RESULTS OF FILARIASIS.—*Mental Sequelae:*—Extreme depression is very often observed as mental sequelae in victims of frequently recurring attacks of lymphangitis and of fever associated with other inflammatory filarial conditions. It is due to two causes; dread of recurrences, and sensitiveness, especially amongst women. Thus, one Puerto Rican patient so afflicted had not left her house for fifteen years, and a young girl in Caguas with elephantiasis of one leg wore four stockings on the sound limb in order to make the enlargement of the other less noticeable.

Profound depression usually follows severe attacks of lymphangitis and lasts for varying periods.

Fatalities:—It is generally believed that filarial disease *per se* does not kill. However, a small percentage of patients die as the result of septic complications, notably in abdominal filariasis (Wise [26]). Study of the literature reveals the fact that suicide is not uncommon amongst filarial subjects. Manson's original patient, in whom he estimated the number of microfilariae in different organs, was a suicide as was the man in whom Young [20] found many adult filariae. Cunningham reports that five of his patients committed suicide, while a sixth attempted the act but failed. While studying postmortem records in Puerto Rico it was found that amongst suicides there was a high percentage with evidence of well established filarial disease.

Economic Loss Associated with Filariasis:—It is surprising that amongst patients affected with elephantiasis, often so marked as to inhibit free locomotion, many are able and willing to continue their employment. Amongst those suffering from recurrent inflammatory conditions, however, there is evidence of definite interference with the ability to earn a living. The reasons are two: the patients are discouraged by the frequent attacks which make it necessary for them to lose much time from their employment, and by the fact that they never feel quite well enough to work; and employers are disinclined to retain employees who must often absent themselves from their work and whose work is inferior to that of persons not subject to filarial attacks. Many writers have referred to the economic aspect of filariasis; Connor summarizes the matter in Economic Loss:

In many cases chronic invalidism results, in others wage earning capacity is much lowered by recurring exacerbations of a febrile or inflammatory nature. It is difficult to estimate the numbers who are thus afflicted, but in endemic zones many thousands must be involved.

In Puerto Rico many filarial patients were seen in their homes who for varying periods had done no work at all because they were incapacitated or were refused employment on account of inflammatory recurrences. A white Puerto Rican physician calculated that during the last year he had lost 48 working days as the result of recurrent attacks of lymphangitis and the depression following each.

PATHOLOGY

The frequent discovery of living filariae by dissection and the failure to find calcified or other degenerating parasites by this procedure when such were suspected to be present, suggested that the examination of serial sections of tissue taken from foci of infection might be helpful in the study of filarial cases. Experience with the method has shown it to be of great value in this work and has indicated, moreover, that it may yield important information with regard to other parasitic infections as well, notably such helminthic infections as schistosomiasis, paragonimiasis and clonorchiasis, and such protozoal infections as amoebiasis and leishmaniasis. The method was used in 1921 for the study of the epitrochlear gland by C. E. Berry in Polynesia and was described two years later [15]. It has since been necessary to modify the process in order to make it practicable from the standpoint of time and economy, and the method as used at the present time is therefore described in some detail below.

The tissues are fixed in bulk in 10 per cent formalin and stored in it until required for cutting. The following photographic and diagrammatic records are prepared: (1) a natural size photograph of the specimen with scale (Fig. 9); (2) a natural size roentgenogram for the detection of calcified filariae, indicative of the position of the majority of calcified parasites and therefore the non-calcified ones in the vicinity (Fig. 10); (3) tracing of first photograph on which may be marked the size of the blocks and the positions of any worms that may be discovered in the sections (Fig. 11). The tissue is cut into blocks, and the exact size indicated on the diagram

(Fig. 11). The blocks, properly numbered, are put through any of the usual routine processes, embedded in paraffin, mounted on the microtome, and sections nine micra thick are cut in long ribbons of twenty sections each.

The parent or immature worms, whether dead or alive, are commonly coiled. Moreover it has been observed in serial sections that pathological evidence of the presence of worms becomes apparent for a considerable distance before the worms are disclosed. It has been found in practice that if neither parasites nor pathological evidences of them are seen in the first few sections examined it is safe to lay aside the next twenty sections before examining another group. Two or more sections are then placed on a slide and kept for study. The next twenty sections in ribbon form are retained, without mounting, in an ordinary microscopical slide box which has been partitioned by means of glass slides so as to hold only this ribbon. The next few sections are again collected for study, and so on until the whole of the block has been cut.

The sections on slides are now put through the ordinary routine for staining with hematoxylin and eosin. When they have been cleared in xylol they are rapidly examined under the dissecting microscope with the x10 lens, and immature and parent worms can easily be detected. Confirmation under the microscope with the ⅔ objective and the No. 4 ocular can be made. The microscope should be used in any case for a few sections in order to detect any microfilariae that may be present in the blood, lymphatic vessels or the tissues. If parasites are found, the complete series may be collected from the ribbon sections which have been laid aside in the slide box. The positive slides are returned to xylol for further clearing and these, together with the positive sections subsequently made, are mounted in Canada balsam, labelled, numbered and preserved in serial order as records. It has been found that with considerable practice it is possible to detect the parasites in the wax sections without further preparation under the dissecting microscope, while microfilariae are as readily discernible in the wax sections under the microscope with ⅔ objective. When examination is made in this way the amount of chemicals and stains required is reduced by more than half, while the time saved is con-

