More important to the clinician than the kind of scale which is adopted is the use of a thermometer of known accuracy. It is not essential that the thermometer shall be precisely correct in its readings throughout the entire scale so long as the exact amount of error and its location are known, for the correction may then be made in reading the register. To insure this, a certificate may be obtained through the manufacturer, guaranteeing the accuracy of the instrument, or stating to what extent it is inaccurate.

Unfortunately, mercurial thermometers do not retain their accuracy. Owing to the liability of glass to undergo molecular contraction, the bulb not infrequently becomes reduced in size and thus causes the instrument to register erroneously high temperatures. This is generally avoided by thoroughly "seasoning" the tubes before engraving the scale.

Application of the Thermometer.—The object to be attained in the use of the clinical thermometer is usually to determine as nearly as possible the temperature of the interior of the body, the blood heat. Several localities are available for this purpose, on account of the nearly constant character of their temperature, but the axilla, the mouth, and the rectum are most employed. At times the conditions of disease render necessary the selection of other localities, as the groin, the urethra (female), the vagina, or the closed hand, and it has been proposed to take the temperature of freshly voided urine. The mouth is the most easily accessible. The bulb should be placed under the tongue, and the lips closed on the stem. The mouth must remain closed during the observation. If oral respiration has been carried on previous to the introduction of the instrument, a minute or more should be allowed for the rise of the mercury beyond the time that would otherwise be required.

In many cases the axilla will best answer the purposes of thermometric investigation. The arm-pit must be thoroughly dried, if moist, before the introduction of the thermometer. The instrument should then be inserted into the middle of the axilla in such a manner as to insure contact with the skin only. The cavity is then closed by pressing the arm firmly against the chest, the forearm being drawn slightly forward. It is advisable, when practicable, to use the thermometer in the axilla of the side upon which the patient has been lying. From three to five minutes are usually required for a correct register of the axillary temperature.

Taking the temperature in the rectum yields the most trustworthy results, particularly in children. The use of the urethra or vagina is resorted to only in such conditions as Asiatic cholera, when the temperature of the axilla has been found as much as 7° C. (12.6° F.) below that of the vagina; and the temperatures of the mouth and rectum are also unreliable. Whatever locality is selected in an individual case, the same should be used for all subsequent observations.

Thermometric observations should be made at stated intervals, the frequency of which must depend upon the character of the case and the object of the examination. In the commencement of a febrile disease it is often necessary, in order to arrive at a correct diagnosis, to take the temperature at frequent intervals, every half hour, every hour, or every two hours; but regular morning and evening observations are, as a rule, sufficient for the requirements of treatment. These are best taken between 7 and 9 A.M., and between 5 and 7 P.M. If, however, the points of maximum and minimum temperature are found not to occur in these intervals, the times must be made to conform to the peculiarities of the case.

In addition to the periodical observations, the thermometer should be used upon the occurrence of any phenomenal event during the progress of the disease, as after a rigor, a sweat, or psychical disturbances.

The systematic observation of temperature changes is essential to the intelligent treatment of almost every febrile disease. The attendant should be provided with a reliable self-registering thermometer, with instruction how and when to use it in the absence of the physician.

It is not enough that the temperature be regularly measured; it must be regularly recorded on a chart prepared for that purpose. Every chart should bear the name of the patient, the diagnosis of his disease, the region in which the temperature is taken, the date and time of day. Its value is enhanced if it have recorded upon it the rate of the pulse and respiration at each thermometric observation, the occurrence of critical evacuations, the alvine dejections and urine, the explanation of any anomaly of temperature or other feature of the disease.

The Temperature in Health.—In speaking of the body temperature, whether physiological or pathological, reference is usually had to the temperature of but a single thermometric region, which region, accuracy of statement requires, should always be indicated in clinical reports.

The temperature of the axilla in health averages about 36.89 C. (98.4° F.), as stated by Liebermeister, or 37° C. (98.6° F.), according to Wunderlich. It varies, however, between 36.40° C. and 37.77° C. (97.5° and 100° F.). Landois states, as the average of five hundred observations, 36.49° C. (97.68° F.). The temperature of the mouth is from a fifth of a degree to a degree higher than that of the axilla. The last-named authority gives as the average 37.19° C. (98.94° F.). The rectal and vaginal temperatures vary from 37° C. to 38° C. (98.6° F. to 100.4° F.). Thermometric observations in the closed hand are too variable for clinical purposes, as they are liable to be altered by external conditions of heat and cold. Römer places the variation which is liable to occur in this region at 6° C. (10.8° F.).

