

FIG. 67.—MULTIPLE SARCOMA OF THE SKIN, PARTLY PIGMENTED AND TELANGIECTATIC (Camera lucida?); *lysp*, vascular fissures of the tumor into which the sarcomatous mass proliferates; *v*, small vein surrounded by lymph-spaces containing partly endothelia, partly pale red blood-corpuscles, partly pigment; the lymph-spaces are surrounded by proliferated cells containing here and there some pigment; *s*, sarcoma tissue.

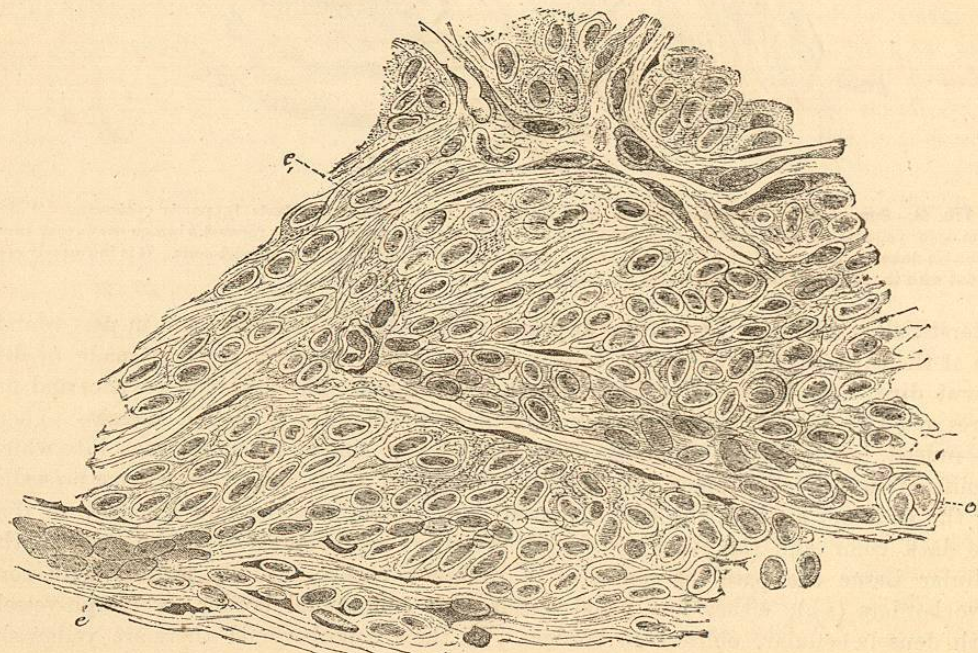


FIG. 68.—PRIMARY ENDOTHELIAL SARCOMA OF THE INTROITUS VAGINÆ.

On treatment with osmic acid, there is made apparent in the tumor a fine, dense, round-meshed network which forms alveoli, on the walls of which are deposited, similar

