous consistency, showing symptoms very similar to those of chondroma, especially in cases when chondroma lies in places characteristic of the ganglion.

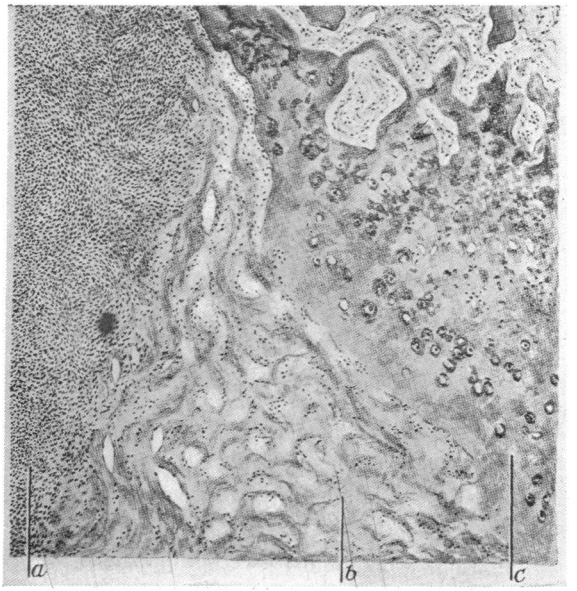

FIG. 6.—Case III. Fibrochondromyxoosteosarcoma. *a*. The sarcomatous tissue. *b*. Myxomatous tissue. *c*. Cartilagenous and osteoid tissue.

With the exception of four cases already mentioned in different papers (Billroth, Chauvain-Roux, Delbet, Pallailon), three new cases were reported recently:

1. BUXTON (1923). A professional violinist complained of pain and swelling in his left hand for two months. The swelling was soft, non-fluctuating. There was no evidence of an injury. At the operation an encapsulated mass was found with a pedicle attached to the tendon sheath of flexor, distal to the metacarpophalangeal joint of the left ring-finger. It measured 2½ x 1½ x 1½ cm.

Microscopic Diagnosis.—Chondroma simplex with areas of calcification.

2. BUXTON. No clinical history of the case. The diagnosis was: fibroma multiplex of tendon sheaths. Microscopic appearance corresponded to fibrochondroma.

3. BECK. (cited by Buxton). The tumor was attached to the tendon sheath of flexor of the forefinger.

Microscopic Diagnosis.—Chondroma with calcification.

To the above, our two cases should be added.

IV. Angioma, described by Pitzorno, occurs very rarely.

V. Sarcoma occurs as sarcoma globo-, fuso-, and giganto-cellulare. The commonest of sarcomas and generally of all tumors of tendon sheaths is:

A. Sarcoma giganto-cellulare (myeloma, xanthosarcoma). Its clinical picture and pathology is of great interest, to which a great many papers have been devoted. The first of these papers appeared in the second half of last

century. At that time the different forms of sarcoma were not distinguished, (Chassaignac, Czerny, Billroth, Spenzer, Wells, Paquet), Heurtaux's studies, however, solved the question. He gave the tumors the name of myelomata, as distinct from the sarcomata, based on the clinical course and microscopical picture, in which he found giant cells (1891). Seven years later the French pathologist Dor found in these tumors cells containing fat, another characteristic of myeloma. Further French works followed (Venoit, Mallerbe, Reverdin), ascertaining the presence of the brownish pigment of sanguineous origin, distributed in fine droplets intra- and extracellularly. The pigment corresponds to the Prussian blue reaction for hæmosiderin.

