

half or two litres, have been mistaken for pleuritic effusions.

The following excellent table is taken from Rotch's "Pediatrics," p. 761:

DIFFERENTIAL DIAGNOSIS BETWEEN A DILATED HEART AND A PERICARDIAL EFFUSION.

Case I.—Endocarditis; dilated heart.	Case II.—Pericarditis; effusion.	Case III.—Endocarditis; enlarged heart; pericardial effusion.
Girl, eleven years. Attack followed acute articular rheumatism.	Boy, six years. Attack followed acute articular rheumatism.	Girl, eight years. Attack followed acute articular rheumatism.
Orthopnea; precordial pain; heart's impulse feeble, but perceptible a little to left and below left nipple, fifth interspace.	Orthopnea; precordial pain; heart's impulse feeble but perceptible a little to left and below left nipple, fifth interspace.	Orthopnea; precordial pain; heart's impulse feeble, but perceptible all over cardiac area, with apex beat a little below and to left of left nipple, fifth interspace.
Vertical absolute dullness not increased.	Vertical absolute dullness not increased.	Vertical absolute dullness not increased.
Absolute dullness under the sternum, and to left of sternum; identical with cases II. and III.	Absolute dullness under the sternum and to left of sternum; identical with cases I. and III.	Absolute dullness under the sternum and to left of sternum; identical with cases I. and II.
Absolute dullness did not extend to right of sternum.	Absolute dullness in fifth right interspace 2 or 3 cm. from edge of sternum.	Absolute dullness in fifth right interspace 3 or 4 cm. from edges of sternum.
Systolic murmur at apex.	Pericardial friction rub at base.	Soft systolic murmur at apex, transmitted to axilla; pericardial friction rub at base.
Recovery.	Recovery.	Recovery.

The following points, mentioned by Osler, may assist one in differentiating between dilatation of the heart and pericardial effusion:

In dilatation the impulse in thin-chested people is usually visible and undulatory; the shock of the cardiac sound is more distinctly palpable in dilatation; the peculiar area of dullness in effusion, especially if the upper limit shifts with change of position of the patient.

In dilatation the heart sounds are clearer, often sharp, valvular or fetal in character; gallop rhythm is common, whereas in effusion the sounds are distant and muffled.

Rarely, in dilatation, is the distention sufficient to compress the lung and produce the tympanic note in the axillary region.

Fluoroscopic examination is extremely useful for differential diagnosis. The opaque area does not pulsate as it does in enlarged heart or aneurism. The upper level can be seen to move with changes of position.

Diseases of the Pericardium in Children.—Only a few special observations need be mentioned under this heading, as the signs of pericardial disease are practically the same at all ages. Rotch states that so far as he could determine by the dissection of sixteen infants of different ages the relation of the infant's pericardium does not differ from that of the adult. The amount of fluid normally present is of variable quantity, but is probably under 5 c.c. When pericardial friction sounds are absent, the diagnosis of pericarditis in a young child is attended with great difficulties. Some writers (Warthin) state that an accentuated pulmonary second sound is characteristic of pericarditis. In infancy, however, the pulmonary second sound is normally much accentuated. Owing to the greater flexibility of its thorax the child is much more likely than the adult to manifest a bulging of

the precordium as a result of the pressure of the fluid. It must be kept in mind that on account of the smallness of the child's thorax the heart and pericardium are both brought nearer the surface than in the adult; and as a result the heart's impulse can be felt, and the heart sounds heard, in much larger effusions than would be possible in adults.

Pericarditis sicca is uncommon in childhood. Exudation takes place more frequently than in the adult, and with greater rapidity, and is more likely to be purulent (Rotch). Exudation tinged with blood is not uncommon in early life, and is not so significant of tuberculosis as is a pronounced hemorrhagic exudation.

Holt states that pericarditis is rare in infancy and early childhood, only two cases having been seen in seven hundred and twenty-six consecutive autopsies at the New York Infant Asylum. In later childhood the disease is more frequent. According to Jacobi, Holt, and other authorities diseases of the lung and pleura, especially of the left side, take first rank as etiological factors in infancy and early childhood. After the fourth year rheumatism takes precedence and the pericarditis is then usually associated with endocarditis. Pericarditis may develop in the new-born as a result of infection of the cord. In children pericarditis may develop and become very pronounced, while the articular complaint is mild.

In young children pain seems to be generally absent.

Prognosis.—Pericarditis should always be looked upon as a serious disease, chiefly because of the myocardial degeneration which accompanies it. Death may take place in a few days in the acute cases associated with rheumatism and pneumonia, but this sequel is very uncommon. The immediate prognosis in these cases is generally good. The probability of repeated attacks, the likelihood that adhesions will form, and the presence of myocarditis render the prognosis for a long life unfavorable. When associated with Bright's disease the prognosis is bad.

Patients occasionally die from syncope as a result of embarrassment to the action of the heart from pressure, by very large collections of fluid.

Suppurative pericarditis is nearly always fatal if associated with a general septicæmia; if it is secondary to an empyema or other localized collection of pus, there may occasionally be recovery, with the adoption of early and proper surgical treatment. Of thirty-five cases of suppurative pericarditis treated by incision, fifteen recovered and twenty died (Roberts, *Am. Jour. Med. Sc.*, December, 1897).

In adherent pericardium the prognosis is serious if there are adhesions to the chest wall, or if the heart is enlarged, or especially if these adhesions are associated with valvular lesions. Universal adhesion of the pericardium to the heart, provided the heart is not enlarged, does not necessarily tend to shorten life.

Treatment.—Pericarditis must always be considered a serious disease, even if the symptoms are slight. The patient should be put to bed. The diet should be chiefly liquid, milk forming the major part. The stomach should not be overloaded. In the milder cases soft articles of food may be given. Pain should be relieved chiefly by the application of the ice-bag. In children hot applications may be more satisfactory. Morphine may be required in some cases. Restlessness and sleeplessness should be controlled by suitable doses of bromide or trional. The heart action, pulse, respirations, and color of the patient should be closely watched, and heart tonics, such as strychnine and digitalis and ammonia, given when indicated. The time may come when the heart is overwhelmed by the obstacles presented by the enormous effusion; the pulse becomes extremely weak and rapid, marked dyspnea and cyanosis develop; then heart tonics are useless, and one must resort to paracentesis to save the patient.

Unless the symptoms are moderately urgent a serous effusion should not be evacuated, because many times the absorption is very rapid. If the effusion is large and has existed for many days, and shows no signs of resorption, it should then be evacuated without hesitation.