The factors which are generally recognized as influencing the results of thermometric observations may be summarized thus: 1. The region in which the observation is made; the closed cavities are warmer than exposed parts, the trunk is warmer than the limbs. 2. The temperature is higher in the extremes of life than in middle age. 3. The taking of a full meal causes a slight temporary depression of the temperature; digestion elevates it. Fasting lowers it. Alcohol produces a prompt but transitory depression, after which the temperature again rises to about the normal. 4. Physical exercise short of fatigue causes a slight rise of temperature, whereas mental exertion is said to depress it. 5. The body is coolest in the morning, gradually becoming warmer until evening, reaching the maximum, as a rule, between five and seven o'clock. A gradual decline to the morning minimum occurs during the night. This daily fluctuation ordinarily amounts to a little more than 0.5° C. (1° F.). 6. Prolonged exposure to heat causes a slight elevation of temperature, exposure to cold a slight depression. A marked effect is produced by agencies which promote or retard the radiation and convection of heat from the body. 7. The nervous system exerts a considerable influence over the bodily temperature, as has been shown by the experiments of H. C. Wood and others.

The Temperature in Disease.—A large proportion of diseases are accompanied by an elevation of temperature. In a comparatively few, there is at some period a decline below the normal. In order to denote a morbid process, in the absence of other positive signs of disease, the temperature must remain for several hours outside the bounds of health. The temperature in febrile affections undergoes a fluctuation from morning to evening and from day to day, which is typical of the underlying morbid process. By the use of the thermometer we are able to recognize this fluctuation and estimate from it the severity of the disease, and any variation which may occur in the course of the affection as a result of complications, accidents, or treatment.

The thermometer is therefore a valuable aid in diagnosis, in prognosis, and in treatment.

In Diagnosis.—The early diagnosis of infectious diseases is of the utmost importance. By the use of the thermometer we are often able, more than by any other means, to corroborate our suspicions of their existence, or, on the other hand, to disprove the evidence of fictitious symptoms. Complications arising in the course of a fever and relapses from convalescence are usually indicated by a more or less pronounced alteration of the temperature range, or by a return of high temperature.

Thermometry is no less valuable in the diagnosis of certain chronic affections, but more particularly for determining their activity or latency at the time of the observation. This is particularly true of tuberculosis. The thermometer has led to the discovery of this affection in individuals who had exhibited no subjective manifestations of the disease.

An inequality of temperature between corresponding surfaces of the body, in the absence of local inflammation, often points to the existence of paralysis of the cooler part, or of other nervous disorder, a fact which is especially of value in the presence of coma.

A diagnosis cannot be based upon a single thermometric observation. A series of observations must be made before we can learn enough of the temperature range to render a differential diagnosis possible. The absence of abnormal temperature conveys more positive information than does its presence.

Notwithstanding the value of thermometry, its results are not infallible. A sudden rise of the temperature may be due to a specific infection, but it may arise solely from an acute attack of indigestion. The taking of food, exercise, and excitement are liable to elevate the temperature in disease, as does also the retention of urine or of fæces. Due caution is always to be exercised in estimating the diagnostic as well as the prognostic importance of an elevated temperature in women, when accompanied by hysterical manifestations, when the pyrexia often appears to be due solely to the peculiar condition of the nervous system. Children are subject to sudden elevations of temperature as a consequence of the most trivial disorders, such as a simple angina or a disturbance of digestion.

In Prognosis.—The thermometer is an aid to prognosis in the extent to which it enables us to detect an approach of the temperature to the danger line. But the points at which the temperature crosses the lines of danger are not fixed points, and depend in most instances upon a combination of circumstances peculiar to the individual case. A few more or less positive rules may, however, be stated.

When the temperature reaches a height of 40° C. (104° F.), it is considered a factor of considerable gravity in prognosis. When 40.5° C. (105° F.) is passed the febrile state is termed "hyperpyrexia," and the gravity of the prognosis rapidly increases until 42.5° C. (108.5° F.) is reached, when death is usually imminent. A few cases of recovery from a temperature of 43.3° C. (110° F.) have occurred. In a few instances recovery has been reported after hyperpyrexia ranging from 44.5° C. to 50° C. (112° to 122° F.). Anomalies of such rarity, even if real, have little or no scientific value.