TESTICLE AND CORD

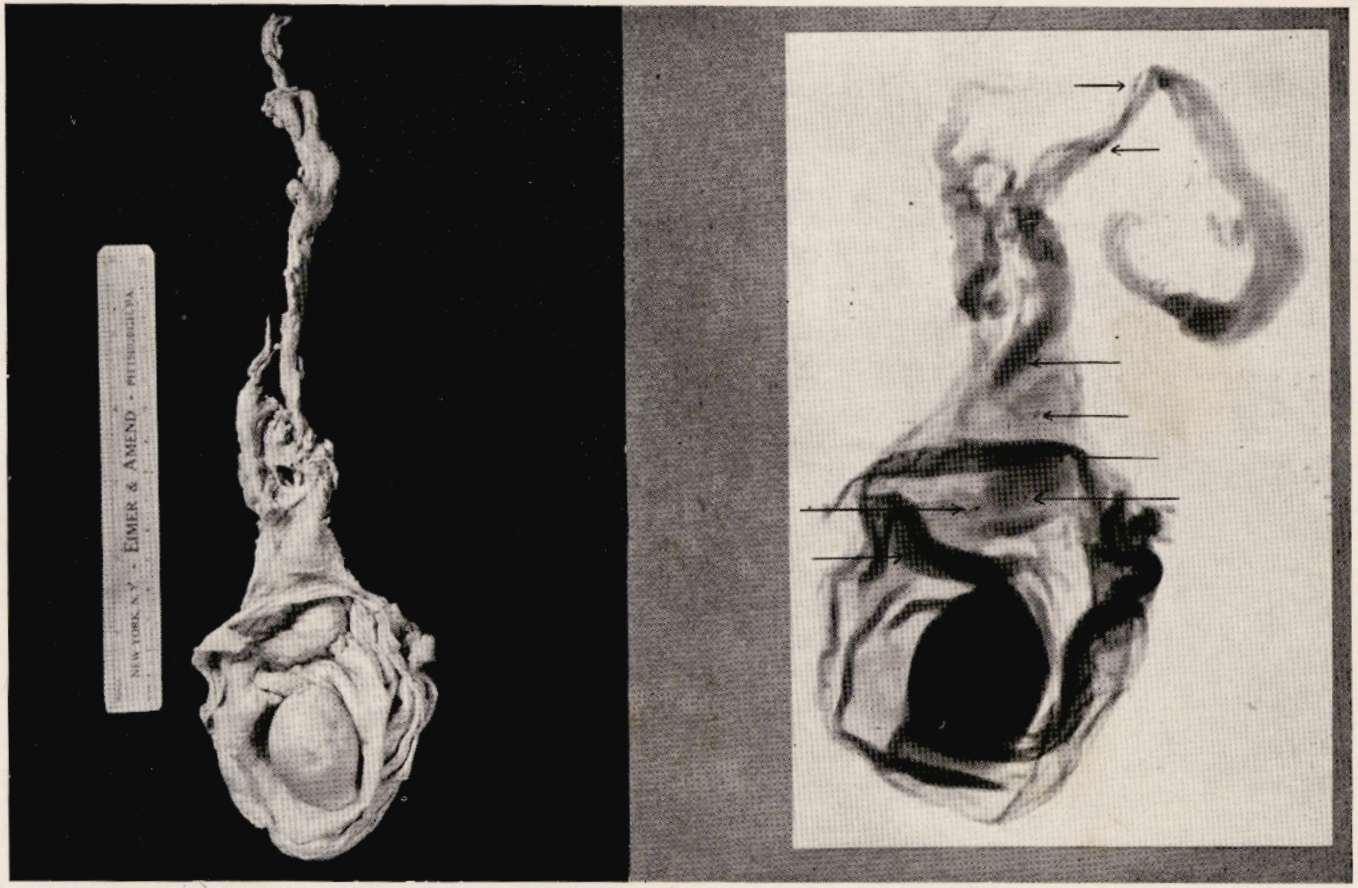
FIG. 9. Hydrocele of tunica vaginalis with contained microfilariae. The epididymis is thickened and there are various thickenings throughout cord. It was found subsequently that these thickenings coincided with masses of filarial worms.

FIG. 10. Roentgenogram of same. Arrows indicate positions of calcified worms confirmed by serial sections.

TESTICULO Y CORDON

GRABADO 9. *Hidrocele con una túnica vaginal en la que había microfilarias. El epidídimo está engrosando así como el cordón en varios puntos, los cuales correspondían con los acúmulos de vermes fíláricos.*

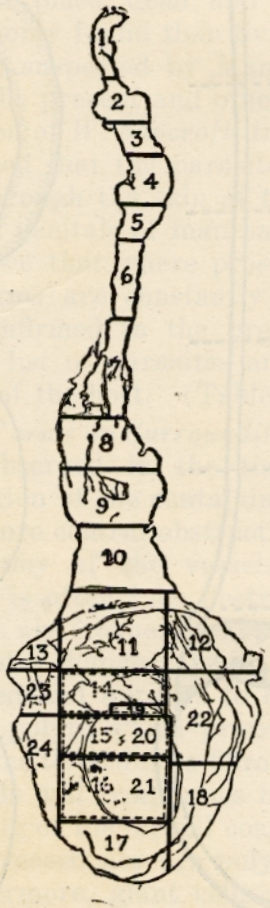
GRABADO 10. *Radiografía del mismo espécimen. La flecha indica la posición de los vermes calcificados que aparecieron en la observación microscópica de los cortes en serie.*



FILARIASIS

O'CONNOR AND HULSE

siderable. By this method two technicians working six to seven hours daily, can cut complete serial sections of a testicle, epididymis, hydrocele sac of average size and spermatic cord as far as the internal abdominal ring in the course



SIZE AND POSITION OF BLOCKS
SECTIONED IN CASE J.S.

Fig. 11:—Size and position of blocks sectioned.
Grabado 11:—Tamaño y posición de los trozos dispuestos para cortar.

of three days. If the cord blocks are cut horizontally the time can be further curtailed.