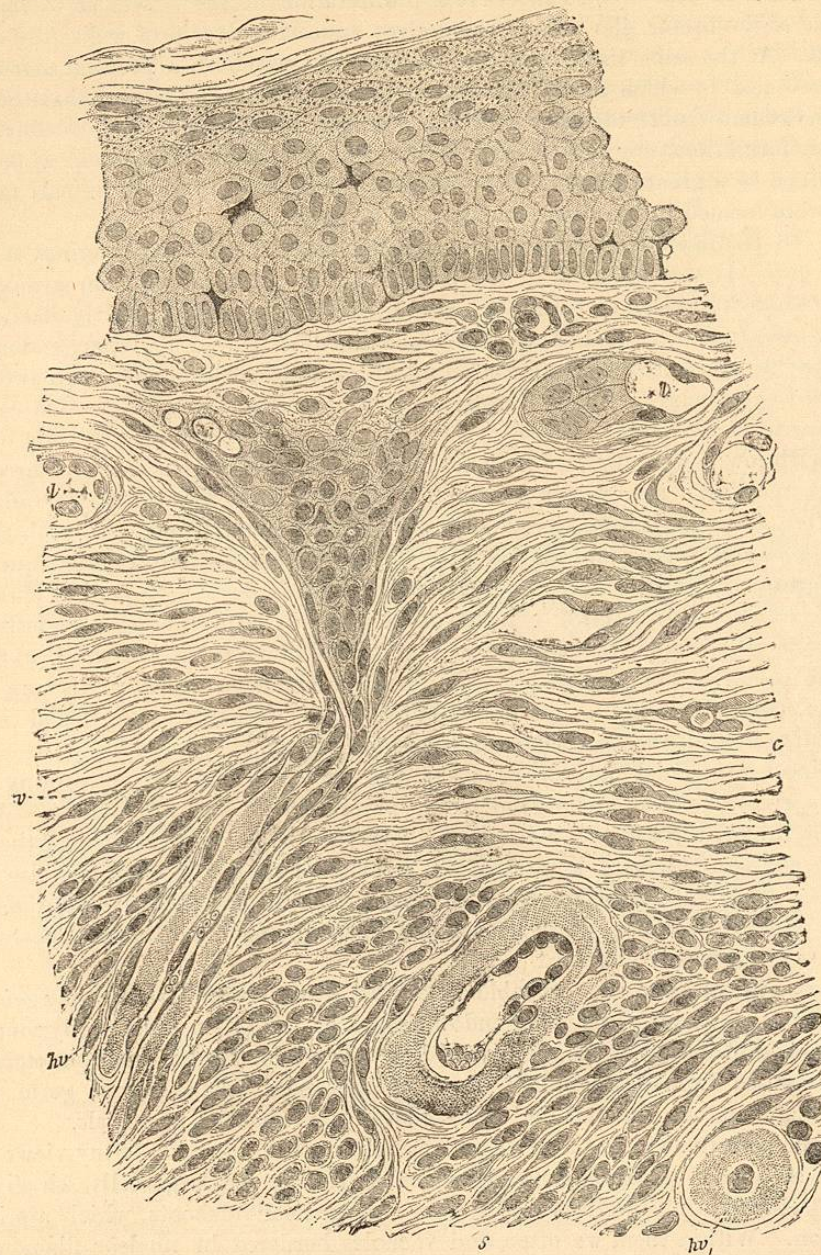


FIG. 69.—PRIMARY ENDOTHELIOMA OF THE VAGINA, WHICH RELAPSED AS A SPINDLE-CELLED SARCOMA: *e*, atrophic epidermis containing migratory cells; *v*, vein; *hv*, hyaline wall of a vessel entering the tumor; *h v*, a vessel entirely compressed by hyaline degeneration of its wall (become "cylindromatous"); *c*, cutis, in its upper layers dilated lymph-spaces, in the depth tendon-like tissue running parallel with the surface and containing numerous cells. Then follows the spindle-celled sarcoma

to endothelium, seemingly fusiform elements. By this treatment, the red blood-cor-

puscles infiltrated into the tissue appear still more numerous, while with other methods they partly melt down and stain the tissue a diffuse yellowish color. Here, then, we have to deal with so excessive a proliferation of the vessels as to form almost the whole of the tumor, the vessels themselves appearing devoid of walls, and as fissures and cups. At the same time, by a certain mode of treatment, a peculiar alveolar structure is revealed in which the spindle-cells act as endothelia. The fact that this alveolar structure became visible together with the youngest blood-corpuscles probably indicates that both formations are similar in quality. The formation of pigment is probably to be explained to a great extent by the escape of red blood-corpuscles, in part perhaps by such as were formed in the tissue and aborted or perished.

