

per portion of the chest, as this is the most important point for counter-pressure. When the jacket is nearly firm it should be trimmed, if practicable, while the patient is in the swing. As a rule, the front of the jacket

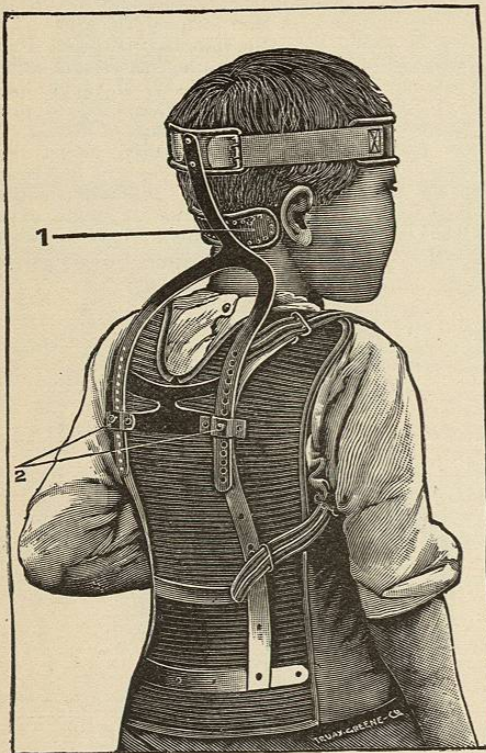


FIG. 4449.—Blanchard's Brace.

should extend from the top of the sternum to the pubes; behind, from the spines of the scapulae to the gluteal fold. Laterally, it should be cut away sufficiently to prevent chafing of the arms, and below, too, in order to allow flexion of the thighs in the sitting posture. When properly applied, the jacket need not exceed a thickness of from one-eighth to one-quarter of an inch. The shirt is then drawn up over the jacket and sewed to the upper border, and the two ends of the bandage or skin rubber are tied together.

In the treatment of children by this means a protective bib should be worn to prevent crumbs from falling under the jacket, and at morning and night the skin should be vigorously rubbed by means of the bandage. In many instances the anterior shoulder brace, already described, may be used with advantage. This may be attached to buckles incorporated in the back of the jacket.

If the disease is of the upper or middle region of the spine a head support is required (Fig. 4452). For this purpose a jury-mast is most often employed. This should be of tempered steel, and its base should be incorporated firmly in the jacket below the seat of disease. When it is properly applied the head should be tilted and drawn somewhat backward with so much tension as can be tolerated.

In place of the jury-mast a fixed support may be used, as shown in (Fig. 4448). Fixed supports of this character have an advantage over the jury-mast in the matter of security, for although the latter appliance is effective when properly adjusted, it is of no value when the straps are allowed to hang loosely about the head, as is the case in so many instances.

The Application of the Jacket in the Recumbent Posture.—For young children who have been treated on the frame a very satisfactory method is the following: The patient

is suspended face downward by two assistants, one holding the arms and the other the thighs. Thus a certain amount of traction is exerted while the trunk is in the overextended position. The jacket is applied, and before it has hardened the patient is replaced upon the frame, and the spine becomes fixed in the habitual attitude. The jacket may be applied in the supine posture by means of the appliance devised by Goldthwait. The body is supported at the seat of disease by means of an upright, on which are placed two pads like those used in the Taylor back brace. The two extremities of the spine are then allowed to sink downward with the aim of extending the spine at the point of disease. The jacket is then applied about the central support, and when it is firm the patient is lifted from it, the two adjustable pads remaining within the jacket (Fig. 4453).

As a rule a jacket may be worn for three months, although in hospital practice six months is not unusual.

In the stage of recovery the jacket may be replaced by a corset. This is constructed as follows: A jacket applied in the manner described is cut through the centre and removed from the body. It is then thoroughly dried and trimmed, and strips of leather with hooks having been sewed in front, it may be laced like an ordinary corset. The corset should always be removed and reapplied with the patient in the suspended or recumbent posture. It should not be used during the active stage of disease.

In contrasting the two ambulatory supports that are in common use, the jacket and the metallic brace, it may be stated that the jacket has the great advantage in that the treatment is in the hands of the surgeon. It is inferior to the brace when the disease is in the lower lumbar region.

The brace is to be preferred also when the disease is in the upper region, as in such a case the jacket serves only as a base for the head appliance.

In certain instances when the disease is in this situation, the jacket is carried over the shoulders and is made to include the head. This is an effective treatment, but rather cumbersome.