In sectioning the spermatic cord, epididymis and testicle

the following procedure has been found practical. Since it has been observed that the majority of the parasites are present in the lymphatics anterior to the vas deferens or between the epididymis and the vas or between the epididymis

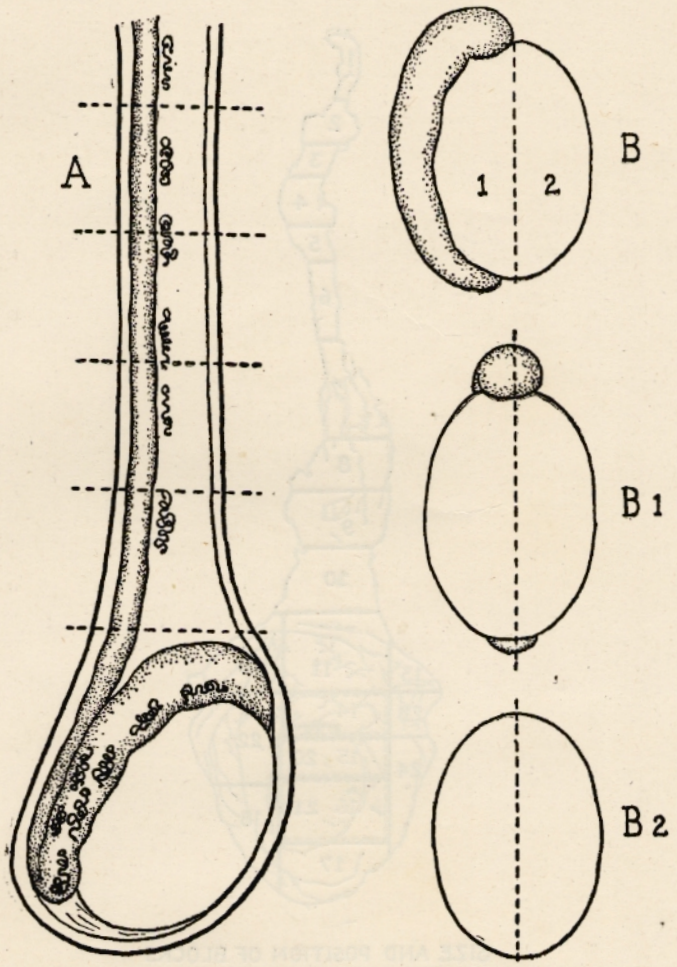


Fig. 12:—Preparation of tissue for sectioning.
Grabado 12:—Preparación de los tejidos para el corte.

and the testicle, the gross material is laid on its side and blocks are cut. The testicle and epididymis require special treatment. The testicle is divided laterally (Fig. 12) just anterior to both poles of the epididymis into two portions

(B 1 & 2); B 1 is now divided antero-posteriorly into two blocks for section and B 2 is treated in a similar manner.

Discussion of pathological findings.—Histologic study of tissue removed from filarial subjects makes certain facts obvious. In the first place, dead and degenerated worms are much more commonly found than living ones. Secondly, hyperfilariation, long suspected by Manson, has been definitely confirmed by the present and other recent work. The special sites of election of *W. bancrofti* in man are not known though it is recognized that the parasites may remain near the point of entry through the skin at the time of infection and that the external genitals of man harbor large numbers. It has also been shown that where present in any numbers, dead and living worms are constantly found in the same vicinity. This is confirmed in the present studies and is demonstrated in the list of parasites and the state of each at the time of death of the host. (Table 3.)

Effect of Living Worms on Surrounding Tissue:—The first noticeable change observed in the tissues around living *Wuchereria* is dilatation of the containing lymphatic vessels. Where evidence of more central obstruction above the worms is lacking, hypertrophy of the vessels is not noticeable. (Fig. 13.) As there is often such obstruction, however, the containing lymphatics are frequently hypertrophied (Fig 14). The most characteristic changes are in the intima, which is considerably thickened and appears to be thrown into folds by the formation of polypi which protrude into the lumen. The hypertrophy seems to be due to fibrous elements in which enlarged blood vessels and lymphatics may be seen. There is also some thickening of the medial coat. As a rule eosinophil cells are not increased nor are polymorphonuclear cells conspicuous. Furthermore, giant cells are not observed in the tissue cells near living worms. The lymphocytes however are always increased and may be found in small groups or in dense lymphoid deposits. Mixed with them or at the outer edges of the groups may be some plasma cells. Within the lymphatic vessel normal lymph, numerous lymphocytes and small or larger groups of red blood cells are seen.

Death and Degeneration of Worms:—The mere preponderance of dead over living worms is ample evidence of the fragility of the parasite. Furthermore, Manson-Bahr has