It is not when considered by itself that the temperature is of most value in prognosis, but when taken in connection with the other features of the disease in which it occurs; for in some diseases hyperpyrexia is frequent, whereas in others it is exceptional. A temperature which in one malady would be looked upon as of the gravest import, would in another be considered of less significance. Acute articular rheumatism, scarlatina, relapsing fever, and tetanus, for example, are often attended with hyperpyrexia, 41° to 42° C. (105.8° to 107.6° F.), which is not necessarily serious. Yet persistently high temperature is an evil omen in these diseases. A high evening temperature is less to be feared if the morning remission be considerable than if it be slight. An evening hyperpyrexia followed by an equal or still higher morning temperature is very apt to foreshadow death by a short interval, the temperature, as a rule, continuing to ascend until the fatal issue. It follows, as a corollary to this, that a high morning temperature is more to be feared than a high evening elevation.

A sudden pronounced rise of temperature after it has, in the ordinary course of the disease, declined to near the normal, is generally of evil import, because it often denotes the development of a complication, except in such diseases as malaria, smallpox, and relapsing fever.

A persistence of pyrexia, even of low degree, after the other symptoms have subsided, very often indicates a delayed convalescence, generally from the presence of a complicating affection, as when a catarrhal pneumonia or tuberculosis follows measles or smallpox; or when sepsis follows typhoid fever.

Many febrile diseases undergo a more or less rapid defervescence, involving a fall of temperature to or below normal; but under other circumstances a sudden marked decline is often as much to be feared as a sudden rise, particularly if the fall be accompanied by acute prostration. The designation "collapse temperature" has been applied to a fall below 35.5° C. (96° F.); falling below 34° C. (about 93° F.), it has been called algid collapse. A rapid fall of temperature may augur evil to the patient, without, however, reaching a subnormal degree.

In some conditions the temperature falls from the norm without previous elevation, as in certain forms of insanity, in emphysema, asthma, cardiac lesions, and in the coma of alcohol and narcotic poisons. In these the prognosis is not always so grave as the temperature would, under other circumstances, indicate. Several well-authenticated recoveries have occurred after a temperature as low as 37.7° C. (90° F.), the result of alcoholism.

In Treatment.—Here a thorough knowledge of symptomatology, including the usual temperature range of the affection in which the observation is made, is imperative. It is generally recognized that a high temperature demands prompt recourse to the application of cold or other remedies to reduce it. *Per contra*, a subnormal temperature calls for the application of heat and the use of such measures as promote heat production or retard its radiation. The cause of the pyrexia must in all cases be taken into account.

James M. French.

THIGH, THE.—The term thigh is used to mean the part comprised between the hip and the knee. In this sense it is limited above by the line of the groin (Poupart's ligament) in front, and the gluteo-femoral crease behind. The patella and knee-joint mark its boundaries below.* In its restricted sense, as the regio femoralis of regional anatomy, the thigh has more artificial, but more definite, boundaries. It is limited above and posteriorly by the gluteo-femoral crease and anteriorly by a line drawn 12 to 15 cm. under Poupart's ligament (Lig. inguinale) and below by a line drawn around the limb from 3 to 8 cm. above the superior boundary of the patella.†

In this restricted sense the inguinal region (regio subinguinalis) lies between its superior boundary and Poupart's ligament. However, the separation into two regions at this point is entirely artificial.

Various bony prominences aid us in determining the relations of the structures of the thigh. The most important are the anterior superior spine of the ilium, the crest of the pubis, the tuber ischium, and the great trochanter above. Below, the patella, the internal and external condylar processes serve as guides. The most important muscular landmark of the thigh is formed by the sartorius. This is best seen when the limb is raised, and it helps to form the boundaries of Scarpa's triangle, Hunter's canal, and the popliteal space.

The general shape of the thigh is that of a truncated cone with its base above. Its contour varies with the amount of muscular development, the condition of contraction of these muscles, and the thickness of the subcutaneous fascia. Its median surface is marked by a furrow running from the inguinal fossa (fossa subinguinalis) to the inner side of the knee. This groove marks the boundary between the adductor muscles and the vastus internus muscle (M. vastus medialis). The sartorius lies

* The term thigh is defined in this manner in the Century Dictionary and is used in this sense by Cunningham, Quain, Morris, etc.