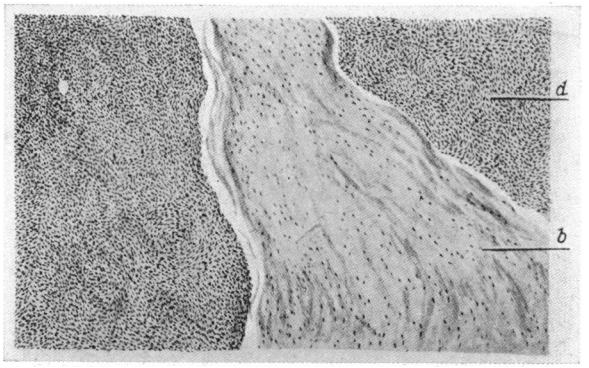

FIG. 7.—Case III. The tendon tissue limited sharply from the tissue of neoplasms.

Later the German authors began to take interest in the above kind of tumors (Rosenthal, Fleissig, Landois, Hartert, etc.) without accepting for them the French name *myeloma* which is still used in France, and giving them different names: xanthoma, xanthosarcoma, giant-celled sarcoma, etc.

Etiology.—The etiology of myeloma tumors is as generally in neoplasms unknown. Injury is quoted in the majority of cases as a provocating factor. The relation of trauma to the neoplasm is very differently explained (direct irritation of latent neoplasm cells, causing the inflammation and the formation of granulating tissue, on the ground of which an malignant growth develops, the producing of locus minoris resistentiæ according to the bacteriological theory.

The injury plays indeed an important part as shows the fact that the disease occurs on the upper extremities more frequently than on the lower ones (according to Rosenthal 54:17, according to Tourneaux, 66:27), more frequently on the palm and fingers than on the forearm (47:7, 50:6), lastly more frequent in men than in women (37:30, 55:38).

Pathology.—The size of the tumor depends on the localization, *viz*, the tumor is larger, the more proximally it lies. Therefore the average size of a tumor on the finger is that of a walnut, while on the palm and in the region of ankle-joint may be as large as a hen's egg (except the tumors on the hand which are subject to malignant transformation), and finally on the forearm it reaches to the size of a fist or still more. It is generally very limited and encapsulated, and only rarely does infiltrate the neighboring tissue. It may surround the tendon and nerves, having a longitudinal shape. The tumor is of yellow or gray color, in the last case with yellow areas in

proportion to the amount of lipoid. Further in many of them brownish areas are found as remnant of forearm hæmatomata (blood effusion). The consistency is elastic, rarely soft, showing false fluctuation (if any at all) causing numerous mistakes in diagnosis (the symptoms being similar to those of tenosynovitis).

Symptoms.—Generally after an injury the swelling appears and increases in size gradually but slowly, seldom causing limitation of movement of the extremity concerned, pain or other discomfort. No metastases are present, although some authors have mentioned them. These metastases however were due to true sarcomata. Sometimes, after the removing of the tumor a new swelling may grow in the same place, which must be considered as a false recurrence due to an incomplete removal of the neoplasm, especially in case of tumors of an infiltrating character. Thus, they may recur locally but they form no metastases.

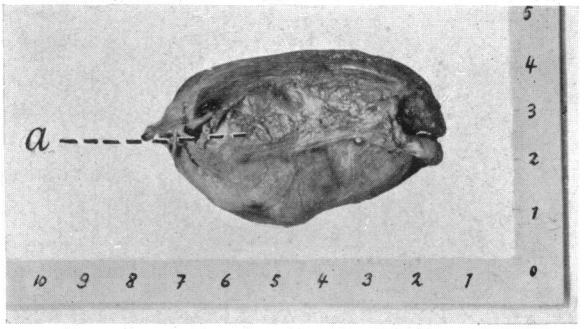

FIG. 8.—Case IV. *a*. Tendon sheath.