TABLE 3

Case No.	Sex	Age	Adult Filariae Found	Living	Degenerating	Calcified	Cause Death or Operation	Time	Material Studied	Remarks
1.....	M.....	68	28	12	2	14	Homicide.....	Midnight...	R. testis with epididymis, hydrocele sac with spermatic cord. R. inguinal glands	Microfilariae in inguinal glands, hydrocele sac, blood vessels. Apical tuberculosis
2.....	M.....	35	39	2	4	33	Lobar pneumonia.....	4 A.M.	Both testes with epididymis and spermatic cord	.....
3.....	M.....	45	15	0	0	15	Aneurysm, pneumonia.....	5.30 P.M.	Testis, epididymis and spermatic cord from one side	Ascaris infection. Syphilis
4.....	M.....	36	4	1	0	3	Hemorrhage, gastric ulcer.....	6 A.M.	R. testicle, epididymis and spermatic cord	.....
5.....	M.....	36	29	0	0	29	Leprosy.....	12.50 P.M.	Testis, epididymis, spermatic cord from both sides	Schistosoma of colon. Liver cirrhosis
6.....	M.....	39	12	3	0	9	Homicide.....	1 A.M.	L. testicle, epididymis, hydrocele sac and spermatic cord	Microfilariae scanty in blood vessels
7.....	M.....	55	13	5	6	2	Cardiac Failure.....	4 A.M.	Both testes, epididymis, spermatic cords	.....
8.....	M.....	42	10	3	0	7	Leprosy, tuberculosis.....	12 P.M.	Both testes with epididymes	Schistosoma in adrenal, tuberculosis
9.....	M.....	50	12	0	1	11	Aneurysm.....	5 A.M.	Testis, epididymis, hydrocele sacs and spermatic cords from both sides	.....
10.....	M.....	43	13	0	0	13	Operation (Castration).....	A.M.*	Testis, epididymis with large cyst of latter	.....
11.....	M.....	47	1	0	0	1	Op. (Excision of skin).....	A.M.	Skin, superficial and deep fascia left external malleolus	.....
12.....	M.....	59	32	3	0	29	Op. (Castration).....	A.M.	L. testis, epididymis and cord. Blood cyst epididymis, elephantoid skin scrotum	.....
13.....	F.....	28	7	6	0	1	Op. (Excision of glands).....	8 A.M.	Right subinguinal glands.....	No microfilariae in blood at 11 p. m. nor in sections after excision
14.....	M.....	51	9	0	0	9	Op. (Castration).....	A.M.	One testicle with cyst of epididymis and spermatic cord	.....
15.....	F.....	32	1	0	1	0	Op. (Excision of skin).....	A.M.	Skin, superficial and deep fascia of left internal malleolus	.....
16.....	M.....	29	9	1	1	7	Op. (Castration).....	A.M.	Left testicle, epididymis and spermatic cord	No microfilariae in any of the tissues
17.....	F.....	10	16	2	1	13	Op. (Excision of glands).....	A.M.	Left subinguinal lymphatic glands....	No microfilariae in blood at 11 p. m. or in tissues subsequently. Ascaris, hookworm infection
18.....	M.....	26	80	0	0	80	Op. (Excision of glands).....	A.M.	Left popliteal, subinguinal, inguinal, Right subinguinal glands	.....
19.....	M.....	66	10	1	0	9	Pneumonia, uremia, nephritis	4.30 A.M.	Left testis with epididymis and hydrocele sac	No microfilariae in blood
20.....	F.....	21	50	0	0	50	Op. (Excision of glands).....	A.M.	Left subinguinal glands.....	No microfilariae in blood or tissues

*Routine operations in Puerto Rico are most commonly preformed between 7:30 a.m. and 11 a.m.