Fig. 68 is drawn from a tumor extirpated from the introitus vaginae of a three-year-old girl. It was situated in the depth of the cutis, larger than a walnut, egg-shaped, freely movable and could be enucleated; it was whitish, softly elastic, almost homogeneously smooth. When carefully examined it proved to be an endothelioma. The entire tumor consists of anastomosing, thin-walled vessels filled with swollen and proliferated endothelia; the vessels appear partly compressed into obliterated cords containing fusiform elements. Between them lie also a few narrow fixed cells of darker color. With low powers the tumor makes the impression of a spindle-celled sarcoma.

Three years after the operation a slightly larger tumor appeared at the same place; it was softer, more lardaceous, irregularly fissured, intimately connected with the skin, and had here and there some shallow ulcers. Microscopically it presented quite a different picture: Fig. 69. The skin over it is thinned, devoid of papillae; under the epidermis are unusually dilated lymph spaces lined with proliferating endothelia and sparse capillaries; there extended up to the epidermis vascular ramifications (*v*) originating in the tumor, accompanied by large fusiform elements which partly ran parallel with them, partly bent off in the direction of the cutis elements. Perithelial cell material is accumulated in the delta between the ramifications.

The most superficial cutis layer is changed to a tendinous tissue running parallel with the surface, but rich in large elements provided with bushy processes. Where it borders the tumor, these elements bend off along the vessels into the mass of the tumor. The latter consists chiefly of large fusiform elements arranged in cords, or else bordering canals. The blood-vessels are sparse and, excepting the swollen endothelia, have suffered a peculiar hyaline (cylindromatous) change, whereby their lumen appears greatly narrowed (*h v*), or even obliterated (*h v'*).

This case permits the very probable conclusion that the spindle-cells may genetically represent an atypical development of endothelia which have been unilaterally compressed especially by proliferation of the vascular rudiments and deprived of their characteristics, or were prevented from developing these altogether, so that the tumor germ, though essentially angiomatous, did not find expression in the formation of vessels.

I may be permitted to add a few brief remarks in substantiation of my views on cell division in sarcomas. 1. In myxo-sarcomas, it is mainly the large cells, which I consider as vessel-forming, as well as very similar enlarged cell-offshoots, which are in indirect division. Within them we often find vacuoles bordered by nuclear filaments. 2. In perithelial (alveolar angio-sarcoma) sarcomas, it is mainly the large cells situated in the centre of the alveoli which are in process of division. 3. When an endothelial wart develops into sarcoma, the endothelioid cells nearest to the spindle-cell tissue show numerous processes of division. 4. In ordinary spindle-celled sarcomas these processes are sparse and affect spindle-cells whose offshoots are connected with young vessels.

The condition mentioned under 3, as well as the manner of embryonal vascularization in endothelioid tissue (probably of lymphatic nature) is shown by an almost gelatinous tumor extirpated from the back and represented in Fig. 70. It consists of sharply demarcated, connected, racemose lobes (*e*) which gave the surface a coarsely granular appearance, and of scanty, superficially granulating interstitial tissue (*i*). The lobes consist of endothelioid cells, usually arranged radially into solid or hollow columns, between which enter thin-walled capillaries and solid delicate cords springing from the interstitial tissue (*i*). Where they enter, they are accompanied for some distance by rows of the