Microscopic Pathology.—This is very characteristic. Some principal and characteristic components of such tumors must be distinguished, although not all often must be found in each case.

a. The growths are lobulated and well encapsulated. From the capsule stripes of connective tissue run toward the centre dividing the growth into many lobules. The connective tissue contains blood-vessels and shows a hyaline degeneration. From these stripes run bundles of fibrillæ surrounding nests of cells and finally single cells, gradually becoming smaller and smaller. The shape of the cells is various: small, large, irregular, polygonal, rounded, spindle-shaped, etc.

b. Giant cells containing a variable number of nuclei. Sometimes it is difficult to find these cells, and it is necessary then to examine all parts of the tumor. It should be added that often in tumors of the forearm the above cells cannot be found at all. Rosenthal states to have found giant cells only in one case of myeloma out of seven cases observed; it should be pointed out however that even in this case the neoplasm was, originally localized on the hand, and only secondarily passed on to the forearm.

c. Lipoid cells are large, vesicular, bright, similar to the xanthoma-cells and containing round or oval-shaped nuclei, often excentrically situated further plasma honeycomblike tissue (Weben-, Schaum-zellen) which is seen, whenever the specimen was subjected to the influence of liquids dissolving fats (alcohol, ether, xylol). On the other hand, if the specimen is congealed, the empty spaces are filled with crystals and fine droplets of fat. In the

polarimeter we perceive doubly refracted light, and in Sudan III reaction the lipoid cells become red-yellow. This fat-substance is a cholesterin ester of fat acid. On account of the increase of cholesterin in blood (hypercholesterolemia) crystals of cholesterin form local deposits in sheaths and tendons (Pinkus, Pick, Pringsheim). As consequence of irritation caused by the deposits of cholesterin results xanthosarcoma.

d. Numerous blood-vessels having thick walls affected by hyaline degeneration.

e. The presence of pigment deposits of sanguineous origin. The macroscopic examination shows dark brownish areas on the section and on the surface of the tumor. The microscopical findings of these places shows numerous crystals of hæmosiderin, both intracellularly and extracellularly. When exposed to the influence of potassium ferrocyanide it assumes a blue color.

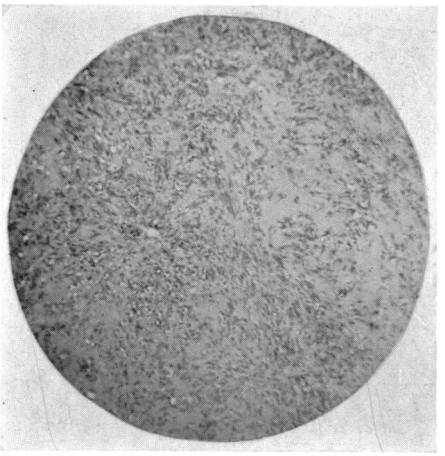

FIG. 9.—Case IV. The fibromatous area.

This pigment is the remnant of old extravasations of blood.

It must be added that myelomata are by some authors of recent years considered as granulomata of tendon sheaths of inflammatory origin (Fleissig, Beri, Broders, Buxton, etc.).

B. Sarcoma fusocellulare and globocellulare. As a matter of fact it is a malignant neoplasm and differs from the giant-celled sarcoma in its clinical symptoms and histological picture in which the giant cells and lipoid cells are missing, besides Sudan III reaction is negative and the double refraction of light in the polarimeter is missing. The capsule may be present but the surface of neoplasm is generally without any lobulations. Most frequently it is of an infiltrating character.

Torneaux in 1913 reviewed the literature of 93 cases of sarcomata of tendon sheaths. Fifty-four of them were giant-celled sarcomata and 37 fuso- or globo-celled sarcomata.

To these statistics some new cases reported recently must be added. Most of them are xanthosarcomata:

1. HARTERT (1923).—A woman, aged fifty-eight, had a slowly developing tumor which grew to the size of a fist and sprang from the sheath of the tendon of m. tibialis posterior, grown together with the internal malleolus, the articular capsule and blood-vessels.

The excision of the tumor. Microscopic diagnosis: Xanthosarcoma.

2. HARTERT.—A man, aged about thirty-one, had a tumor as large as a fist, attached to the sheath of the m. tibialis anterior, grown together with the internal malleolus and articular capsule.

The growth was extirpated. Microscopic diagnosis: Xanthosarcoma.