If the disease is seated in the lower region of the spine, and if it is accompanied by contractions of the thighs, the limbs may be encased by means of the spica jacket. As a rule, however, cases of this character are best treated by recumbency.

In certain instances the Thomas collar may be used. This is of especial service in atlo-axoid disease, where it may be used with or without the jury-mast. The shape is shown in Figs. 4454, 4455, 4456 and 4457). It is made of a piece of thin sheet metal, wide enough to reach from the sternum to the chin and from the back of the neck to the base of the occiput. The edges are turned

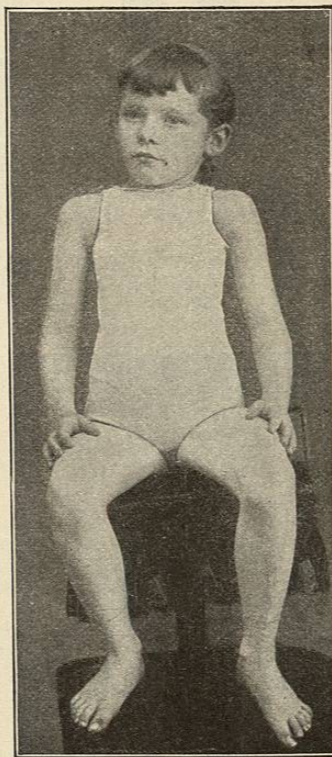


FIG. 4450.—A Plaster Jacket Applied to Support the Abdomen, showing also the Method of Fastening the Shirt about the Neck. (From Whitman's "Orthopedic Surgery.")

out and the whole properly covered with pieces of felt and fitted. One may improvise a support of this character by making a thick muff-like appliance of absorbent cotton, which may be stiffened by layers of adhesive plaster on the exterior. The original form of collar is shown in the illustration.

Prognosis and Treatment as Influenced by the Situation of the Disease. The Lower Region.—The prognosis as regards deformity is favorable. The part may be easily supported. The cases are often seen before the deformity is extreme; and, as a rule, one may predict recovery without noticeable distortion. In most cases the trunk is somewhat shortened and a peculiar erect attitude persists.

The most troublesome complications of disease in this region are psoas contraction and the abscess with which it is often combined. Slight psoas contraction usually disappears after the application of effective support. If it persists it is well to provide the patient with crutches. If it is a symptom of progressive disease and is accompanied by pain, the patient should be placed in bed, where, if necessary, the deformity may be reduced by traction. In confirmed cases in which the distortion has become fixed by secondary contraction of the muscles and fascia, operative treatment is occasionally required to overcome the deformity. In this region of the spine the plaster jacket or the spinal brace may be used, the former means being perhaps preferable. The most troublesome complication is abscess, which is present in about fifty per cent. of the cases.

Disease of the Middle and Upper Dorsal Region.—Disease of this region of the spine is not often acute in its onset, and in most instances deformity is advanced before treatment is begun. It is the region most unfavorable for treatment from the standpoint of prevention of deformity, for the reasons that have been stated.

Whenever possible the patient should be treated by recumbency in the overextended position until the progress of the disease has been checked. Support must be employed for many years because there is a tendency toward increase of the deformity even after the cure of the disease. The Taylor brace assures better fixation than does the jacket. In most instances the anterior shoulder brace should be employed for better support, and to prevent the forward movement of the arms; and whenever the disease is above the eighth dorsal vertebra a head support should be applied. In this region of the

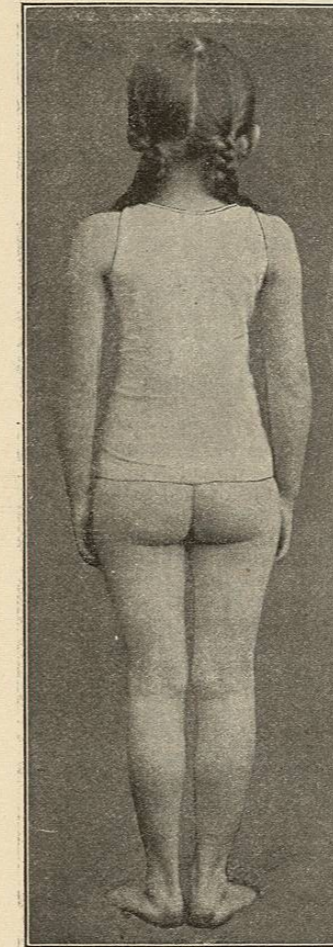


FIG. 4451.—The Plaster Jacket from Behind. (From Whitman's "Orthopedic Surgery.")

spine paralysis is the most important complication. This occurs in about ten per cent. of the cases.