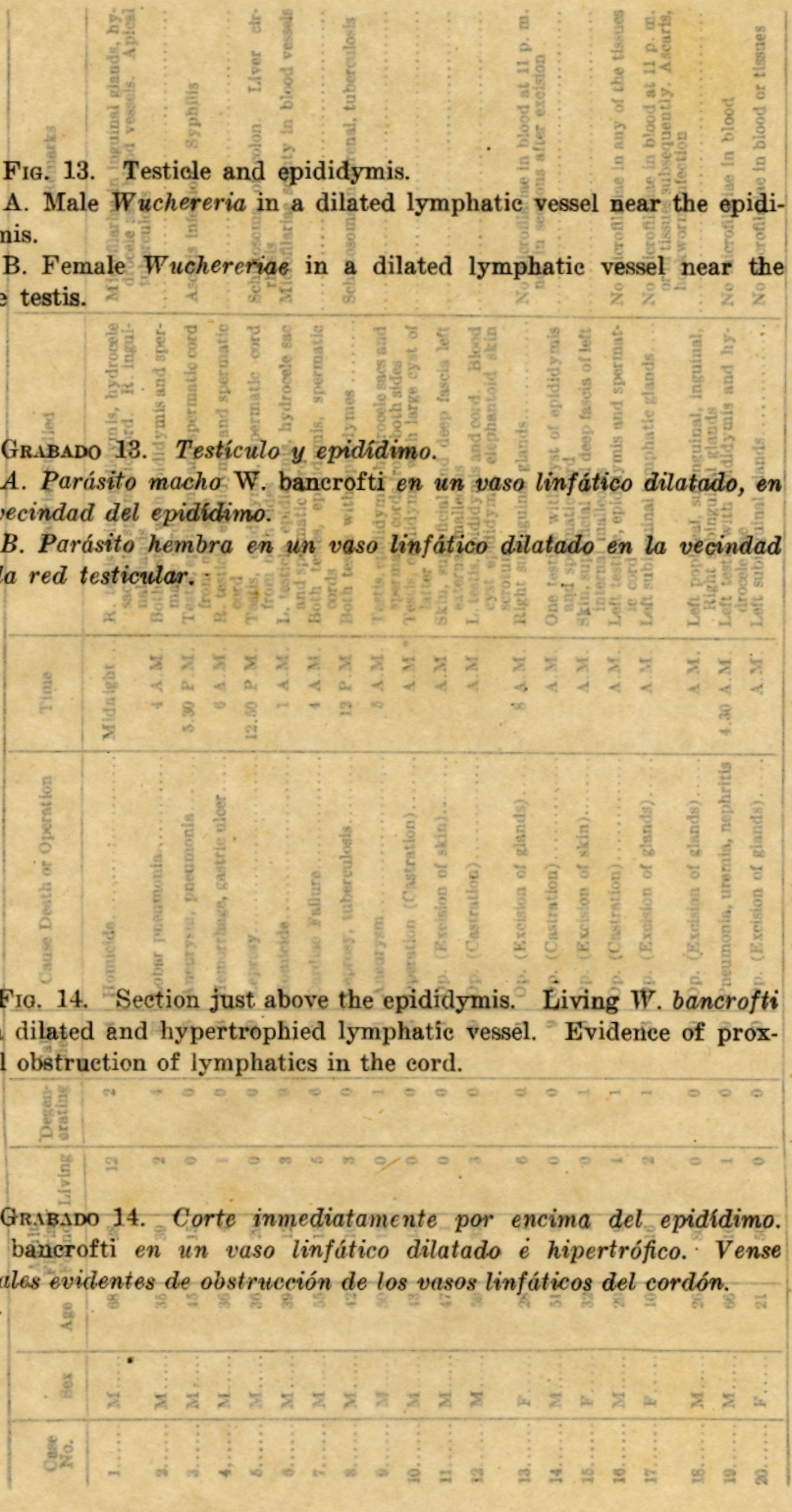


FIG. 13. Testicle and epididymis.

A. Male *Wuchereria* in a dilated lymphatic vessel near the epididymis.

B. Female *Wuchereriae* in a dilated lymphatic vessel near the rete testis.

GRABADO 13. *Testículo y epidídimo.*

A. Parásito macho W. bancrofti *en un vaso linfático dilatado, en la vecindad del epidídimo.*

B. Parásito hembra en un vaso linfático dilatado en la vecindad de la red testicular.

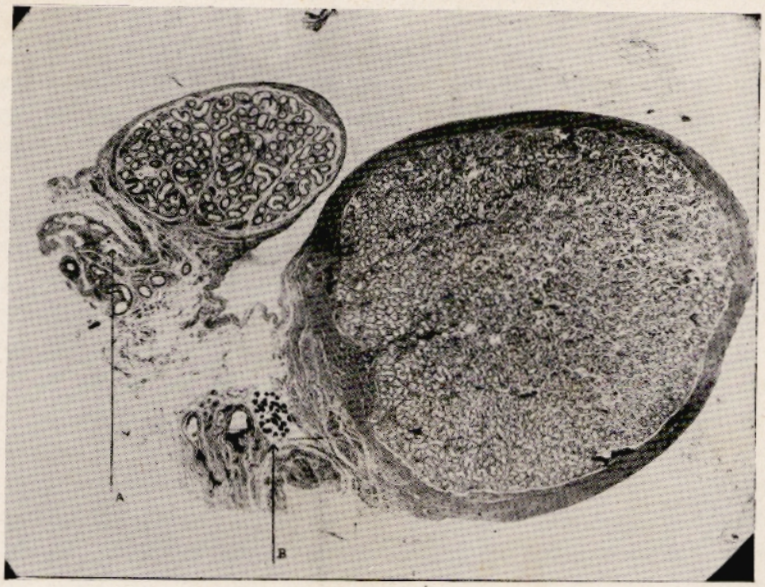
TABLE 3

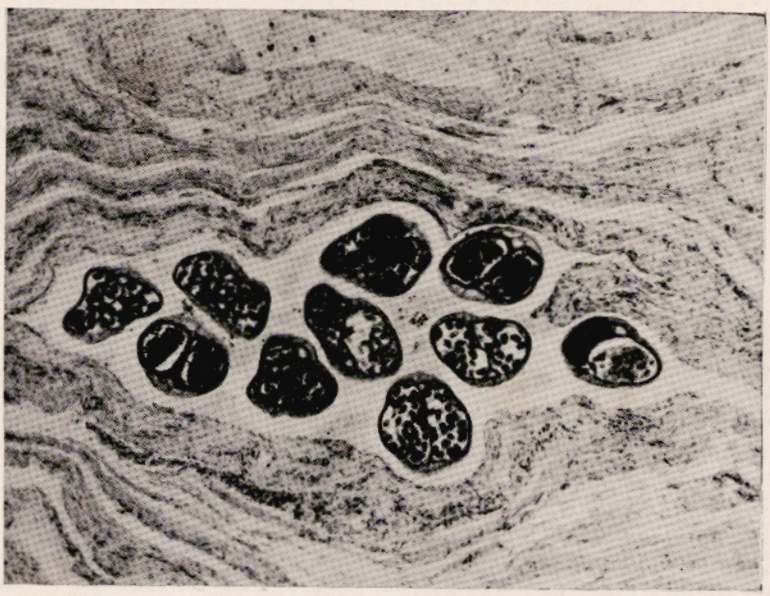
Case No.	Sex	Age	Cause Death or Operation	Time	Remarks	Degenerating	Living
1	M	68	Homicide	Midnight	R. testicle, hydrocele sac and spermatic cord. R. inguinal glands	2	12
2	M	30	Lobar pneumonia	4 A.M.	Microfilariae in inguinal glands, hydrocele sac and blood vessels. Apical tuberculosis	4	2
3	M	47	Aneurysm, pneumonia	5.30 P.M.	Both testicles, epididymis and spermatic cord	0	0
4	M	36	Operation (Castration)	6 A.M.	Asiatic infection. Syphilis	0	1
5	M	26	Hemorrhage, gastric ulcer	12.30 P.M.	R. testicle, epididymis and spermatic cord	0	0
6	M	39	Leprosy	1 A.M.	Testis, epididymis, spermatic cord	0	0
7	M	55	Homicide	4 A.M.	L. testicle, epididymis, hydrocele sac and spermatic cord	3	3
8	M	47	Cardiac Failure	4 A.M.	Both testicles, epididymis, spermatic cords	6	5
9	M	80	Leprosy, tuberculosis	12 P.M.	Both testicles, epididymes	0	3
10	M	67	Aneurysm	5 A.M.	Testis, epididymis, hydrocele sacs and spermatic cords. Lymphatics from both sides	1	0
11	M	47	Operation (Castration)	A.M.	Testis, epididymis and large cyst of latter	0	0
12	M	58	Op. (Excision of skin)	A.M.	Skin, subcutaneous tissue, deep fascia left external malleolus	0	0
13	F	26	Op. (Excision of glands)	8 A.M.	L. testis, epididymis and cord. Blood cyst epididymis. Chronic elephantoid skin scrotum	0	3
14	M	55	Op. (Castration)	A.M.	Right inguinal glands	6	6
15	F	39	Op. (Excision of skin)	A.M.	One testicle with cyst of epididymis and spermatic cord	0	0
16	M	24	Op. (Castration)	A.M.	Skin, subcutaneous tissue, deep fascia of left internal malleolus	1	0
17	F	10	Op. (Excision of glands)	A.M.	Left testicle, epididymis and spermatic cord	1	1
18	M	29	Op. (Excision of glands)	A.M.	Left subinguinal lymphatic glands	1	2
19	M	66	Pneumonia, uremia, nephritis	4.30 A.M.	Left popliteal, subinguinal, inguinal. Right inguinal glands	0	0
20	F	21	Op. (Excision of glands)	A.M.	Left testicle with epididymis and hydrocele sac	0	1
					Left subinguinal glands	0	0