3. HARTERT.—A woman, thirty-five years of age, had for sixteen years a tumor of the size of a fist over the os cuboideum.

Pirogot's amputation. Microscopic diagnosis: Xanthosarcoma.

4. HARTERT.—A man had a tumor originating from the tendon sheath of second finger. It was removed. Microscopic diagnosis: Xanthosarcoma.

5. HARTERT.—A neoplasm in connection with the tendon sheath of the flexor of the fifth finger of bean size.

The excision. Microscopic diagnosis: Xanthosarcoma.

6. FLEISSIG (1923).—A woman, thirty-eight years of age, had for two years a growth arising from the sheath of the flexor of the left forefinger. Clinical diagnosis: panaritium. Microscopic diagnosis: Granuloma.

7. FLEISSIG.—A woman, twenty-two years of age, during the past nine months a tumor appeared about the size of an American walnut, arising from the tendon sheath of the flexor of the right forefinger. Microscopic diagnosis: Granuloma.

8. FLEISSIG.—A woman had a swelling arising from the tendon sheath of thumb flexor. Excision. Microscopic diagnosis: Granuloma.

9. BUXTON (1921).—A young woman noticed a swelling, a little larger than a pea which was attached to the sheath of the long extensor of the right thumb. Removal. Microscopic diagnosis: Giant-celled myeloma.

10. BUXTON.—A woman, aged twenty-four, had a swelling of the size of a split pea attached to the tendon sheath of the right thumb flexor.

Excision. Microscopic diagnosis: Giant-celled myeloma.

11. KROGIUS (1922).—A woman, twenty-nine years of age, had for ten years, a fist-sized tumor arising from the tendon sheath of the m. tibialis anterior, grown together with the tendon of this muscle. Excision. Microscopic diagnosis: Xanthosarcoma.

12. KROGIUS.—A woman, aged fifty, noticed twenty-four years ago a small tumor which grew slowly and gradually reaching the size of a walnut. It was connected with the tendon sheath of the flexor carpi radialis. Excision. Microscopic diagnosis: Xanthosarcoma.

13. KROGIUS.—A man, aged forty-eight, complained of a walnut-sized growth which sprang from the sheath of the extensor tendon of the second finger. Excision. Microscopic diagnosis: Xanthosarcoma.

14. KROGIUS.—A woman, twenty-one years of age, had since the past three years a tumor of the size of a hen's egg. The tumor was connected with the tendon sheath of flexor hallucis longus. Excision. Microscopic diagnosis: Sarcoma fusocellulare.

After one year followed a recurrence which was removed. Exact microscopic examination showed xanthoma cells and doubly refraction of light. No evidence of giant cells.

Thus we obtain the number of 70 cases of myeloma of tendon sheaths reported so far in literature. It must be added however that this number may probably be increased, if the American literature be duly revised. We were only able to review the American journals of some last years.

Finally we must point out that some authors do not distinguish sarcomata giganto-cellulare from true sarcomata, and therefore some of them suggest radical operation including amputation of the extremity while they are quite benign in their clinical course, and may probably be that they are as mentioned above, inflammatory granulomata. Therefore, as such, they ought to form a separate group among tumors of tendon sheaths. We cannot, however, express our precise opinion, as we had not any such case in our observation.

The tendon sheaths are no rare places where mixed tumors occur. They may be composed of a benign neoplasm tissue such as fibrochondroma, or,

sometimes, they assume a malignant character, *e.g.*, chondrosarcoma, fibrochondrosarcoma, etc., and in our case fibrochondromyxoosteosarcoma. Among cases reviewed by Tourneaux, (Sonbeyran, Morestin, Broca, Mayer, Billroth, Buxton) mixed tumors are found quite often. Our cases belong to the most interesting ones.

Differential Diagnosis.—The clinical diagnosis of the above neoplasms is difficult, often possible only during or even after the operation on base of the microscopic examination.