Paracentesis Pericardii.—The pericardium is tapped with a Potain aspirating set in the same way as is the pleura. The only difference is in the selection of the points of puncture. An excellent method is first to freeze the part with an ethyl chloride spray, make a very small incision through the skin with a bistoury, then insert the needle at right angles to the chest wall for a distance of from one and a half to two inches. After consulting a large number of authorities upon the correct site for puncture, and finding that each writer advises a different location, I have come to the conclusion that if a fairly large effusion is present it is safe to puncture anywhere from an inch to the right of the sternum to an inch or so beyond the left nipple line, between the fourth and sixth ribs. One is cautioned to avoid wounding the internal mammary artery. Little attention need be paid to the intercostal arteries.

Rotch very strongly recommends the fifth right interspace 4 cm. (1½ in.) outside the right border of the sternum. He states that an effusion of even as little as 100 c.c. can be found at this point, and that there is no danger here of wounding the heart, or the right internal mammary artery, or the pleura. Osler recommends the fourth left interspace, either at the sternal margin or 2.5 cm. (1 in.) from it. He also speaks of the fifth left interspace an inch and a half from the left sternal margin, and close to the costal margin in the left costo-xyphoid angle, as the point where the needle may be thrust upward and backward.

Purulent effusions should be treated like any other abscess, by early free incision and drainage. Irrigation of the sac is not advisable except in selected cases.

The treatment of adherent pericardium is practically that of organic heart lesions (myocardial and valvular). It is necessary to keep up bodily nutrition by proper exercise and diet, and at the same time guard against overtaxing the weak heart. If symptoms of incompensation develop they should be treated by rest, diet, and cardiac medicines, as indicated elsewhere.

HEMOPERICARDIUM and HYDROPERICARDIUM have been considered in detail in Vol. IV.

PNEUMOPERICARDIUM, because of its extreme rarity and hopeless prognosis, is of very little practical importance. By it is meant the presence of gas or air in the pericardial sac. As a matter of fact, gas is never present alone, but is in combination with fluid, usually pus, i.e., pyopneumopericardium. The fluid may be ichorous. It is always secondary to some very serious destructive disease in which a communication is established between the pericardium and a cavity or tube containing air—as, for instance, perforation from the œsophagus, especially in connection with cancer; rupture into the pericardium of a lung cavity, or pneumothorax, or perforation of a gastric ulcer. It may occur as a result of penetrating wounds, such as fractured ribs, concussion or crushing of the chest, or injury from the side of the œsophagus. The gas in pneumopericardium varies in amount and in composition, and is generally offensive. It may be under so great pressure that when the pericardium is punctured the gas escapes with a hissing noise.

Symptoms.—These are very indefinite, and difficult to dissociate from the primary disease. If the gas is present in abundance there will be dyspnea, cyanosis, attacks of syncope, collapse, a feeble and irregular pulse, and occasionally dysphagia and precordial distress.

Physical Signs.—There may be bulging of the precordial region. The apex beat is weak or absent. The heart movements may produce a very peculiar crackling sensation due to the bursting of bubbles.

Percussion signs are very striking. A metallic tympanitic note is heard over the distended pericardium. Because of the presence of fluid and air a freely movable area of dullness is detected in the dependent part, upon change of position. The quality of the tympanitic note may also vary with the change of position.

Auscultation.—The heart sounds are unusually loud and may have a metallic ring. If murmurs are present they take on the same quality. The cardiac movements and

deep breathing agitate the fluid and gas present in such a way as to produce unusual adventitious sounds. They have a metallic ringing quality, and have been likened to the sound of a water wheel.

Treatment is expectant and supportive. It may at times be wise to allow the gas to escape through a fine trocar, or even to incise and treat surgically. Little can be done in a medical way.

New Growths and Parasites.—Under this heading are included tuberculosis, carcinoma, and hydatids. Tuberculosis is much more common than the latter two. It is very unusual to find the tubercles of acute miliary tuberculosis on the pericardium. In most cases tuberculosis of the pericardium is chronic and secondary to tuberculosis in other parts of the body, especially of the lungs and mediastinal lymph glands. In many cases of pulmonary tuberculosis the complicating pericarditis is of the simple serous type. The exudate in tuberculosis and carcinoma of the pericardium is likely to be blood-tinged, and may be purulent or ichorous.

Carcinoma of the pericardium is extremely rare and is always secondary, the sac being involved by extension from neighboring organs.

Hydatids of the pericardium are extremely rare. Clinically we have no means of recognizing the presence of a new growth in the pericardium, except as we infer its presence from the detection of similar disease in neighboring tissues.

PERINEORRHAPHY. See *Obstetric Operations*.

PERINEUM, SURGICAL ANATOMY OF THE.—I. THE MALE PERINEUM.—In the skeleton the perineum corresponds to the outlet of the pelvis. It is a diamond- or lozenge-shaped space bounded in front by the pubis and subpubic ligament, behind by the coccyx, and on each side, from before backward, by the rami of the pubis and ischium, the great tuberosity of the ischium, and the great sacro-sciatic ligament.

The whole space measures about three inches and a half from side to side, and four inches antero-posteriorly. At the posterior part it is from two to three inches deep;

anteriorly it only reaches the depth of one inch. The perineal space is separated from the pelvic cavity above by the recto-fascia and levatores ani muscles. A line drawn across from one ischial tuberosity to the other, and passing immediately in front of the anus, would divide the space into two parts (see Fig. 3794), the anterior of which is called the urethral triangle or true perineum, and the posterior the anal or rectal triangle. The anterior triangle contains the bulb and urethra, with the muscles of the perineum proper; the posterior triangle has in it the rectum and the two ischio-rectal fossæ.

SURFACE ANATOMY.—In the undissected subject the superficial area of the perineum is very limited, especially when the thighs are brought together; it then consists of a narrow space or groove reaching from the coccyx behind to the symphysis pubis in front. In the centre of this groove is an elevation of the skin, called the median raphe, which runs from the front of the anus, over the scrotum, to the under surface of the penis. No vessels cross this line, and in this situation incisions may be made without any fear of hemorrhage. The osseous boundaries of the perineum may be easily made out through the skin; the great sacro-sciatic ligaments, however, being covered by the gluteal muscles, can be felt

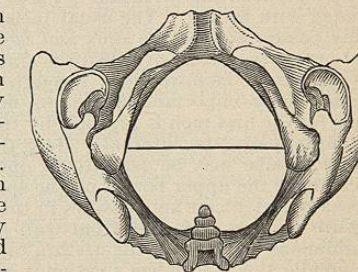


FIG. 3794.—Outlet of the Pelvis. Line dividing outlet into anterior or urethral triangle, and posterior or rectal triangle.

only by pressing in a line drawn from the coccyx to the ischial tuberosity. In thin subjects they can be more easily felt. The anus is situated at the midpoint between the tuberosities, and its centre is about one inch and a half from the end of the coccyx. The central point of the perineum is a little more than an inch in front of the anus; this point corresponds to the middle of the free border of the triangular ligament. A knife introduced here, and given a slightly upward direction, would reach the membranous urethra. Immediately in front of the central point may be felt, in all but very fat persons and children, the bulb of the urethra and the corpus spongiosum. Abscesses point, and urethral fistulae are often seen, in this region.