† Joessel: "Lehrbuch der topographischen Anatomie:" article on the *Thigh* by Huntington, in the first edition of this work; etc.

directly external to this, and the larger nerves and blood-vessels of the thigh are just median to this upon the adductor muscles. On the external surface (regio femoris lateralis) it is possible to see a furrow, unless the amount

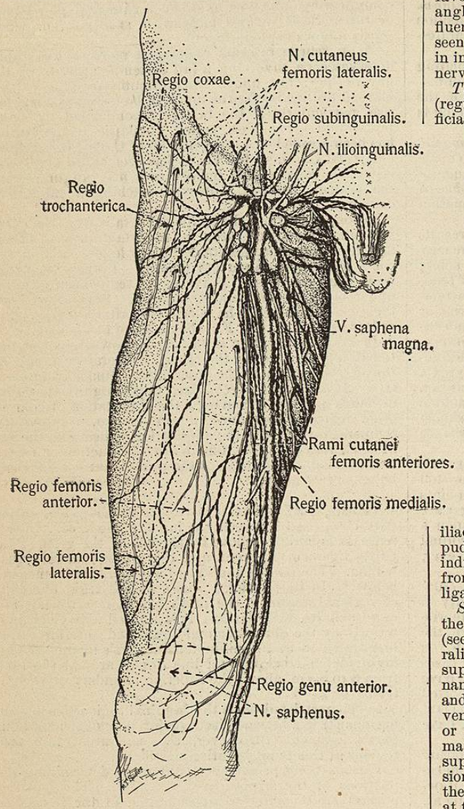

FIG. 4703.—Superficial Veins, Nerves, and Lymphatics on the Front of the Thigh. Only part of the lymphatic vessels is shown, in order not to make the figure too complicated. Drawn from the dissection and from photographs. The dissection was made by A. J. Price, Cornell University Medical College, Ithaca, N. Y. The regions are taken from Spalteholz's "Atlas of Human Anatomy."

of fat is so thick that it is hidden. It is caused by the intermuscular septum (lig. intermusculare externum) between the vastus externus (M. vastus lateralis) and the biceps (M. biceps).

On the median surface (regio femoris medialis) the gracilis muscle is assumed as a dividing line, although it does not form an easily recognized boundary.

The skin covering the thigh is very retractile, due to the loose subcutaneous fascia. It is relatively thick and covered sparsely with hair. Over the inguinal region it is thinner, and in new-born children and very stout people the secretion of the glands may cause irritation. It is attached rather firmly at Poupart's ligament (lig. inguinale).

The superficial fascia (fascia subcutanea) is usually quite thick and better developed in women than in men. It may be from 2 to 3 cm. thick over the femoral artery (A. femoralis) in stout persons, and it is also apt to be the favorite seat of fatty tumor, especially over Scarpa's triangle. It is nowhere very dense, and has little or no influence upon the progress of a superficial abscess, as is seen in the readiness with which pus reaches the surface in inguinal buboes. This fascia contains the superficial nerves, veins, lymphatic vessels, and glands.

The Superficial Lymph Glands.—In the inguinal region (regio subinguinalis) there are from nine to twelve superficial lymph glands that can usually be felt with the finger. From three to five are arranged in a row parallel to Poupart's ligament (glandulæ inguinales) and the others at right angles to it (glandulæ crurales) (see Fig. 4703). The glandulæ inguinales receive the vessels returning from the abdominal wall, perineum, and external genitalia. They are often the site of inflammatory processes in infections of the genital organs, and when they are enlarged from such a cause, they are known as buboes. The glandulæ crurales receive the vessels of the lower extremity. Swelling of the different sets of glands serves to indicate the region of infection and thus are an aid in diagnosis. In operating upon these glands for suppuration their intimate relations with the large veins, arteries, and nerves should be borne in mind. The deep lymph glands (usually two in number) lie under the femoral vein (V. femoralis) and receive vessels from the limb. Most of the large lymphatic vessels which supply the thigh and leg accompany the long saphenous vein (V. saphena magna) as shown in Fig. 4703.