Let us consider the commonest tumor of the tendon sheath, *viz.*, the sarcoma and try to distinguish successively the diseases that may be taken into account here:

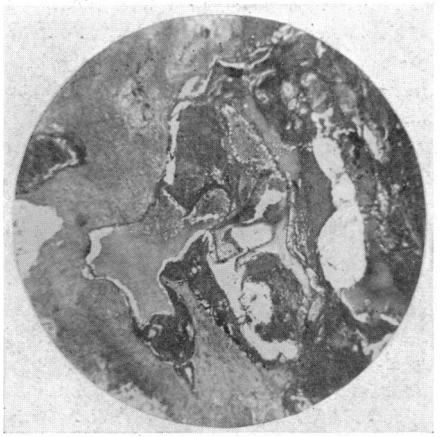

FIG. 10.—Case IV. The angiomatous area.

a. Sarcoma of tendon is rarer and characterized by early limitation of the movement of the tendon. If it has a smaller inclination to the infiltration into the surrounding tissue, it will be movable if the tendon is brought into action.

The sarcoma of the tendon sheath, however, can give the same symptoms, if it affects the tendon secondarily, surrounding it from all sides. During the operation it is necessary to remove the sheath together with a part of the tendon. The microscopical examination shows then that the tendon tissue is unchanged and the limit between it and the neoplasm tissue is sharply outlined. On the other hand, if even a distinctly outlined sarcoma comes out of the tendon itself it may be only slightly movable, if the physiological movement of the tendon is small.

b. Benign tumors of tendons are very rare, and we can therefore leave them unconsidered.

c. Benign tumors of tendon sheaths: fibroma grows slowly, without attaining a large size, chondroma grows slowly, too, and has a hard consistency, lipoma can appear symmetrically or multiplex but not symmetrically, showing a false fluctuation. Sometimes it is lying under the fascia and then it grows along the tendon, giving a longitudinal swelling which can imitate chronic tenosynovitis.

d. Ganglion tendinosum appears generally on the dorsal region of the forearm (sarcoma reversally) and is small in size, spherical, and disappears after pressure.

e. Tenosynovitis tuberculosa granulosa is easy to distinguish from the sarcoma which has malignant symptoms but it is difficult to distinguish it from giant-celled myeloma, because the shape, localization, clinical course and symptoms can be similar in both diseases. In tenosynovitis the move-

ment can occur earlier, and the consistency of the swelling is softer. Other movements must be taken into consideration, in order to ascertain the diagnosis, *viz.*, the general physical symptoms, appearance and condition of patient, function findings, etc.