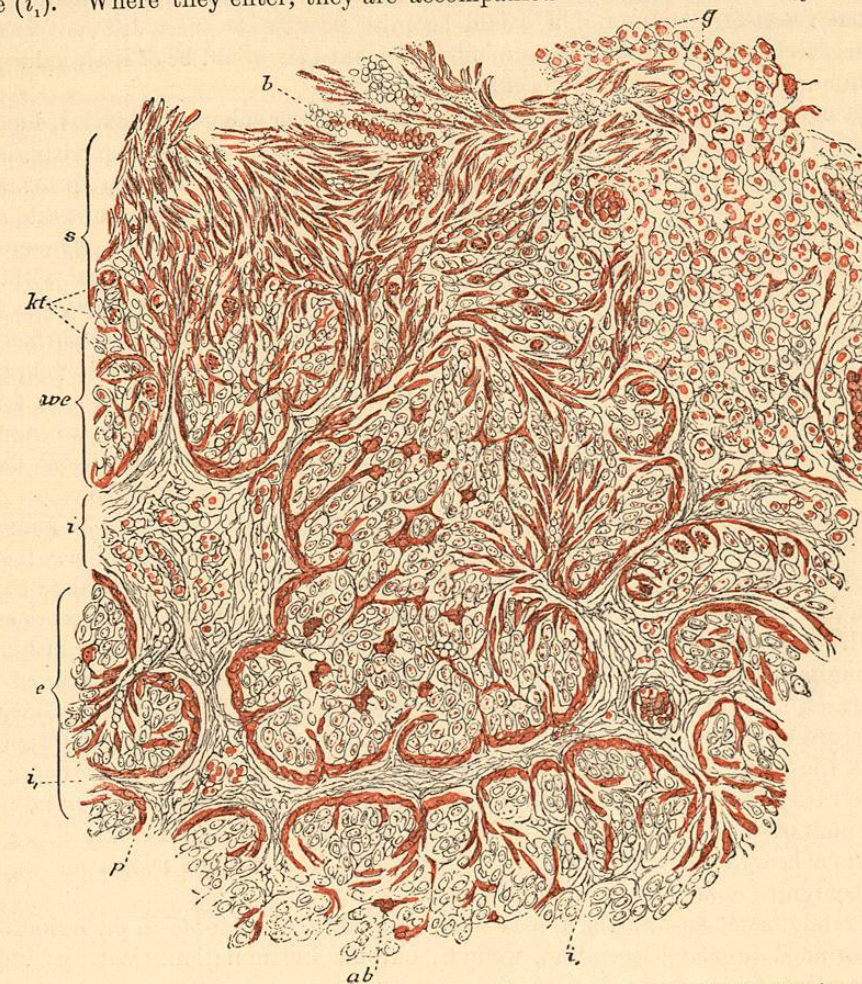


FIG. 70.—SARCOMATOUS PROLIFERATION OF AN ENDOTHELIAL WART: *g*, granulation tissue of the surface; *b*, superficial blood-vessel bordered by sarcoma tissue; *s*, zone of sarcoma formation by indirect division of endothelial elements; *kt*, figures of nuclear divisions; *we*, endothelial tissue; *i*, interstitial connective tissue; *e*, penetration of vascular offshoots into the endothelial masses; *ab*, hyaline vascular islets.

most superficial, youngest, spindle-cell layer of the lobes. In the direction of the cords with branches at right angles, but without demonstrable connection with them, there occur equally stained (safranin), isolated cells which often exhibit vacuoles (*ab*). Near the proliferating surface of the tumor, the endothelioid cells show numerous processes of nuclear division (*kt*), and between them occur in ever denser masses deeply stained spindle-cells (*s*) which at the surface fill the entire lobes and immediately border branch-

ing columns of red blood-corpuscles (*b*). This sarcoma tissue alternates here and there with granulation tissue (*g*).

In this case, as well as in that mentioned at the beginning of this chapter, we can follow the process of sarcoma formation; we recognize in the arrangement of the fusiform embryonal elements, in the continuation of the vessel-buds, the tendency to the formation of portions of new vessels, but which is again made nugatory by cellular individualization and proliferation of the buds.

In numerous other cases, a perithelial proliferation forms the atypical feature of the embryonal vessel-formation, and it would be quite possible to erect different species of cutaneous sarcomata in the directions mentioned; but this would be of little value owing to the numerous transitions which occur.