Disease of the Cervical Region.—In disease of the cervical region the prognosis is good, the most noticeable



FIG. 4452.—The Anterior Shoulder Brace Applied with the Plaster Jacket and Jury-Mast.

deformity being the shortened neck and the forward thrust of the head.

Disease of the occipito-axoid region is uncommon. The tendency is toward fixation of the head in the attitude of flexion. This may be prevented by the use of apparatus. The jury-mast when properly applied is a thoroughly efficient support, but fixation of the head by means of the Taylor support or posterior splint insures better control of the patient when he is not under observation.

The Complications of Pott's Disease. Abscess.—It may be assumed that a limited collection of tuberculous fluid accompanies practically every case of Pott's disease; but unless it can be demonstrated by palpation or unless it

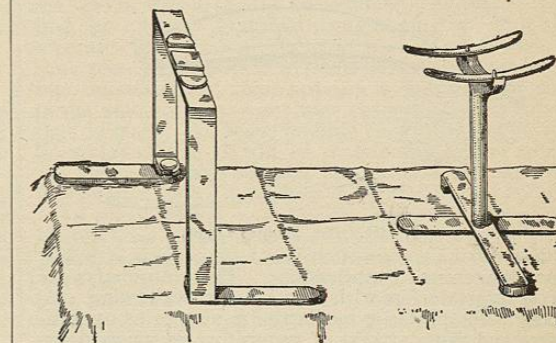


FIG. 4453.—The Goldthwait Frame as used with the Short Uprights in applying the Plaster Jacket.

appears upon the surface of the body it is not as a rule detected. Abscess as a complication in this sense is present in about twenty-five per cent. of the cases. It is far less common in the upper than in the lower region of the spine. This is accounted for in part by the fact that ab-

cesses find their way downward, and in part because the large size of the vertebral bodies in the lumbar region offers better opportunity for their formation.

An abscess may appear without noticeable symptoms, but in many instances it is preceded by pain or discomfort, which indicates apparently tension at the seat of disease.

Abscesses are not as a rule accompanied by increase of bodily temperature, but when they are of large size and are approaching the surface, and especially when the skin covering them is reddened, there is usually a rise in temperature that implies apparently secondary infection of a mild type.

The Course of Abscesses in the Different Regions of the Spine.—Abscess accompanying disease of the occipito-

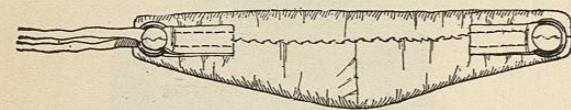


FIG. 445A.—The Thomas Collar.

axoid region may force its way forward and appear in the throat as retropharyngeal abscess. More often it finds its way backward, distends the suboccipital triangle, and then passes forward to the region of the mastoid process. Abscesses from the middle cervical region pass outward and appear usually in the interval between the trapezius and the sterno-mastoid muscles.

In the thoracic region the abscess in the posterior mediastinum usually passes outward to perforate the intercostal muscles and appear on the posterior or lateral aspect of the chest. Or it may pass downward through the openings in the diaphragm and become an iliac abscess. Abscesses that originate in the lumbar region, or that have come from above, may follow various paths. Some perforate the sheath of the quadratus lumborum muscle and become a lumbar abscess, distending the skin between the twelfth rib and the crest of the ilium. Others pass downward on the surface of the iliac fascia and form a tumor at the outer extremity of Poupart's ligament or escape into the thigh. Psoas abscess burrows in the sheath of the psoas muscle and appears on the inner aspect of the thigh. Occasionally the fluid may escape from the greater sacro-sciatic foramen and appear as a gluteal abscess. In rare instances abscesses may take other courses. They may find their way into the spinal canal or break into the lung or into the intestines.

In most instances abscesses cause no direct symptoms, but occasionally from their size or situation they may

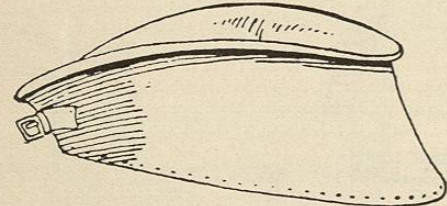


FIG. 445B.—The Thomas Collar.

cause dangerous complications. The retropharyngeal abscess may interfere with breathing or swallowing. An abscess in the posterior mediastinum may press upon the trachea and cause attacks of inspiratory dyspnoea resembling asthma. Psoas contraction, which so often accompanies lumbar abscess, has been described already.