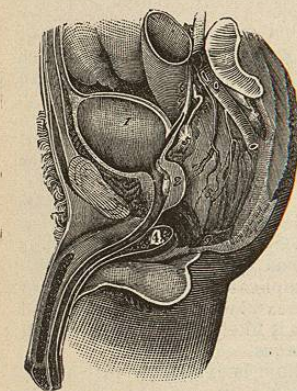


FIG. 3735.—1, Bladder; 2, prostate; 4, bulb; 5-6, seminal vesicles and vas deferens; 7, ureter; 8, rectum; 9, sphincter ani. (Roser.)

The membranous portion of the urethra perforates the triangular ligament one inch below the symphysis pubis, and one inch and a half in front of the anus. The skin of the perineum is thin and covered with hairs; about the anus it is of a brownish color and thrown into radiating wrinkles by the contraction of the external sphincter; these folds are much enlarged when the hemorrhoidal veins are swollen and inflamed. If the skin of the anus be everted, a fine white line is seen which marks the junction of the skin and mucous membrane, and corresponds exactly to the lower margin of the internal sphincter. There are a number of follicles about the margin of the anus, and small subcutaneous abscesses frequently occur in this situation. These must not be confounded with fistulae. The usual incision in lateral lithotomy passes between the anus and ischial tuberosity, a third nearer the tuberosity than the anus.

If the finger be introduced through the anus into the rectum, many important landmarks may be felt. The finger for the first inch is grasped by the sphincter muscles, principally the internal. Here the internal openings of fistulae may be felt; these openings are rarely much above the upper border of the sphincter ani. One can easily feel ulcers and fissures in this situation, when they are present. In the front wall of the bowel the membranous portion of the urethra can be made out in the middle line, and when a catheter is introduced into the bladder it can be easily felt as it passes through the membranous portion; with the finger in the rectum a catheter can be guided into the bladder in cases of enlarged prostate, and if the instrument enters a false passage it can be detected and directed into the proper channel. The prostate gland can be felt one inch and a half from the anus, and its condition ascertained if it be enlarged or inflamed. Passing beyond the prostate the finger comes on the trigone of the bladder. When the bladder is distended it may be made out through the rectum as a soft fluctuating tumor. It is more easily felt when the other hand, placed above the pubis, presses the apex downward. The bladder, when distended, may be tapped through the trigone with a curved trocar, without there being any danger of wounding the peritoneum, which generally reaches only to within four inches of the anus. In rare cases the peritoneum passes down between the gut and the trigone. In such cases, of course, in this operation, it would inevitably be wounded.

The vesiculæ seminales can rarely be felt, unless affected by disease. Stone in the bladder in children can often be diagnosed through the rectum. Above the trigone of the bladder transverse folds of mucous membrane in the rectum can be felt; these are soft and velvety when healthy, but when ulcerated or inflamed they feel thick and cause great pain on defecation. Many diseases are diagnosed by the finger in the rectum, viz., ulcers, polypi, hemorrhoids, stricture of the gut, diseases of the prostate, deep-seated abscess of the ischio-rectal fossa, pelvic tumors, etc.

With the whole hand introduced into the rectum the entire pelvis may be explored, as well as the lower part of the abdomen.

ISCHIO-RECTAL FOSSA.—The ischio-rectal fossa is the space which exists on each side between the rectum and ischial tuberosity. It is of a pyramidal shape, with the apex pointing upward to the pelvic cavity, and is from two to three inches in depth.

Boundaries.—Internally, the levator ani covered by the anal fascia; externally, the obturator internus muscle covered by the parietal layer of pelvic fascia; in front, the triangular ligament and transversus perinei muscle; behind, the lower edge of the gluteus maximus, the great sacro-sciatic ligament, and the coccygeus muscle.

The space is filled with fat, and crossing the fossa obliquely are the inferior hemorrhoidal vessels and nerves. The anterior portion is crossed by the perineal vessels and nerves, and entering the fossa at its posterior part is the perineal branch of the fourth sacral nerve.

The tuberosities of the ischia have also a cushion of fat over them, and when this is removed several bursae are seen. The apex of the space corresponds to the division of the pelvic fascia into parietal and visceral layers, or rather to the junction of the anal with the obturator fascia. When the anal fascia is removed the levator ani muscle is exposed, and internal to the levator ani is the visceral layer of pelvic fascia.

The lower end of the rectum is placed between the two fossae, slung, as it were, by the meeting of the two levatores ani muscles, and held in place by the external sphincter and recto-vesical fascia. The fibres of the levatores ani muscles at the lower end of the rectum are separated from one another, and in this situation the anal fascia is also very thin, so that little resistance is offered to the entrance of pus.

Ischio-rectal Abscess and Fistula in Ano.—Abscess in the ischio-rectal fossa is not an uncommon affection, and is often caused by the ulceration of foreign bodies, such as fish-bones, through the bowel into the fossa, and there setting up inflammation. Sitting on cold, damp seats after exercise is another, and perhaps the most common, cause of ischio-rectal abscess.

When pus forms in the fossa it presents at the points of least resistance, viz., the internal wall of the fossa and the skin at the base. When the abscess breaks through the skin it will be found that after a time a sinus remains, which generally communicates with the bowel; this sinus is called a *fistula in ano*. The internal opening of the fistula is usually within half an inch of the margin of the anus, as at this point pus can more easily penetrate the rectum, because of the thinness of the fascia and the scantiness of the muscular fibres. The external opening may be anywhere in the region of the posterior part of the perineum. To prevent the formation of a fistula, the ischio-rectal abscess should be opened early and freely.

PERINEAL FASCIAE.—The superficial fascia of the perineum consists of two layers, between which, in the rectal triangle, is a large amount of fat; in the urethral triangle there is less, and as the fascia reaches the scrotum the fat is replaced by the muscle or dartos tissue of that structure. The deep layer of fascia (fascia of Colles) is limited to the urethral triangle; it is attached to the base of the triangular ligament, to the anterior lips of the rami of the pubes and ischia laterally, and anteriorly it is continuous with the fascia of the scrotum. By its junction with the triangular ligament posteriorly it forms a pouch, which is divided into two portions by a median septum.