Most cutaneous sarcomas are at first isolated, and form spherical, gnarled, lobulated tumors deep in the cutis, more rarely springing from the papillæ. Subsequently, smaller nodules not rarely form in the surroundings. In the beginning, the deep forms are not adherent to the epidermis; later they become immovably adherent, may ulcerate superficially, and then undergo fungous proliferation. Usually they are but loosely connected with the surroundings, easily enucleated, encapsulated; not rarely the tumor within the capsule is here and there free, invested with a serous membrane, and even within it are found smaller nodules partly isolated by cup-shaped fissures. On the cut surface, sarcomas are homogeneous or striped, white, sometimes translucent, at times also gelatinous, here and there infiltrated yellowish or greenish, reddish or brownish to black, fissured radially or in lamellæ. They sometimes develop, mainly by central growth, to enormous size. They are frequently congenital, not rarely formed in early youth without demonstrable cause or from warts, *e. g.*, on the lids, the extremities, or the genitals.

As peculiar forms of congenital sarcoma mention might here be made of a tumor the size of a pea, of cartilaginous hardness, from the finger of a three-year-old boy; it was fungous, intimately adherent to the skin, and consisted of homogeneous hyaline connective tissue and vessel-walls, in which moderate numbers of small spindle-cells were evenly imbedded. A diffuse sarcoma of the foot, the size of a dollar, of a bluish translucence, firmly doughy, flatly prominent, immovably connected with the skin, was removed from a new-born-child. The papillæ here were uncommonly enlarged, and the papillary processes merged so diffusely with the cutis tissue which abounded in dense, short spindle-cells that the lower epithelial limit could no longer be defined. In the depth, the spindle-cell tissue formed homogeneous masses gradually blending with the normal tissue.

Sarcomas of infancy are usually malignant. In adults, sarcomas of the skin generally possess a benign early stage, or else they develop from benign neoplasms, as from warts or benign tumors of the connective tissue.

Not rarely, sarcomas can be traced back to traumatic factors; *e. g.*, irritation of warts, continued pressure, laceration, wounds, chronic inflammation, cicatrices, and on the toes, malignant onychia.

We frequently find sarcomatous degeneration of granulations, particularly starting from ulcers of the foot; in such a case roundish or undermined ulcers of the foot rapidly proliferate into deep-red, fungously overhanging loose or firm masses which the microscope shows to consist of round cells, or of bundles of spindle-cells having a radiate arrangement toward the widened surface; at their ends it is possible to recognize with special facility that the bundles are vessels in papillary proliferation which have embryonal thickening of their walls and narrowed lumen. At times rows of large cells (degenerated rudimentary vessels) traverse the proliferating round-celled granulations, so that

the granulation tissue can still be distinguished from sarcoma, and the latter even be confounded with nests of carcinoma.

Warts give rise most frequently to melano-sarcomas, then to the above-mentioned endothelial sarcomas and transitions into lympho-sarcomas; finally the papillary sarcoma arises from soft papillary warts—sometimes also primarily—in the shape of a coarsely verrucous, firm or carneous, reddish, often fungous structure which usually ulcerates, when a naked, fasciculated stellate or acinous fungous tissue rapidly sprouts forth. Sarcoma fasciculatum is developed from this, or else independently. It is characterized by its peculiarly friable, gelatinous consistence, by pronouncedly fascicular or lamellar fissures, by its translucent appearance resembling macerated fish, by rapid proliferation and extensive superficial degeneration, as well by malignancy. It consists of courses of closely packed, perishable spindle-cells which appear separated from each other by fibrous or granulating interstitial substance, the several bundles—probably vascular rudiments in cellular degeneration—lying on the whole parallel, so that, when cut across, they give the impression of epithelial nests; and, as if to render confusion with carcinoma still more likely, we often find in the depth—especially in tumors developed from warts—and at the point where the fungous proliferation bends away from the normal skin, true epithelial pearls and branching papillary processes. The tumor is often traversed by several hemorrhages which, usually not sharply circumscribed, blend with the surroundings.

Multiple sarcomas of the skin are rare. They arise as superficial roundish nodules, destitute of sharp demarcation, are generally rich in blood and colored. The above-mentioned case would give a good idea of this formation. In other cases there were small spindle-celled forms—hard, flat, smooth, more clearly circumscribed, uncolored tumors which nevertheless progress inevitably, often giving way to soft tumors. In rare cases angiosarcomas and erectile forms were also observed; the latter commencing as points resembling flea-bites, then forming numerous walnut-sized and larger hemispherical, smooth, reddish or livid tumors.