Treatment of Abscesses.—Abscesses that cause direct symptoms may require immediate treatment. The retropharyngeal abscess in case of emergency may be opened by direct incision in the throat. As a rule, however, a lateral opening in front of or behind the sterno-mastoid muscle is preferable. Obstruction due to mediastinal

abscess is uncommon, and in such cases the abscess should be evacuated. An incision is made at the point of deformity over the articulation between the transverse process and rib. A portion of the latter is removed and

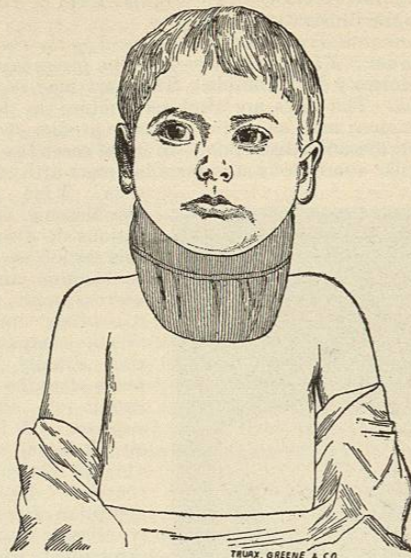


FIG. 445C.—The Thomas Collar Applied.

the abscess is exposed, lying as a rule directly in front of the spine. Care should be taken to follow the spine as closely as possible in order not to wound the pleura.

All infected abscesses should be opened and drained, but quiescent abscesses that cause no discomfort need not be disturbed, as a collection of tuberculous fluid is simply an incident of the original disease of the bone.

If an abscess is of large size, as, for example, when it distends the lumbar region or iliac fossa, the fluid may be evacuated by simple incision. The contents having been removed, the cavity is thoroughly flushed with hot salt solution in order to remove the shreds of necrotic tissue, and the wound may be then closed by layers of sutures.

Drainage should be employed if the abscess is infected, or if the surroundings are such that subsequent infection may be avoided. It must be borne in mind that the danger of a tuberculous abscess is an indirect one, and this danger is from secondary infection, which does not often occur until a communication with the exterior has been established either by operation or by spontaneous evacuation. It is on this account that one hesitates to open abscesses when their source cannot be removed.

Aspiration.—Aspiration serves a useful purpose in removing the thinner fluid and thus preventing the extension of the abscess. The injection of iodoform emulsion is sometimes employed after aspiration, although it is less in favor than in past time. The action of the iodoform is that of a local irritant, and it may be supposed to lessen the infectious quality of the tuberculous fluid. The ordinary form is a ten-per-cent. emulsion of iodoform in sterilized oil. A quantity vary-

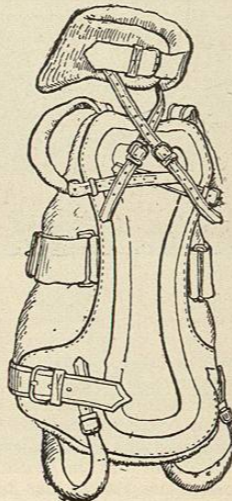


FIG. 445D.—The Thomas Spinal Cuirass, with Collar.

ing from 4 to 30 gm., according to the size of the abscess, is injected at intervals of from two to four weeks.

In many instances abscesses disappear spontaneously by absorption, and after natural evacuation there is apparently no more danger from infection than after operative intervention, if cleanliness is assured.

It is apparent that the treatment of abscesses must be governed by the conditions in the individual case.

PARALYSIS.—The tuberculous process in the vertebral bodies may find its way backward into the epidural space, press upon the spinal cord, and thus cause paresis or paralysis of the parts below. In most instances the pressure is due to the inflammatory thickening of the coverings of the cord. Thus, in addition to direct pressure, there is often an interference with the blood supply and with the lymphatic circulation. As a result there are, after a time, an increase of the interstitial connective tissue and atrophy of the nervous elements, which may go on to partial or complete sclerosis. As a rule, however, but little permanent damage results, even from long-continued pressure and paralysis.

Occasionally paralysis is due to the pressure of an abscess; and when it is of sudden onset it may be caused by a breaking down of a vertebral body, which allows pressure of the thickened tissues upon the cord. In cases of this character the paralysis is at once relieved by straightening the spine.