This pouch has an important influence on the direction which urine takes when extravasated, or pus when it

forms, in this region. Owing to the attachment of the superficial fascia to the base of the triangular ligament and to the rami of the pubes and ischia, fluid cannot go back toward the anus or down the thighs, but, as the fascia is continuous anteriorly with the dartos of the scrotum, no resistance is offered to its progress forward and upward over the scrotum to the abdomen.

This is the course taken by urine when extravasated in front of the triangular ligament. When an abscess forms in the perineum, owing to the median septum, it is usually confined to one side of this pouch, and the swelling is triangular in shape. The pus, as it passes forward, on account of the deficiency of the septum in front, fills both sides of the pouch.

The anterior perineal pouch contains the superficial perineal muscles, vessels, nerves, and the root of the penis, which latter is made up of the two crura of the cavernous portions and the bulb of the spongy portion.

Muscles.—The muscles of the perineum bound the perineal triangle, in which the knife is entered in the operation of lateral lithotomy. The base of the triangle is formed by the transversus perinei muscle, the outer side by the ischio-cavernosus (erector penis) muscle, and the inner side by the bulbo-cavernosus (accelerator urine); the triangular ligament forms the floor of the triangle.

The point of meeting of the two transverse perineal muscles, the sphincter ani, and bulbo-cavernosus muscles is called the tendinous or central point of the perineum. Along the lower border of the transverse muscles is seen the transverse artery, a branch of the internal pudic.

Triangular Ligament.—This ligament divides the perineum into two portions—a deep and a superficial. It has very definite attachments to the subpubic ligament, the rami of the pubis and ischia, and the superficial fascia. It also blends with the central tendinous point

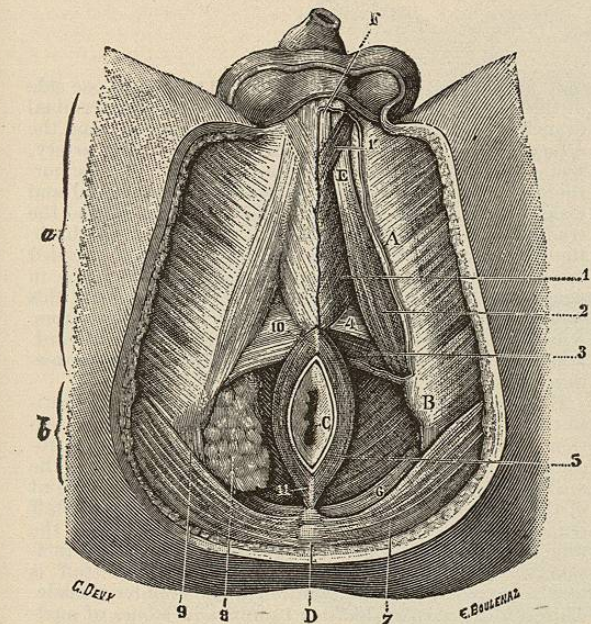


FIG. 3736.—Superficial Dissection of the Muscles of the Perineum. 1, Bulbo-cavernosus muscle; 2, ischio-cavernosus; 3, transversus perinei; 4, triangular ligament; 5, sphincter ani; 6, coccygeus; 7, great gluteus muscle; 8, cellular fatty tissue of the ischio-rectal fossa; 9, sacro-sciatic ligament; A, ischio-pubic ramus; B, ischium; C, anus; D, coccyx; E, cavernous body.

of the perineum. As suggested by Prof. D. J. Cunningham, of Dublin, it is better to regard this ligament as a

* This structure is sometimes named the anterior layer of the triangular ligament, the posterior layer being the parietal layer of pelvic fascia. It is also called the deep layer of the deep perineal fascia and the subpubic fascia.

distinct membrane, and to class it in the same category as the obturator membrane; for "it lies in the same morphological plane as the bony and ligamentous wall of the

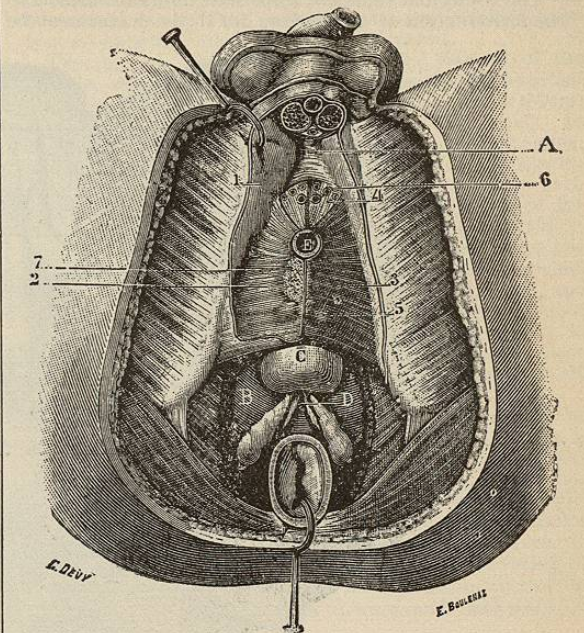


FIG. 3737.—The Muscles of the Perineum. Deep Dissection. A, Symphysis pubis; B, bladder; C, prostate; D, seminal vesicle; E, urethra cut transversely; 1, triangular ligament; 3, deep transverse perinei muscle; 5, Cowper's glands; 6, subpubic plexus of veins.

pelvis," and it completes the pelvic wall in front in the same manner as the thyroid membrane closes the thyroid foramen.

When the body is erect the lower surface of the triangular ligament looks downward and forward, and the deep surface upward and backward.

Structures in Relation with the Triangular Ligament.—In front are the structures named above as being contained in the perineal pouch.

The ligament is pierced by the urethra, and also by the dorsal vein and nerves of the penis and the internal pudic arteries. The urethra pierces the ligament one inch below the symphysis pubis, in the middle line. The parietal layer of pelvic fascia (posterior layer of the triangular ligament) is above and behind, and is attached to the ligament below, but as it proceeds upward the space between them widens. Between these two structures are the membranous portion of the urethra, the pudic vessels and nerves, with the artery of the bulb, the dorsal vein of the penis, the compressor urethrae muscle, which surrounds the membranous urethra, and Cowper's glands. These latter empty their secretion into the bulbous portion of the urethra; in inflammatory conditions of the urethra they may become inflamed and suppurate; they are the homologues of Bartholin's glands in the female.