f. The tumors of other soft parts (muscles, fascia, etc.) too, can render

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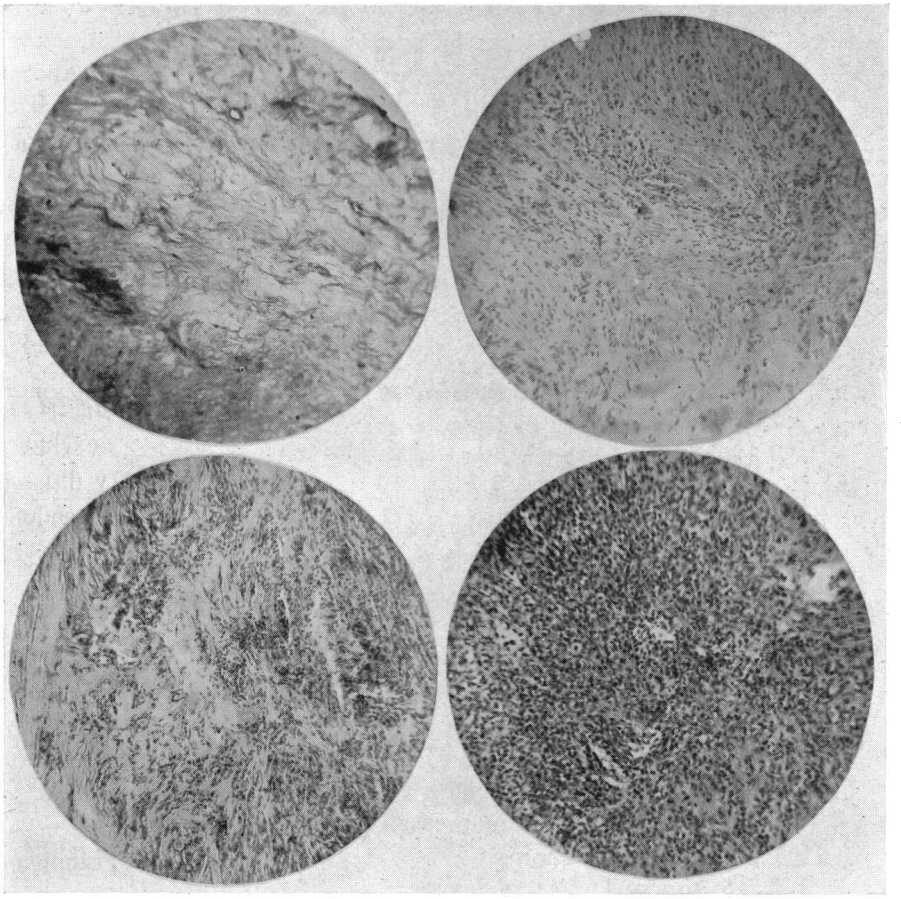

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FIG. 11.—Case IV. The loose fibromatous area.
FIG. 12.—Case V. Dense fibrous connective tissue. Hyaline degeneration.
FIG. 13.—Case V. The nests of spindle-shaped cells.
FIG. 14.—Case V. Homogeneous collection of cells.

the diagnosis difficult, as it imitates entirely the tumors originating from tendon sheaths.

As it may be seen from the above, it is very difficult, often even impossible to distinguish the sarcoma of tendon sheaths from other diseases which we have quoted.

Prognosis.—The prognosis of benign tumors is favorable. The excision of such tumors has no influence on the function of the extremity, even if they

have grown together with the tendons. The affected part of the tendon can easily be excised, and the remaining ends of the tendon can be stitched together, the tendon being prolonged in case of need.

The prognosis of giant-celled myeloma is good, because the tumor is easy to remove and does not form any metastases.

The worst prognosis is that of sarcoma.

The prognosis in regard to the function of an extremity is better in neoplasms of the fingers and hands than in the neoplasms of forearm where the growth (*e.g.*, myeloma) is usually larger and the excision consequently more difficult.

Treatment.—Depends mainly on the character of the neoplasm. In the majority of cases it is sufficient to apply the local excision of the tumor. The amputation and exarticulation of an extremity is made only in severe and malignant cases.

SUMMARY

1. Primary tumors of tendons are very rare. The commonest of them are the sarcomata.

2. Primary tumors of tendon sheaths are more frequent. The commonest among them are the giant-myelomata (granulomata).

3. The giant-celled myeloma seems to be caused by some injury or irritation. It is an inflammatory granuloma, and should therefore be excluded from the group of neoplasms, and included in that of inflammatory disease.

4. The following classification and terminology of the tumors of tendons and tendon sheaths should be adopted:

A. Neoplasms:

I. Neoplasms of tendons:

1. Benign neoplasms: fibroma, osteoma, chondroma.
2. Malignant neoplasms: sarcoma.

II. Neoplasms of tendon-sheaths:

1. Benign neoplasms: fibroma, lipoma, chondroma, angioma.
2. Malignant neoplasms: sarcoma.
3. Mixed neoplasms.

B. Inflammatory and other tumors: tendovaginitis tuberculosa, granuloma (the former myeloma), ganglion, etc.

5. The differential diagnosis between the tumors of tendon sheaths and inflammatory diseases especially tendovaginitis tuberculosa granulosa is difficult.

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