*Routine operations in Puerto Rico are most commonly performed between 7:30 a.m. and 11 a.m.

FIG. 14. Section just above the epididymis. Living *W. bancrofti* in a dilated and hypertrophied lymphatic vessel. Evidence of proximal obstruction of lymphatics in the cord.

GRABADO 14. *Corte inmediatamente por encima del epidídimo.* W. bancrofti *en un vaso linfático dilatado é hipertrófico. Vense señales evidentes de obstrucción de los vasos linfáticos del cordón.*





FILARIASIS O'CONNOR AND HULSE

clearly shown that even with the most delicate handling it is extremely difficult to remove specimens intact from the living or recently dead tissues. While then most of the parasites reach maturity, it is conceivable that any slight local injury, severe local inflammatory reaction, toxic or bacterial, may result in the death of one worm or more, especially since dead immature forms are also found.

In sections containing living worms there are frequently observed changes which seem to be precursors of the death and degeneration of the worm. In such cases one notices here and there on the endothelial lining small deposits of fibrin, which tend to increase in size and rapidly become infiltrated with small round cells and fibroblasts. Soon foreign body giant cells appear and eosinophil cells may be present in varying numbers. The center or stem of the small granulomatous mass becomes organized into fibrous tissue, while its free margins, projecting into the lumen, continue to grow through further deposits of fibrin on the surface, which in turn becomes organized, with the additional formation of fibrous tissue. Eventually endothelial tumors of such magnitude are formed that the worm becomes pressed into crevices or pockets at the side of the lymphatic vessel. As the tumors increase in size they show a tendency to grow around the worm in many situations, and finally the latter becomes entirely imprisoned and dies. These changes are most commonly observed at the two ends of the worm. At first they may be of a nature beneficial to the worm since by narrowing the lumen at either end they allow greater room for the growth of the parasite and maintain it in its position. Their presence slows but produces no real stasis of lymph, since in the early stages associated with such changes, patency of the lymph channels is maintained at each end of the worm area. In the course of time, however, as study of many specimens shows, the granulomatous process involves the endothelium throughout the area occupied by the parasites. When a certain degree of granulation has taken place the imprisoned parasite dies. The granulomatous bands and tumors, which have till now been thickly infiltrated with cells, become organized into bands of fibrous tissues which, since they surround the worm, have the characteristic circular arrangement so commonly seen and described.

About this time the first degenerative changes in the parasite are observed in the form of calcium deposits in the cuticle, without, however, any alteration in the shape of the worm. In all cases where early calcification is observed the cuticle alone is involved. The interior and contents seem to be affected much later. At this stage giant cells are often found close to the worm surface and in the degenerated tissues of its interior. Meanwhile the fibrous tissue surrounding the worm becomes arranged as a capsule in concentric rings. (Fig. 15.) The cellular elements become more scanty and are mainly limited to the outer portions and poles of the capsule, where larger or smaller collections of small round cells may be observed. Finally, calcification is completed within the lymphatic and the parasite is entirely separated from the surrounding tissues. In only two specimens was there evidence of calcification of the endothelial lining of the containing lymphatic. Usually the lymphatic, though destroyed, does not share in the calcification process, but becomes occluded by fibrosis. When microfilariae are present in the worm they also calcify.

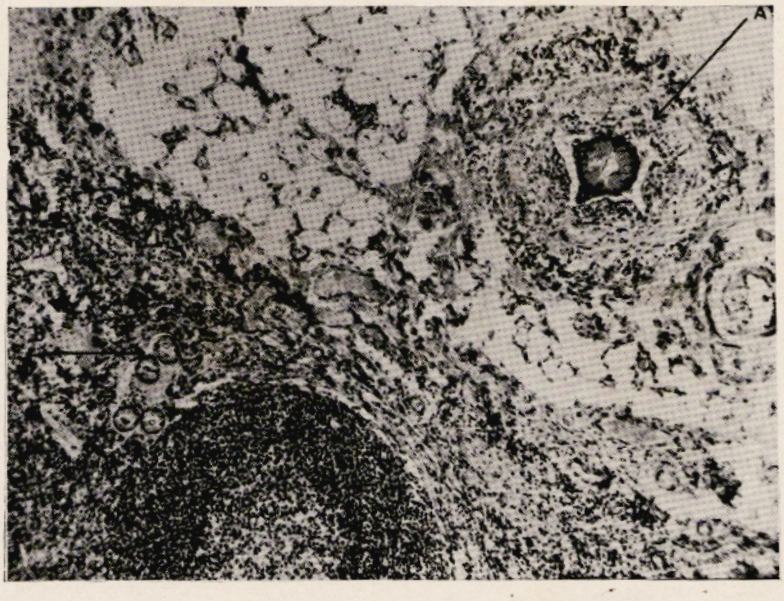
When calcification is recent, even when complete, the degenerated parasite shows a marked affinity for hematoxylin and for the silver nitrate in Von Kossa's stain. When the process has been of longer duration the calcified mass becomes glassy and yellow in appearance, fragments easily and shows an increasing resistance to the penetration of stains. In these later stages there is also a tendency for the capsule to lose its uniform appearance and for the spaces between the layers of fibrous tissue to become more compact and close set and finally to become diffused in the fibrosis of the neighboring connective tissue. In some specimens where the granulomatous bands have surrounded a worm in the lumen of a lymphatic the outlines of the latter may be observable after calcification is completed. More frequently, however, all trace of the original lymphatic is completely obliterated. With the completion of calcification giant cells and plasma cells disappear from the inflammatory area and finally the lymphatic cells may also do so. The tissue in the immediate vicinity of the destroyed parasite becomes completely hyalinized. This type of degeneration, a gradual process, occurs most commonly.