The calibre of the spinal canal is not lessened by the characteristic angular deformity; in fact, paralysis more often accompanies slight than extreme distortion.

Paralysis not infrequently complicates disease in the upper and middle dorsal regions of the spine, occurring in about ten per cent. of the cases. It is an unusual complication of disease of other regions of the spine.

Symptoms.—The early symptoms, as noted by the patient or his friends, are weakness and an awkward shuffling gait. The symptoms usually increase rapidly until paralysis of motion is complete. The extent of paralysis depends upon the situation of the pressure; thus the paralysis is most evident in the legs. There is an increase of the reflexes; and although when the patient is quiet the limbs appear limp, when he is moved, or when the reflexes are stimulated, the peculiar spastic rigidity appears. As a rule, the rigidity increases with the duration of the disease, and in cases of long-standing flexion contraction becomes permanent. This indicates irretrievable damage to the cord. Sensation is retained in the ordinary cases, but in those of the more severe type it may be impaired or lost.

When the paralysis is incomplete, control of the bladder is retained; but usually there is incontinence. As the bladder fills, the reflex centre is excited and it empties itself. The control of the sphincter ani is less noticeably impaired.

If the pressure on the cord is in the cervical region the arms are involved in the paralysis. If it is in the lower portion of the spine the symptoms are weakness and impaired sensation. The reflexes are not exaggerated.

Time of Onset.—Occasionally paralysis may precede deformity, but as a rule it is a late symptom, appearing more often from one to two years after the beginning of the disease.

Duration.—In exceptional cases in which the paralysis is caused by temporary pressure or disturbance of the circulation, it may be relieved at once by straightening and supporting the spinal column. If, however, the paralysis is complete, as it is in most instances, it persists usually for at least six months, and not infrequently for a year or longer, recovery being dependent upon the organization of the tuberculous granulations or disappearance of the abscess that causes pressure.

Prognosis.—In properly treated cases the prognosis is very favorable. In about seventy-five per cent. of the cases practically complete recovery occurs; absolute and permanent paralysis is unusual. Recurrence of the paralysis after an apparent cure is not uncommon, being dependent of course upon the persistence of the local disease.

Treatment.—The treatment of the paralysis is in great

degree included in the treatment of the disease of which it is a symptom. If possible, rest on the stretcher frame in the position of overextension should be employed. If the disease is in the upper region of the spine traction upon the head is of value. In many instances the additional fixation secured by a plaster jacket should be used also.

If there is persistent contraction of the lower limbs restraint and traction should be applied. Counter-irritation, such as the local application of the actual cautery, is thought by some to exert a favorable influence upon the disease. Iodide of potassium in large doses may aid in bringing about the absorption of the granulation tissue.

The first indication of improvement is a lessening of the muscular rigidity; then there is a gradual return of voluntary motion.

The exaggerated reflexes persist long after the disappearance of the paralysis.

Operative Treatment.—Operative treatment may be required in exceptional cases. If the presence of an abscess in the posterior mediastinum can be demonstrated it is well to evacuate it before opening the spinal canal, because the pressure may be due to the collection of fluid. If after persistent mechanical treatment there is no improvement in the paralysis, the operation of laminectomy may be undertaken. Eighteen months has been suggested as the limit of time which should have tested the efficacy of mechanical treatment.

The usual method of operating is as follows. A long incision is made parallel to and close by the side of the spinous processes. The muscles are drawn to one side, the spinous processes of several of the vertebrae at the seat of disease are cut through at their bases, and with the attached tissues are drawn to the opposite side. The laminae are then removed with cutting forceps, exposing the dura mater. The thickened tuberculous tissue is usually found by the sides and in front of the cord. As much of this should be removed as is practicable. The wound is then closed and the spine is supported by a plaster jacket or other appliance.

Forcible Correction of the Deformity of Pott's Disease. Calot's Operation.—In 1896 the ancient operation of forcible straightening of the deformity of Pott's disease was revived by Calot of Berck-sur-Mer, and for several years the proceeding was in favor; but it has now been practically abandoned, at least as a measure of routine. Experience proved that in the milder cases the deformity might be overcome by rest upon the back, or even by the application of corrective jackets, while in the cases in which the destruction of bone was extensive, the recurrence of deformity after correction was practically inevitable. At the present time the operation is restricted to cases in which the deformity is of recent onset, and in which, it may be assumed, the disease is limited in extent. Forcible straightening of the spine separates the vertebral bodies at the seat of disease, and thus places the spine in a position favorable for repair; but, unfortunately, there appears to be but slight power in the spine to throw out new tissue to fill the interval that is made. If, then, forcible correction of the spine is employed, one should be prepared to fix the spine in the over-corrected position for at least a year. This necessitates, as a rule, rest in the horizontal position.