The membranous portion is the least dilatable portion of the urethra, and is frequently the seat of *traumatic* strictures; it measures three-fourths of an inch in length.

Behind and above the pelvic fascia (posterior layer of the triangular ligament) is the apex of the prostate gland, covered by the levator ani muscle and by its own capsule. From this description it will be seen that the triangular ligament divides the perineum into two compartments, a superficial and a deep; the superficial contains the perineal muscles and root of the penis; the deep the membranous portion of the urethra, the pudic artery and nerves, the dorsal vein of the penis, the compressor urethrae muscle, and Cowper's glands. The base of the triangular ligament is the meeting-point of three fasciae,

viz.: (1) perineal fascia; (2) triangular ligament; and (3) the parietal layer of the pelvic fascia (posterior layer of the triangular ligament).

The triangular ligament sometimes offers an obstacle to the introduction of a catheter; for if the instrument be

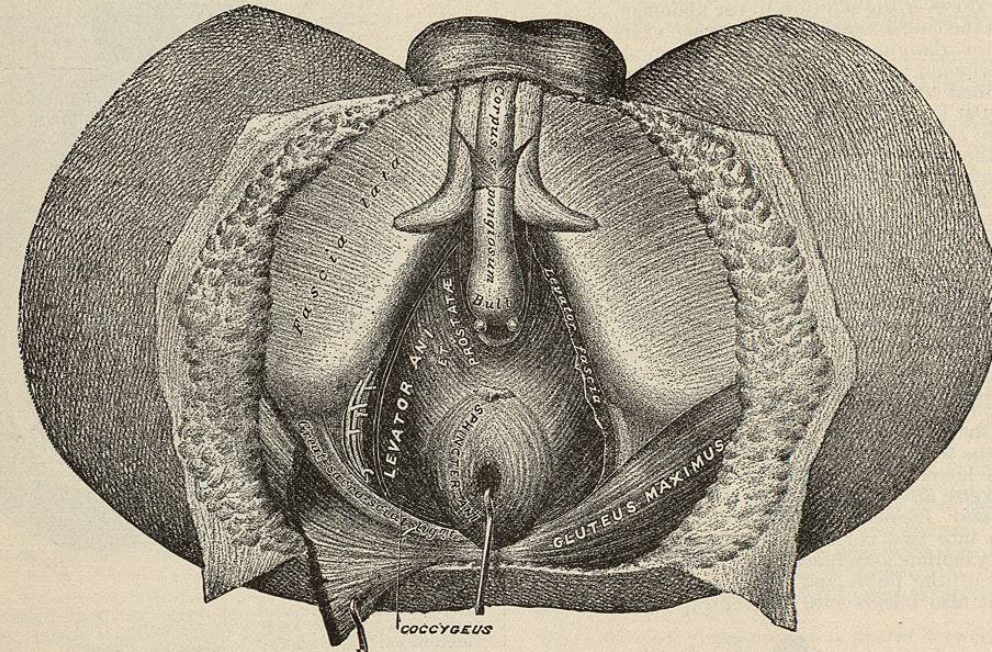


FIG. 3798.

not kept against the upper wall of the urethra, it is apt to sag in the lower wall, which is very distensible, and reach the triangular ligament below the opening of the membranous urethra. After the triangular ligament has been successfully passed, the point of the instrument may be arrested in the membranous urethra by the spasmodic contraction of the compressor urethrae muscle which encircles it; this obstruction may be overcome, without exercising any force, by merely keeping the end of the instrument pressed gently against the obstructing point; after a short time the muscle relaxes and the instrument slips into the bladder.

Kicks in the perineum, or injuries from falling astraddle of anything, may rupture the membranous portion of the urethra, and in these cases blood and urine will be extravasated between the triangular ligament and the parietal layer of the pelvic fascia (posterior layer of the triangular ligament). Should the injury tear the triangular ligament, then the extravasated fluid would take the ordinary course upward over the scrotum and abdomen. When extravasation has occurred, free incisions should be made in the perineum, and if the urethra be completely torn across, the perineum should be opened in the middle line and an instrument introduced into the bladder.

Professor Cunningham, of Dublin, has pointed out, in his "Dissector's Guide," that in removing the various structures from the surface to the prostate gland, alternate layers of fascia and muscle are met with, viz.: (1) superficial fascia; (2) superficial perineal muscles; (3) triangular ligament; (4) compressor urethrae muscle; (5) parietal layer of pelvic fascia, or posterior layer of the triangular ligament; (6) levator ani muscle; (7) capsule of the prostate and pubo-prostatic ligament.

Internal Pudic Artery.—The pudic artery is seen in the rectal triangle, enclosed within a sheath of pelvic fascia formed by the splitting of the obturator fascia. It lies about one and a half inches above the level of the ischial tuberosity and is accompanied by the pudic nerve and

the two pudic veins; proceeding forward, it passes between the triangular ligament and the parietal layer of pelvic fascia (posterior layer of the triangular ligament), and then, running under cover of the rami of the pubis and ischium, pierces the triangular ligament from behind,

half an inch below the symphysis and a little to one side of the middle line. It then divides into its two terminal branches, the artery to the corpus cavernosum, and the artery to the dorsum of the penis. The pudic artery, while in the ischio-rectal fossa, gives off the hemorrhoidal, and a little further forward the superficial and transverse perineal arteries. While passing behind the triangular ligament, it gives off the artery of the bulb, the wounding of which was formerly so much dreaded by surgeons. The pudic artery itself is said to be in danger of being wounded in lateral lithotomy, but this accident could occur only to the most careless operators, when withdrawing the knife and sweeping it outward. It is possible to wound it only after it has left the protection of the pubic arch.

EXPLORATION OF THE BLADDER THROUGH THE PERINEUM.—This operation is little more than a perineal section. According to Sir Henry Thompson, after introducing a grooved staff an incision should be made in the median line, commencing three-fourths of an inch in front of the anus, and the parts should be divided till the staff is reached in the membranous portion of the urethra; the finger is introduced into the bladder through this incision, the prostatic urethra dilating easily; the staff is now removed and the exploration of the bladder is made. Through this median incision tumors and stones of moderate size can be removed. There is little hemorrhage, even should the bulb be wounded, for this latter structure is not very vascular in the median line.