In the subcutaneous tissue, gelatinous, stellate-celled, large sarcomas often arise; but the sarcomas of the subcutaneous adipose tissue are small-round-celled, and are traceable to proliferation of the vessels with preservation of the peculiar lobulated character of this tissue. Cornil and Ranvier distinguish as lipomatous sarcoma a form in which large spindle cells are infiltrated with large drops of fat. They may form encephaloid colossal tumors and become generalized.

Not rarely, sarcomas present mucous or fatty degeneration, hemorrhages, cysts due to the latter or to softening, infarctions with cheesy necrosis and discoloration, colored imbibition, inflammation, and gangrene.

Sarcoma as a rule is malignant in proportion to its softness, the rapidity and peripheral character of its growth, the indefiniteness of its limitation; small, firm, slowly growing sarcomata are more benign than large, soft, colored ones. The more numerous and the smaller the embryonal elements, the more unfavorable is the prognosis, and the sooner do relapses occur even in the small forms and after thorough extirpation, sometimes indeed only after the lapse of years, in the cicatrix; or else, new nodules appear in other places (pleura, lung), probably from tumor thrombi or as the expression of special proliferative power of other locations. Relapsing sarcomas can also be successfully removed subsequently; but as a rule new ones develop even more rapidly and they become softer, more diffuse. The treatment of sarcoma consists in the earliest possible, thorough extirpation.

## 3. MELANO-SARCOMA OF THE SKIN.

*Sarcomata with pigment degeneration, especially of the vascular rudiments.* They form a frequent variety of sarcomas, and usually develop from pigment moles, more rarely primarily.

I have endeavored to trace pigment moles to a great extent to embryonal rudimentary vessels which form pigment instead of blood. I am of opinion that the cavity of new blood-vessels or blood islets arises as a rule with formation of blood-corpuscles, the central part of the blood islets changing into blood, the adjoining part into an originally homogeneous (elastic) membrane, here as well as in the embryo. The young blood-corpuscles are at first pale, larger and much more perishable than the old. When new blood-vessels develop in the adult, they are generally not permanent, and the simultaneously formed blood-corpuscles soon disintegrate or change into pale or hyaline flakes and are soon replaced by those entering from the old vessels. The degeneration of this blood-forming process here consists in an excessive development of similar formations which, however, at once disintegrate into pigment. We are already acquainted with other kinds of one-sided development of vascular rudiments; thus the rudimentary formation of relatively large vascular spaces gives rise to angiomas; that of excessive endothelium, to endothelioma; that of excessive parietal elements, to sarcomas or peritheliomas. And indeed, in melano-sarcoma, several of these excessive formations are present.

The tendency to form an excessive amount of pigment involves also the abnormal chemical constitution of the latter and its rapid granular deposition. The stasis, the "fading" of the blood-corpuscles in the young vessels of the tumor, their size, and their incrustation with them (Gussenbauer) might likewise be traceable in part to the formation of young blood-corpuscles by reason of this tendency. Hyperæmia of the environment may initiate the pigment-forming process, just as it causes many other neoplastic processes. This view is supported in the main by the locations where the pigment is found. We encounter it, in the youngest forms, in enormously swollen endothelioid cells of those small spaces of the skin which, in other cases, are described as plasmatic channels with hypertrophic endothelia, but which represent also rudimentary blood-vessels; we find it furthermore in the wall and in the interior of young vessels of the tumor, and, finally, in vascular sprouts and in perithelial large cells which are frequently in a process of indirect division and form vacuolæ. The pigment appears also in the form of diffuse discoloration; but by careful treatment we may sometimes (see above) even in this stage recognize in the before-mentioned spaces, pale, perishable formations resembling red blood-corpuscles which are soon decolorized or dissolved and give up their pigment to the surroundings. Such formations are sometimes found in giant-cells, in alveoli destitute of clear demarcation, often by the side of giant-cells. We do not intend to deny that, besides the vascular rudiments, other cells, epithelial cells, fixed cells, may form pigment, in which case the mode of origin mentioned elsewhere prevails.