As the operation is ordinarily performed the patient, having been prepared as for the application of a plaster jacket, is anesthetized, and is then suspended face downward, manual traction being exerted upon the arms and legs, and also upon the head. The deformity is then overcome by the application of gradual direct pressure upon the kyphosis. Thick pads are placed on either side of the spine. A large so-called "dinner pad" is inserted under the shirt and a strong jacket is applied. The patient is then placed in bed upon a pillow, or else upon the stretcher frame.

Great care should be taken to prevent pressure upon sensitive points, and as a rule, if much pressure has been applied, the plaster should be cut away to allow inspection at the seat of disease. As has been stated, cases in

which the disease is of long standing should not be subjected to this operation, nor should cases complicated by abscess. On the other hand, paralysis is rather an indication for the operation than against it. In suitable cases the procedure is practically without danger.

Duration of the Treatment of Pott's Disease.—The duration of treatment must depend upon the extent and the severity of the disease. It may be divided into two stages, one in which the disease is active, when absolute fixation is indicated, and a stage of recovery in which supervision is required. Tuberculosis of the spine is slow in progress and recovery is insecure. The course of the disease is shortest in the cervical region, but even here brace treatment will be required for at least two years. In the lumbar region twice this time may be assigned to this period, and in the upper and middle dorsal regions, where the deformity may increase long after the cure of the disease, support may be required indefinitely.

Indications of Recovery.—As pain is almost always relieved by efficient treatment, its absence is no indication of cure. Muscular spasm usually persists as long as the disease is active; it is therefore a valuable indication in prognosis. The appearance of the kyphosis has some significance. In the early stage of disease the area of the destructive process is not defined; but when consolidation has taken place, its extent is shown by the rigid vertebrae that stand out from the remainder of the spine separated from it by a well-marked depression, deeper below than above. In all cases removal of support must be gradual and its effect must be watched. When the disease is cured massage of the muscles, breathing exercises, and mild gymnastics may be employed with advantage. It may be noted that abscess or even paralysis may appear many years after the apparent cure of disease.

If recovery from Pott's disease has been complete, and if the deformity is slight, the individual may be to all intents normal; but if the deformity is great, his condition is abnormal, and he is unfitted for ordinary occupations. Such individuals usually suffer from neuralgic pain about the weakened spine, and in most instances some form of light support must be worn.

Royal Whitman.

SPIROMETER. See *Respiration.*

SPLEEN.—In the following description of the spleen the physiological is blended with the anatomical, for in

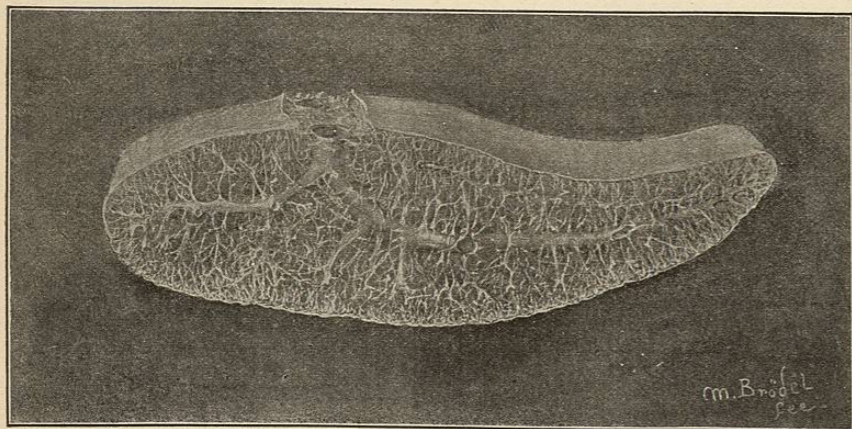


FIG. 4458.—Transverse Section of the Framework of the Spleen. Natural size. It shows the relation of the vein and the artery.

the present state of our knowledge of the subject it is practically impossible to separate them. Throughout the article the description begins with the coarser struc-

tures and gradually passes to the finer ones, in order to point out more definitely that this organ is composed of a multitude of histological units. It will be apparent to the reader that our knowledge of the structure of the spleen is much more satisfactory than that of the function, but it is usually in this order that anatomy and physiology progress.