Superficial Arteries.—The superficial arteries of the thigh that have been given definite names are all found in the inguinal region (regio subinguinalis). They are the superficial epigastric (A. epigastrica superficialis), the superficial circumflex iliac (A. circumflexa iliaca superficialis), and the external pudic (A. pudenda externa subcutanea). Their names indicate sufficiently well their position, and hemorrhage from them is usually easily controlled by compression or ligature.

Superficial Veins.—The principal superficial veins are the long saphenous (V. saphena magna) and its branches (see Fig. 4703). It empties into the femoral vein (V. femoralis) after passing through the fossa ovalis. The three superficial veins corresponding to the arteries already named (V. pudenda externa, V. epigastrica superficialis, and V. circumflexa iliaca superficialis) empty into the vena femoralis as it passes under the fossa ovalis, or one or more of these may empty into the vena saphena magna by separate openings. These veins are all well supplied with valves. The vena saphena magna is occasionally double, and is often the seat of varix, and is then very much enlarged and tortuous. It is also ligated at times in the inguinal region as a curative measure for varix at a lower level.

Superficial Nerves.—The principal superficial nerves of the regio subinguinalis and the regio femoris are the ileoinguinal (N. ileoinguinalis), genito-crural (N. lumboinguinalis and N. spermaticus externa), the external cutaneous (N. cutaneus externus), the middle cutaneous (N. cutaneus medius), the internal cutaneous (N. cutaneus internus), and the cutaneous branches of the obturator (N. obturatorius).

The ilio-inguinal nerve receives most of its fibres from the first lumbar nerve. It emerges from the external abdominal ring and divides into terminal branches, which supply the skin over the adductor longus, and that of the scrotum in the male or of the labia majora in the female.

The crural branch of the genito-crural nerve (N. lumboinguinalis) is formed principally by fibres from the second lumbar. It is distributed to the skin as far as the middle of the thigh.

The external cutaneous nerve (N. cutaneus externus) arises also from the second lumbar. It ordinarily penetrates the fascia lata 2 to 3 cm. under the superior anterior spine of the ilium (spina anterior superior ossis ilii), and divides into anterior and posterior branches. The different branches often penetrate the fascia lata separately (Fig. 4703). The anterior branch goes to the side of the thigh, and the posterior branch goes to the skin of the side and back of the thigh.

The middle cutaneous (N. cutaneus medius) supplies a large area of skin over the median portion of the thigh and over the sartorius muscle.

The internal cutaneous nerve (N. cutaneus internus) accompanies the great saphenous vein (V. saphena magna) and sends branches to the median part of the thigh as well as the inner side of the leg.

The cutaneous branches of the obturator nerve (N. obturatorius) supply a small area of skin just above the inner condyle of the knee.

Fascia Lata—The fascia lata is the deep fascia of the thigh, and is composed of very strong fibrous tissues which completely envelop the thigh. Most of the fibres run in a circular manner, but toward the upper and outer side, where the fascia is thickest, the longitudinal fibres are especially well developed. The whole of the fascia lata forms a strong cylindrical tube containing the muscle of the thigh, and if it is broken at any point, the muscles project outward in a hernia-like fashion. It is attached above and in front to Poupart's ligament (Lig. inguinale), on the outer side and behind to the outer lip of the crest of the ilium, and on the inner side to the tuberosity and ascending ramus of the ischium, the descending ramus of the pubis and the symphysis pubis. Below, it is much thinner, and is continuous with the fascia of the leg. Above and to the side the fascia is divided into two layers, which enclose the tensor vaginæ femoris muscle (M. tensor fasciæ latæ). At this point the fascia is thickened, and runs downward like a tendon to the external tuberosity of the tibia. This thickening is known as the ilio-tibial band (tractus iliotibialis) or Maissiat's band. At the edge of Poupart's ligament the structures are further complicated by a division of the fascia lata into two layers and by the presence of the fossa ovalis. The fascia also divides and forms a sheath for the sartorius muscle. Between the fascia lata and the muscles there is a thin layer of areolar connective tissue, through which phlegmonous processes may extend under the fascia. From the inner side of the tube formed by the fascia two strong projections penetrate between the muscles of the thigh, and are attached to the lips of the linea aspera (Lig. intermusculare laterale et mediale) to form the intermuscular septa. The lig. intermusculare laterale follows the edge of the origin of the vastus externus muscle (M. vastus lateralis), and is inserted into the outer lip of the linea aspera. The groove which this forms in relatively thin subjects has already been mentioned, and it separates the vastus externus muscle from the biceps and the other extensors. On the posterior side of the thigh there is also a slip of the fascia lata that runs between the flexor group of muscles and the adductors. It joins the ligamentum intermusculare laterale, and is inserted with it into the external lip of the linea aspera, as seen in Fig. 4704. The ligamentum intermusculare mediale is fastened to the internal lip of the linea aspera, and divides the adductors and extensors. A part of it also takes part in the formation of Hunter's canal (canalis adductorius).