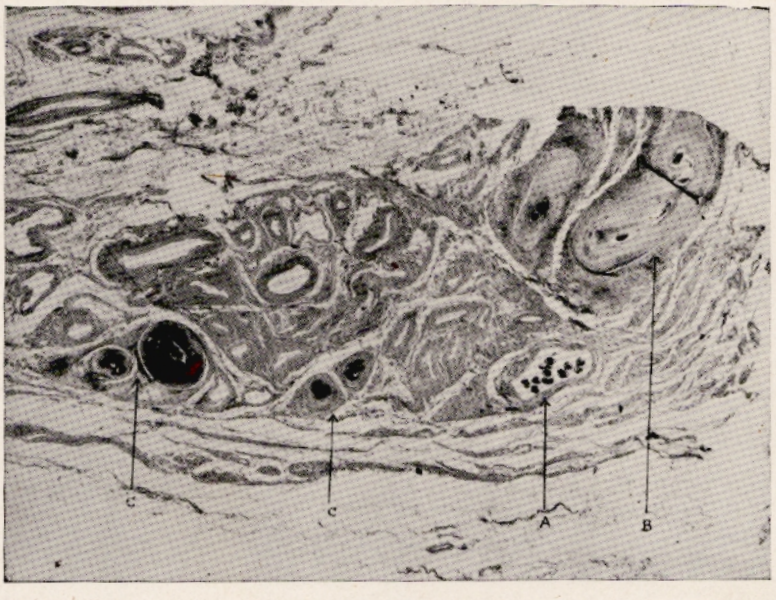
FIG. 15. Left femoral gland ×175.
A. Mature male filaria in vessel of periglandular tissue.
B. Sections of immature male filaria in sinus near cortical center.

GRABADO 15. *Ganglio femoral izquierdo.* ×175.
A. Macho filárico llegado a la madurez en un vasillo del tejido periganglionar.
B. Corte de un parásito macho inmaturo en un seno cercano al centro germinativo cortical.

FIG. 16. Section through the spermatic cord.
A. Female W. *bancrofti* in a dilated and hypertrophied lymphatic vessel.
B. Degenerating parasite in caseating focus.
C. Calcified parasites in fibrous capsules.

GRABADO 16. *Corte del cordón espermático.*
A. W. bancrofti *hembra en un vaso linfático dilatado e hipertrófico.*
B. Parásitos degenerados en un foco caseoso.
C. Parásitos calcificados en cápsulas fibrosas.





FILARIASIS O'CONNOR AND HULSE

In worms degenerating without calcification in the early stages, the picture is different. The parasite is found in a mass of caseous material surrounded by dense lymphocytic infiltration amongst which are many plasma cells. Close to the parasite foreign body giant cells are present in large numbers and later are seen to take an active part in its demolition. Outside the zone of lymphocytes *in the earlier stages* and in many cases eosinophil cells are observed in considerable numbers. As the process advances collogen fibers are found invading the caseous mass or thrombus and with further fibrosis the lymphocytes tend to retreat peripherally while the eosinophils tend to disappear. As fibrosis becomes complete, the giant cells also disappear and a hyalinized fibrous scar results.

When the process of degeneration begins in a caseating focus, calcification sometimes subsequently ensues. The resulting scar containing calcium is less regular than when the process has accompanied complete calcification from the beginning.

In some cases without exhibiting any tendency toward the formation of isolated granulomatous growths, the whole of the intima and media of the lymphatic becomes swollen, oedematous and rapidly infiltrated with small mononuclear cells showing pycnotic changes and fragmentation of nuclei. Eosinophil cells may be seen in large numbers, though in later stages they are not commonly present. During these changes the walls of the lymphatic encroach rapidly on the parasite, which maintains its general morphology but becomes pressed upon and generally constricted. When female parasites are involved, microfilariae with clearly demonstrable nuclei may be seen in the interior of a parent which has been flattened to less than a third of its original dimensions. Eventually the imprisoned parasite disappears by molecular disintegration and is absorbed. In the immediate vicinity of the worm the tissues become homogeneous, stain badly, and appear to be caseous. Finally, with the disappearance of the worm, fibrosis takes place and a local cicatrix results.

In some cases, during the later stages of the process just described, patchy deposits of calcium may be observed, but this change is not uniform and bears no resemblance to the process first described (Fig. 16).