FRAMEWORK OF THE SPLEEN.—If pieces of a fresh spleen are gently crushed between the palms of the hands in a stream of water, the pulp is soon washed out, leaving only the coarser network of fibres, or trabeculae, the capsule, and the blood-vessels. When these are examined with the low power of the microscope, it is found that the trabeculae are of uniform size and encircle spaces, each of which is about 1 mm. in diameter. This rough method of demonstration may be aided by macerating pieces of the spleen in water or in a solution of potassium hydrate, or by digesting them in a solution of pancreatin; but the specimens thus obtained are not much more instructive than those made by the simple water method. After repeated tests I finally invented a method by which the trabecular system of the spleen is demonstrated clearly and definitely.

The spleen is removed from the body with a portion of its mesentery, care being taken not to tear the capsule. It is kept completely covered with water at ordinary room temperature for a week or more, until the pulp is soft, the water being changed from time to time in order to prevent excessive putrefaction. When the pulp is soft the tip of the spleen is cut off and the pulp stripped out. The spleen is then filled with water and washed until the trabecular system and capsule is perfectly clear and clean. By repeated washings the framework of the spleen is finally clean, and it can now be strained, blown up, and dried. After the trabecular framework is purified in this way, it can be digested, stained, or treated with various reagents in order to determine the nature of the fibres of which it is formed.

The capsule and trabecular system being perfectly clean, it is to be stained with acid fuchsin and then thoroughly washed with alcohol. A tube is now tied into the cut end of the spleen and the specimen is kept distended with compressed air. After it is dry the mesenteric border and adjacent capsule are removed with a forceps and scissors, thus giving a most magnificent preparation. Fig. 4458 is from a section of dog's spleen prepared in this way.

STRUCTURE OF THE CAPSULE.—It is easy to show that the capsule of the spleen is composed of both white fibrous and yellow elastic tissues. A strip of the capsule boiled in dilute KOH will show the one, while digesting with pancreatin and further microscopic study will show the other. After the capsule of the spleen, the trabeculae, and a piece of tendon have been digested in pancreatin for eighteen hours to remove all the elastic tissue, boiling them in HCl 0.5 per cent. or KOH 0.5 per cent. will dissolve the tendon in five minutes, the capsule in about twenty minutes, and the trabeculae in about one hour. In each test a control section of the lymphatic gland shows that its reticulum is less resistant than are the fibrils of the capsule of the spleen. These tests, the value of which will be

discussed later on, show that the capsule of the spleen contains, besides yellow elastic tissue, also white fibrous and reticulated. The white fibres can easily be recog-

nized with the microscope by their wavy appearance and by their color, as well as by the great amount of gelatin which can be obtained from them when boiled. That it takes as much time to dissolve the capsule in boiling KOH or HCl as it does to dissolve a section of a lymphatic gland indicates that both are made up of the same tissues. That these two tissues are at least histologically unlike tendons is shown by their appearance under the microscope and by the fact that they will resist boiling acid and alkali at least four times as long as tendon does. From these observations I must conclude that the capsule of the spleen is composed of elastic, white fibrous, and reticulated tissues.

In the spleen of an ox macerated in water, digested in pancreatin, blown up and dried, the capsule is easily split into two layers—an outer which is composed in great part of white fibrous tissue, and an inner which appears to be of the same constitution as is the trabecular network. Between these two layers the lymphatics are located.

If a portion of the capsule of the spleen is first treated with hot dilute KOH, or is digested in pancreatin, and then stained and mounted in Canada balsam, it is found that the fibrils radiate toward centres from which the trabeculae arise. Such a specimen is pictured in Fig. 4459. In case the preparation is treated with KOH the specimen thus obtained is composed of yellow elastic tissue, while if it is obtained through pancreatic digestion it is composed of white fibrous tissue and reticulum fibrils.

The three groups of fibrils forming the capsule of the spleen are all arranged after the same plan. When the white fibres and reticulum fibres are first removed by boiling the capsule in dilute KOH, leaving only the elastic tissue, a specimen is obtained which could easily be mistaken for the tissues destroyed, were it not for the chemical and color reactions, as well as the high refractive index of the elastic fibres.