Parts Divided in Lateral Lithotomy.—The incision is commenced one inch and a half in front of the anus, and is carried downward and outward to a point between the anus and great tuberosity, a little nearer the tuberosity than the anus.* In order to reach the staff in the membranous urethra the following structures must be cut:

In the first incision: Skin and superficial fascia; trans-

*The incision employed in lateral lithotomy falls about in a line parallel with the ascending ramus of the pubis and the ischio-cavernosus muscle. (Roser.)

verse perineal muscle and artery; base of the triangular ligament; the hemorrhoidal vessels and nerves.

Second incision: The knife is now guided by the forefinger, passed up behind the triangular ligament, its point placed in the groove of the staff, and the blade is lateralized and pushed along the groove into the bladder. In this incision the following parts are divided, viz.: Membranous portion of the urethra and compressor urethrae muscle; parietal layer of pelvic fascia (posterior layer of the triangular ligament); anterior fibres of the levator ani and left lobe of the prostate.

Parts to be Avoided.—(1) Artery of the bulb, (2) rectum, (3) pudic artery.

(1) The danger from a wound of the artery of the bulb is not great, and is somewhat traditional; with the modern methods of arresting hemorrhages no one need fear wounding the artery of the bulb. Very frequently it is abnormal in its distribution, and its division cannot be avoided.

(2) The rectum may be cut, especially in children, if the bowel is not emptied previous to operation, or if the incision be carried down too vertically.

(3) The pudic artery need never be wounded in a properly performed operation. It can be cut only by lateralizing the knife too much in withdrawing it. If wounded, it may be secured with the modern artery forceps without great difficulty.

In the withdrawal of the knife a too vertical incision may cut through the prostate, and so divide the visceral layer of pelvic fascia. Should this accident happen, no ill results will follow if the wound be kept sweet and be thoroughly drained. Wounding of the visceral layer of the pelvic fascia is a danger much dwelt on by the older lithotomists, and surgeons of the present day still have a

when enlarged can be removed through a perineal incision either transverse or vertical. Also the seminal vesicles can be reached through the same route. When affected with tuberculous disease it is sometimes necessary to remove them. The ureter as it enters the bladder can be reached through the perineum, and stones which have become lodged there successfully extracted.

TESTICLE IN PERINEUM.—During the descent of the testicle, and after it has passed through the external abdominal ring, it may, instead of entering the scrotum, pass down into the perineum (ectopia perinealis). In these cases it may be felt slightly movable under the skin, about an inch and a half in front of the anus. The scrotum of the side in which the testicle is lodged in the perineum is deficient if the affection be congenital; if the case is of traumatic origin the scrotum of that side is present. The displacement has no evil effect on the testicle, which is always of a good size. The abnormal position of the testicle renders it liable to injury, and patients apply to the surgeon for relief. An operation has been devised for restoring the misplaced testicle to its proper position in the scrotum, but its success has been only moderate. Excision is sometimes demanded to rid the patient of his trouble.

II. THE FEMALE PERINEUM.—The space occupied by the female perineum, owing to the wider pubic arch, is somewhat larger than that of the male. It differs from the male perineum in being perforated in the median line by the vulvo-vaginal opening. This opening occupies the place in the female which in the male is the situation of the bulb. In the female this bulb is, as it were, divided into two halves, as is also the muscle covering it. The space between the divided bulb is the opening of the vagina. The vagina extends upward and backward be-

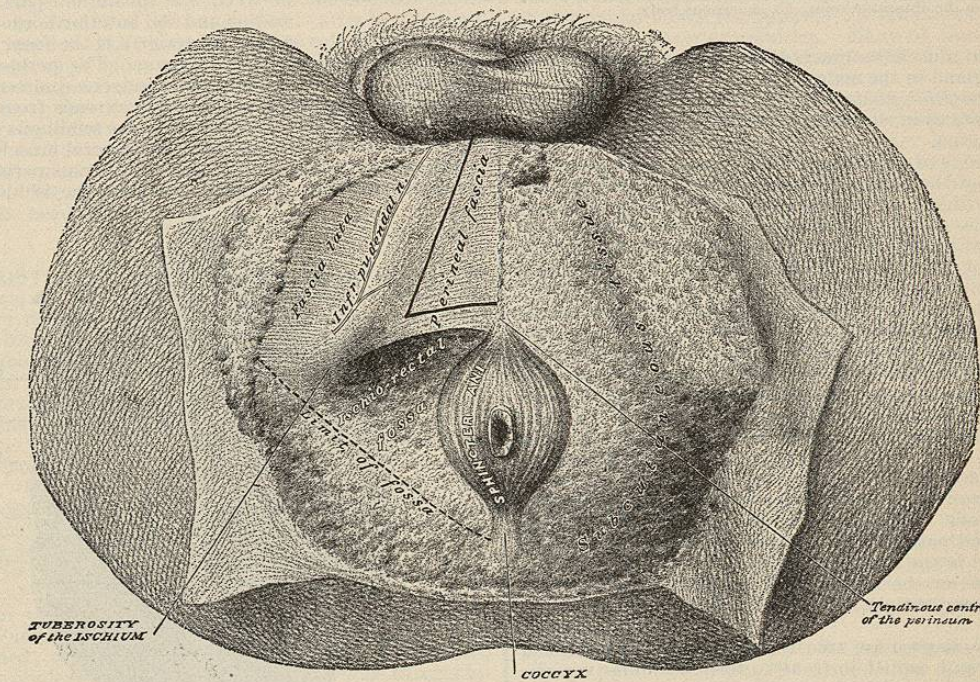


FIG. 3799.

traditional fear of this accident happening. In children, lateral lithotomy can scarcely be performed without cutting through the prostate gland, and at the same time the visceral layer of pelvic fascia; yet no ill results follow; on the contrary, the operation is safer in children than in adults. The real danger in adults is not from wounding the pelvic fascia, but from wounding the prostatic plexus of veins and the ejaculatory ducts. The prostate gland

between the bladder and rectum, its upper part being covered by peritoneum, and thus it is in close relation with the peritoneal cavity.