These fibrous intermuscular septa divide the muscles into three groups: 1. An anterior and lateral group, which includes the tensor vaginæ femoris (M. tensor fasciæ latæ), the sartorius (M. sartorius), and the quadriceps femoris (M. quadriceps femoris). 2. An inner or medial group, which contains the adductors and the gracile (M. gracilis). The femoral vessels run between the quadriceps femoris and the adductors; that is, between the anterior and inner divisions. 3. A posterior group containing the flexors (M. biceps, semimembranosus, and semitendinosus). The muscles of the thigh are very large and strong. Many of them are very long, and, in amputations involving them, it must be remembered that, other things being equal, the farther from its origin the muscle is divided the more marked will be its retraction. So in amputations of the lower part of the thigh more must be allowed for retraction than in amputations of the upper part. The position of the limb will also influence the retraction of the various groups; consequently it should be held in the same position during amputation that it is to rest in during healing. The muscles on the posterior and inner aspect of the thigh usually retract the most, and this difference may amount to 5 to 7 cm., and in amputations by the circular method the flaps should be cut so as to allow for this.

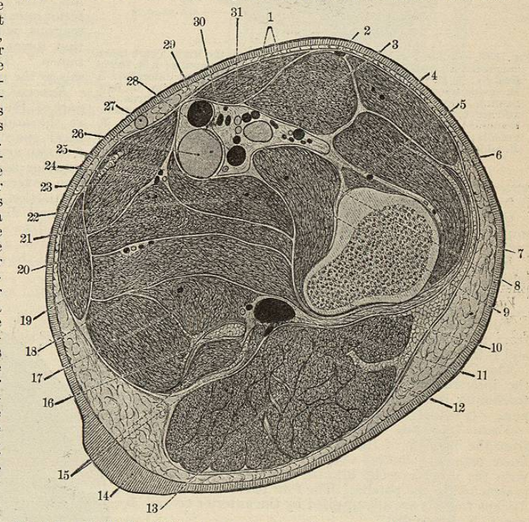

FIG. 4704.—(Toldt, Fig. 1019.) Cross-section through the Right Thigh taken at the Level of the Lesser Trochanter. Distal surface. 1, * A. Circumflexa femoris lateralis; 2, N. cutaneus femoris lateralis; 3, M. rectus femoris; 4, M. tensor fasciæ latæ; 5, M. vastus intermedius; 6, M. vastus lateralis; 7, fascia lata; 8, fascia iliopectinea; 9, M. iliopsoas; 10, trochanter minor; 11, N. ischiadicus (sciatic nerve); 12, N. cutaneus femoris posterior (small sciatic nerve); 13, M. gluteus maximus; 14, gluteal fold; 15, Mm. semitendinosus et biceps femoris; 16, M. semimembranosus; 17, M. adductor magnus; 18, M. adductor minimus; 19, N. obturatorius; 20, M. gracilis; 21, M. adductor brevis; 22, M. pectineus; 23, M. adductor longus; 24, N. obturatorius; 25, fascia pectinea; 26, V. femoris; 27, V. saphena magna; 28, A. profunda femoris; 29, A. femoralis; 30, N. saphenus; 31, M. sartorius.

* A., Arteria; N., nervus; M. musculus; V., vena.

ANTERIOR GROUP OF MUSCLES.—*Tensor vaginæ femoris* (M. tensor fasciæ latæ).—It is on the outer side of the hip. Its origin is on the anterior superior spine of the ilium (spica iliaca anterior superior) and the fascia lata. It is inserted into the ilio-tibial band (tractus iliotibialis), and its nerve supply is the N. glutæus superior.

Sartorius (M. sartorius).—It crosses the thigh in a