Frozen sections of the spleen, which have first been macerated in water or in ten-per-cent. NaCl solution and then stained in haematoxylin, show the capsule and trabeculae intensely stained, as all the non-striated muscle cells and elastic tissue are still present in them. This method is not suited to determine the character of the tissues constituting the capsule and trabeculae, as the presence of all obscures the individual. When, however, the sections are first digested with pancreatin, it is found that the capsule is composed of delicate and wavy fibres, which in turn are arranged in heavier bundles; from these arise fine fibrils and anastomosing fibrils. That a number of white fibres are in the capsule is shown by the large quantity of gelatin easily obtained from it and by the bundles of wavy fibrils seen with the microscope. These bundles lie in great part immediately below the peritoneum, radiate toward the trabeculae, and are continued into them. That the capsule also contains reticulated tissue is shown by the number of anastomosing fibrils present in teased specimens, as well as by the great resistance of the capsule shown when it is boiled in dilute KOH or HCl after all the cells and elastic tissue fibres have been removed by digestion with pancreatin. When boiled with dilute acid or alkali, as shown in Table I, the capsule proves to be much more resistant than is either a section of the lymphatic gland or a bundle of fibres from the tendo Achillis.

The conclusion to be drawn from these tests is that the boiling first removes the white fibres and leaves only the reticulated tissue, which finally falls into pieces. Although these tests are not absolutely definite, they at least make it highly probable that reticulated tissue exists in the capsule of the spleen. The fact that the fine anastomosing fibrils can be seen with the microscope in digested specimens is an additional argument in favor of this view. This question will not be completely solved until an extensive chemical study is made on these fibres obtained from different organs in addition to the invention of a satisfactory differential stain.

The group of the three kinds of connective-tissue fibrils

then radiates toward centres, as shown in Fig. 4459. From these centres the trabeculae arise and penetrate the spleen at right angles to the capsule. In general from four to six trabeculae surround small masses of spleen

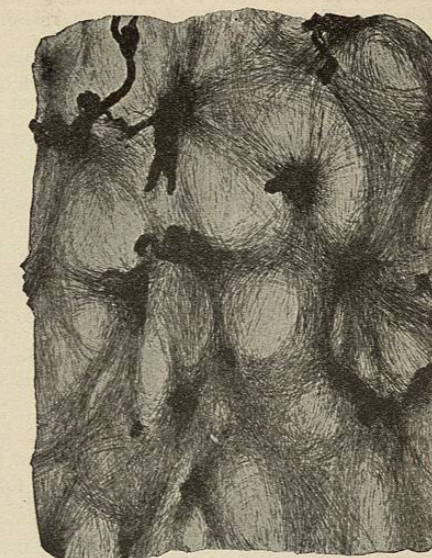


FIG. 4459.—Capsule of the Dog's Spleen Stripped Off Fresh and Digested in Pancreatin. Thoroughly washed in water and spread on a glass slide and allowed to dry. Stained with acid fuchsin and partly decolorized with picric acid. Enlarged 30 diameters. The trabeculae are torn off at their capsular origin.

tissue, about 1 mm. in diameter. These masses I have termed the typical lobules or anatomical unit of the spleen.¹ They are well seen on the surface of fresh contracted spleens as slight elevations about as large as pins' heads. The great number of muscle cells within the trabeculae makes the lobules immediately below the capsule protrude when they contract.

TABLE I.—FRESH TENDO ACHILLIS, SECTIONS FROM LYMPHATIC GLAND, CAPSULE OF SPLEEN AND TRABECULAE FROM THE DOG DIGESTED IN STRONG PANCREATIN FOR EIGHTEEN HOURS, THEN THOROUGHLY WASHED AND BOILED IN KOH ONE-HALF PER CENT. AND IN HCL ONE-HALF PER CENT.

Treated with One-Half Per Cent. KOH Solution.				
Time boiled. Minutes.	Tendon.	Lymphatic gland.	Spleen capsule.	Trabeculae.
1	×	×	×	×
4	+	+	+	+
30	+	+	+	+
75	+	+	+	+
90	+	+	+	+

Treated with One-Half Per Cent. HCl Solution.				
Time boiled. Minutes.	Tendon.	Lymphatic gland.	Spleen capsule.	Trabeculae.
1	×	×	×	×
7	+	+	+	+
15	+	+	+	+
30	+	+	+	+
90	+	+	+	+

× = swollen; + = dissolved.

STRUCTURE AND ARRANGEMENT OF THE TRABECULAE.—The trabeculae in the capsule are composed of elastic, white fibrous and reticulated tissues, as well as great quantities of non-striated muscle cells.

The elastic fibres may be demonstrated by boiling the isolated trabeculae with dilute KOH, but this is not a