The triangular ligament is also divided into two halves, and on this divided ligament rests the divided bulb, the vagina passing between. So we have a bulb which is called the "vestibular bulb" on each side of the vagina, and these bulbs are joined above by a small plexus of

vessels called the "pars intermedia." The bulbs are covered by the sphincter vaginae muscle (bulbo-cavernosus). This is the homologue of the fused *bulbo-cavernosus* muscle in the male. We also see the anterior fibres of the

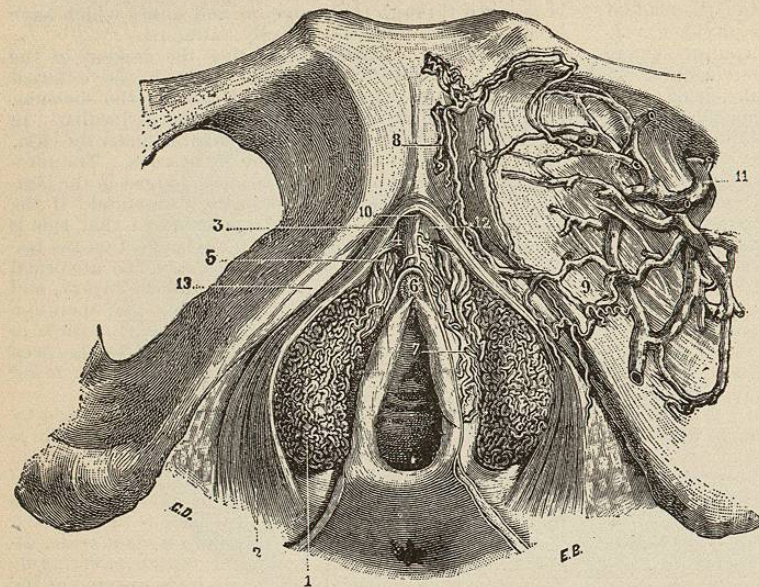


Fig. 3800.—The Bulb of the Vagina with the Venous System of the Clitoris, Viewed from in front. (After Kobelt.) 1, Bulb; 2, constrictor muscle; 6, glands of clitoris; 9, communication with the obturator veins; 13, cavernous body.

levator ani muscle embracing the vagina as they do the prostate gland in the male.

The *superficial fascia* and *Colles' fascia* have the same attachments as in the male, but differ in being perforated by the vagina.

The glands of Bartholin and Duverney are situated on each side of the commencement of the vagina behind the triangular ligament, and correspond to Cowper's glands in the male. Their ducts open on each side between the hymen and labium minus. It is not uncommon to have abscesses connected with these glands, to cure which they have to be dissected out.

The *clitoris* and *nymphæ* correspond to the penis in the male. The clitoris is composed of two corpora cavernosa and a rudimentary glans. It is much smaller than the penis, and is not perforated by the urethra. The corpora cavernosa are attached to the inner side of the pubic arch in front of the triangular ligament, and, as in the male, are covered by a muscle, the ischio-cavernosus (erector clitoridis). The glans is surrounded by a membranous fold, which is the homologue of the prepuce in the male.

The *vulvar cleft* opens on the surface between the two labia majora; anteriorly opening into this cleft is the urethra, and posteriorly is a recess called the fossa navicularis, and in the centre is the vagina. The space anteriorly between the clitoris and the urethra is called the vestibule, and this is bounded on each side by a labium minus.

The *labia majora* are two thick folds of skin covered with hair and united in front to form the mons veneris. In each labium are blood-vessels and dartous tissue as in the scrotum of the male, of which they are the homologue. The vestibule corresponds to the lower prostatic and membranous portion of the urethra in the male.

On separating the labia majora the nymphæ or labia minora are seen. These are folds of skin which are continuous above with the prepuce of the clitoris and below join the *labia majora* about the centre. As a rule they do not project beyond the labia majora, but in the dark races they are of larger size and project considerably be-

yond the vulvar cleft. In old age they are also more prominent.

The *hymen* is a thin fold of mucous membrane of vari- partially occludes the vaginal orifice; in some cases the vaginal orifice is completely closed, and then we have what is called an *imperforate hymen*. Occasionally the hymen is absent or has been destroyed by inflammatory action in childhood. Its presence is not necessarily a proof of virginity nor is its absence significant of the loss of the same. When the hymen has been ruptured, and in women who have borne children, the remnants are seen as small rounded elevations called "carunculæ myrtiformes."

The vessels and nerves of the female perineum do not differ essentially from those of the male; the pudic artery is smaller, while the superficial perineal artery going to the labia is larger. Owing to the small size of the clitoris as compared with the penis, the nerves and blood-vessels supplying it are much smaller.

The *Perineal Body*, or the so-called perineum of the obstetrician, fills in the space between the vagina and the rectum; in section it is triangular in shape, with the base of the triangle downward, corresponding to the skin between the posterior part of the vagina and the anterior border of the anus. Anteriorly is the fossa navicularis, and posteriorly is the rectum. The perineal body measures at its base about one and one-quarter inches from before backward, and laterally extends from one tuberosity to the other; in this space is the tendinous point of the perineum, to which are attached several muscles, such as the levator ani, sphincter ani, transversus perinei, and sphincter vaginae. Laterally we have the ischio-caver-

laris, and posteriorly is the rectum. The perineal body measures at its base about one and one-quarter inches from before backward, and laterally extends from one tuberosity to the other; in this space is the tendinous point of the perineum, to which are attached several muscles, such as the levator ani, sphincter ani, transversus perinei, and sphincter vaginae. Laterally we have the ischio-caver-

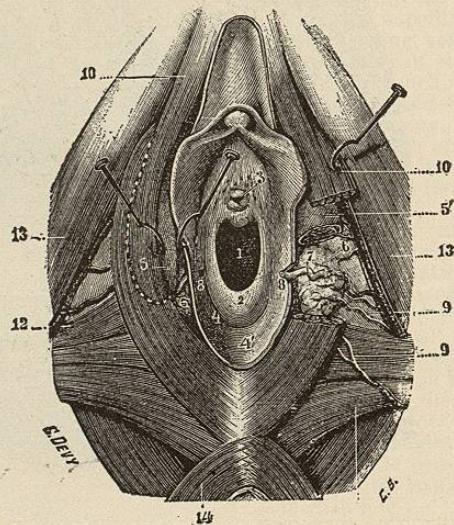


Fig. 3801.—Dissection of the Vulvo-vaginal Orifice with the Glands of Bartholin. 1, Orifice of vagina; 2, hymen; 3, meatus urinarius; 4, navicular fossa; 5, bulb of vagina; 6, vulvo-vaginal or Bartholin's glands; 7, 8, duct with opening cut through orifice of vagina; 10, constrictor vaginae partly resected on left side to show the glands of Bartholin; 11, transversus perinei muscle.

nosi muscles. Running across the perineal body we have a transverse septum which, in the female, is very strong and consists of connective tissue, yellow elastic tissue,

and involuntary muscular fibres; it can be felt as a hard body when examined through the posterior commissure of the vagina. The "perineum" is a highly distensible body, as is well seen in childbirth, when it is almost obliterated. Above the perineal body the vaginal and rectal walls are in apposition, loosely connected with areolar tissue. This so-called perineum is frequently torn in first labors, and if the rent be not sewed up immediately so as to enable union by first intention to take place, the vaginal orifice will be much enlarged and the support of the perineal body be lost. Occasionally these rents extend into the rectum, and a very miserable condition results, there being partial or complete incontinence of feces. Operations undertaken for the repair of this condition are most successful even when of old standing. It is, however, much better to repair the rent as soon as possible after its occurrence.