Degenerating microfilariae were observed in only one case, but their distribution was wide. In loose tissues (Fig. 17) —granuloma of lymph vessels and at the angle of a hydrocele (Fig. 18)—they seem to promote granulation tissue formation with many lymphocytes and plasma cells. Some of the parasites undergo fragmentation. In other areas where calcification of the embryos has taken place fibrosis has resulted. Eosinophil and polymorphonuclear leucocytes were not observed accompanying this process.

General Pathological Changes in Filariasis:—During the inflammatory attacks there is considerable oedema of the tissues, when it is probable that much protein is liberated in the intracellular spaces. In the acute stages infiltration with lymphocytes is characteristic. With subsidence of acute phenomena cholesterol clefts are commonly found in such situation as the epididymis and spermatic cord (Fig. 19). Following each attack fibroblastic activity occurs in the inflamed areas. In early cases the lymphatics beneath the skin are dilated and hypertrophied; in later stages, when fibrosis is far advanced and when trophic changes are present, some of the lymphatic vessels are usually obliterated.

In groups of enlarged lymphatic glands, and in the deeper layers of the skin during the oedematous phase leading to true elephantiasis, excessive deposit of fat is a striking feature. Many large groin masses consist mainly of fat and sometimes contain only slightly enlarged glands. Strands of fibrous tissue penetrate this fat and in cases of long standing tend to replace it. Coinciding with the recurrence of inflammatory phenomena and with fibrotic changes, the intima of the blood vessels becomes considerably thickened and irregular patches of calcium may develop in this situation. The medial coat is also sometimes thickened.

When parasites are present in the vicinity of lymphatic glands, from fifty to seventy-five per cent of these are found in the afferent lymphatics or collaterals outside the gland or in the lymphatic vessels and sinuses of the capsule. They are less commonly found in the substance of the gland, although their numbers in this situation vary in different cases. They are rarely encountered in the efferent vessels or in the hilum of the glands. Their distribution in considerable

Degenerating microfilariae were observed in only one case, but their distribution was wide. In loose tissues (Fig. 17) —granuloma of lymph vessels and at the angle of a hydrocele (Fig. 18)—they seem to promote granulation tissue formation with many lymphocytes and plasma cells. Some of the parasites undergo fragmentation. In other areas where [illegible] resulted. Eosinophil and polymorphonuclear leucocytes were [illegible]

FIG. 17. Microfilariae in the left side of the hydrocele. × 725.

GRABADO 17. *Microfilarias en el ángulo izquierdo del hidrocele. A gran aumento.* × 725.

General Pathological Changes in Filariasis:—During the inflammatory attacks there is considerable oedema of the tissues, when it is probable that much protein is liberated in the intracellular spaces. In the acute stages infiltration with lymphocytes is characteristic. With subsidence of acute phenomena cholesterol clefts are commonly found in such situation as the epididymis and spermatic cord (Fig. 19). Following each attack fibroblastic activity occurs in the inflamed areas. In early cases the lymphatics beneath the skin are dilated and hypertrophied; in later stages, when fibrosis is far advanced and when trophic changes are present, some of the lymphatic vessels are usually obliterated.

In groups of enlarged lymphatic glands, and in the deeper layers of the skin during the oedematous phase leading to true elephantiasis, excessive deposit of fat is a striking feature. Many large groin masses consist mainly of fat and sometimes contain only slightly enlarged glands. Strands of fibrous tissue penetrate this fat and in cases of long standing tend to replace it. Coinciding with the recurrence of inflammatory phenomena and with fibrotic changes, the intima of the blood vessels becomes considerably thickened and irregular patches of calcium may develop in this situation. The medial coat is also sometimes thickened.

FIG. 18. Granuloma in space with calcified microfilariae.

GRABADO 18. *Granuloma con microfilarias calcificadas.*

When parasites are present in the vicinity of lymphatic glands, from fifty to seventy-five per cent of these are found in the afferent lymphatics or collaterals outside the gland or in the lymphatic vessels and sinuses of the capsule. They are less commonly found in the substance of the gland, although their numbers in this situation vary in different cases. They are rarely encountered in the efferent vessels or in the hilum of the glands. Their distribution in considerable

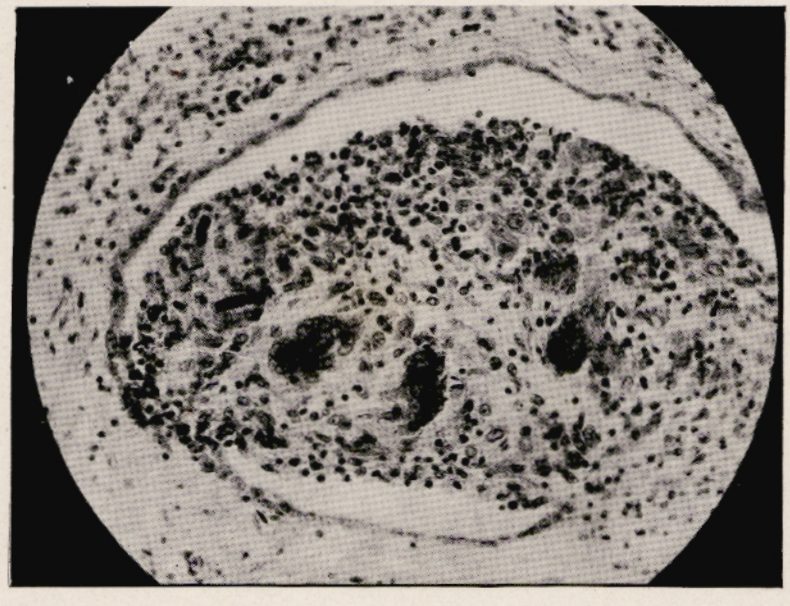


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FIG. 19. Showing spaces left by cholesterol crystals.

GRABADO 19. *Veánse los espacios que ocupaban los cristales de colesterina.*