Tearing of the perineum with general relaxation of the pelvic floor and increase in the intra-abdominal pressure predispose to prolapse of the uterus. This condition is rarely seen in the nullipara or in well-to-do multipara. It is the hard-working woman, who gets up to work too soon after childbirth, in whom this condition is most frequently seen.

Francis J. Shepherd.

PERIOSTEUM, ACTINOMYCOSIS OF.—Actinomycosis is rarely primary in the periosteum; but the periosteum is not infrequently involved by direct extension from actinomycotic processes in neighboring structures. In primary actinomycosis of the mouth the periosteum of the jawbone is first involved, later the bone; in actinomycosis of the lungs the process may extend to the pleura and thence to the periosteum of the ribs and vertebrae. In these cases of secondary extension there occurs first an *actinomycotic periostitis* with formation of granulation tissue. As a result of this a superficial caries is produced and the interior of the bone becomes involved. Here the process develops more rapidly, the bone becomes filled with granulation tissue, and expands into a honeycombed shell. Over this the periosteum may develop irregular masses or spicules of bone or thick layers of fibrous tissue. The microscopic picture is that of a strong reactive inflammation; numerous mast and plasma cells are present. The clinical and diagnostic features are given under the head of *Actinomycosis*.

Aldred Scott Warthin.

PERIOSTEUM, TUBERCULOSIS OF.—Primary tuberculosis of the periosteum is regarded by most writers as a very rare condition; but it probably is of not infrequent occurrence. Though the majority of cases of primary tuberculosis of the bones are of myelogenous origin, there can be little doubt that numerous cases begin as a *tuberculous periostitis (periostitis tuberculosa)*. The process begins with the formation of a granulation tissue beneath the inner layer of the periosteum. This shows little tendency to caseate, but on the other hand becomes ossified. Small tubercles are found in the early stages, but the process shows a great tendency to self-healing through the formation of bone (ossifying periostitis). As a result of such healing, exostoses or hyperostoses are formed. The writer believes that many of the so-called inflammatory local hyperplasias of bone are tuberculous in origin. In other cases the process may break through the periosteum and a tuberculous sinus or a "cold abscess" may be formed; or in some cases the bone becomes involved, and the clinical picture becomes that of a bone tuberculosis. Superficial caries may follow, either with or without the formation of deep foci. As in the case of gummatous periostitis, pseudo-cysts may be formed by the liquefaction of encapsulated caseous areas. The cyst wall may be bony. Secondary tuberculosis of the periosteum is very common in connection with bone or joint tuberculosis.

Aldred Scott Warthin.

PERIOSTEUM, TUMORS OF.—The primary tumors of the periosteum belong wholly to the connective-tissue growths. They are both benign and malignant; the

former, usually arising from the inner osteogenetic layer of the periosteum, are covered by its outer fibrous layer; the latter break through the fibrous layer and invade the neighboring tissues. Occasionally both benign and malignant forms may arise from the outer layer.

Benign Growths.—The *osteoma* is the most common benign growth of the periosteum, occurring usually as a circumscribed bony growth, termed an exostosis. The periosteal osteomata are classed by some writers under the general term *osteophyte*; but by others the latter term is used to indicate a very small bony growth of the periosteum. Larger, more diffuse periosteal osteomata are known as *hyperostoses*. A *circumscribed hyperostosis* differs from an exostosis in being less circumscribed and more superficial. According to their structure the periosteal osteomata may be classed as: *exostosis eburnea*, composed of hard compact bone without marrow spaces; *exostosis spongiosa*, composed of spongy bone about equally made up of bone tissue and marrow spaces; and *exostosis medullaris*, containing very large marrow spaces. The marrow in the exostoses presents the same general appearance as the bone marrow proper. According to histogenesis the periosteal exostoses may be divided into two classes: those arising from the connective-tissue of the periosteum (*exostosis fibrosa*), and those of cartilaginous origin (*exostosis cartilaginea*). The former may arise either from the inner or from the outer layer of the periosteum; in the first case they are immovable (*immovable periosteal exostosis*), in the latter they are movable (*movable periosteal exostosis*). The cartilaginous exostoses may arise from a proliferation of the periost-perichondrium, usually from the epiphyseal cartilages. They occur most frequently in young children and are usually multiple. In other cases cartilage may first form from the periosteum, and this may later develop into bone. Exostoses are found most frequently on the cranial bones, the bones of the trunk, and the long bones of the lower extremities. Many of them are not neoplasms strictly, but are hyperplasias of inflammatory origin.

Chondroma of the periosteum is of less frequent occurrence. It may develop from the inner layer (*immovable periosteal chondroma*) or from the outer layer (*movable periosteal chondroma*). The cartilage may be formed from pre-existing cartilage (*epiphyseal*), or from connective tissue, or from embryonic inclusions of cartilage (*Anlage*). They occur most frequently upon the short bones of the extremities, the shoulder blades, the ribs, and the femur. They are very likely to undergo secondary changes: myxomatous degeneration, calcification, etc. They show a marked tendency toward malignancy. *Osteochondroma* of the periosteum sometimes occurs; and there is also a peculiar growth, the *osteoid chondroma*, which may reach an enormous size. It is found chiefly on the long bones of young individuals and shows a tendency to become malignant. The surface of the growth is usually smooth, the cut surface partly hyaline and transparent, partly lamellated and reticular.

Fibroma of the periosteum is rare. It occurs most frequently in the periosteum of the bones of the mouth and nose (fibroid epulis and fibroid polyps). Through excessive development of blood-vessels the growth may assume the character of a telangiectatic fibroma. It is also very likely to become calcified (*fibroma ossificans*) or to undergo myxomatous change. Malignant changes may develop.

Myxomata arise rarely from the periosteum. They are seldom pure myxomata, but present the appearance of myxochondroma, myxofibroma, myxosarcoma, etc. They form round or oval masses covered on the outside by a dense layer of fibrous tissue.

Lipomata of the periosteum are known as parosteal lipomata. They are very rare, and are nearly always congenital. They usually contain areas of striped muscle fibres. The exact nature of these growths is not yet known. They have been reported as occurring on the anterior surface of the cervical vertebrae, body of the pubis, frontal bone, scapula, etc.

Angiomata of the periosteum are very rare. They