Melano-sarcomas are tubercles which are often sessile on a broad base, fungous, or polypous; frequently they are hemispherical, brownish, livid brown, spotted gray and brown or blackish; they are at first covered with similarly discolored, thinned epidermis, but rarely with kindred papillæ; sometimes they ulcerate superficially and disintegrate into a viscid inky mass, may be moderately firm or fleshy, often become pasty in the centre, range in size from a nut to a fist, usually merge into a black speckled skin, nor are they sharply circumscribed in the depth. On section they appear black or spotted,

usually smooth and moist, exuding a blackish-bloody juice. Sometimes the tubercles arise in the depth of the skin, and in that case usually beneath pigment moles, as roundish, more circumscribed, but otherwise similar nodes, in the surroundings of which we rarely fail to find blackish spots in the glandular and adipose tissue. Soon the latter develop into smaller, more diffuse nodules. Very frequently the tumor now forms metastases or, as I believe, becomes multiple. New nodes continue to form, usually speckled and hemispherically prominent on the surface, more diffuse in the depth. Finally the skin is beset with them and no internal organ is spared. In proportion as the tumors abound in cells and pigment and are soft in consistence, their growth is more rapid. They bleed from ever augmenting vessels containing pigment with blood, often softened throughout into a black inky mass in which no structure can further be recognized. Hardly any tumor is as universally spread or forms as general metastases as does this melano-sarcoma.

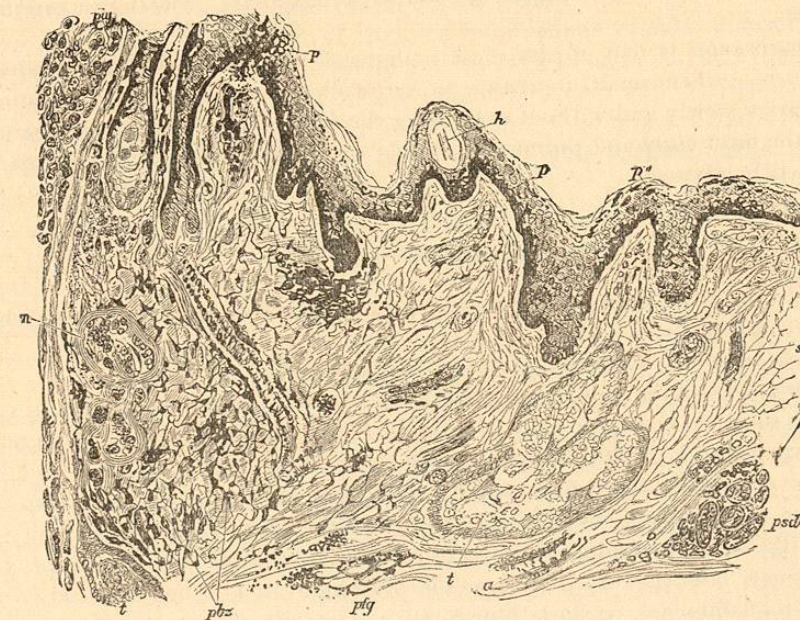


FIG. 71.—BORDER AND NEIGHBORHOOD OF A PIGMENT-SARCOMA OF THE ANGLE OF THE MOUTH (Hartn. 4; 4): e, relatively normal epidermis; c, cutis; p, black pigment replacing the lower layers of the rete and at p' especially penetrating between the cells as far as the surface: p'', pigment in the superficial layers of the rete; h, hair-follicle on top of a papillary elevation of the skin; l y, lymph-spaces of the superficial cutis layer; p s d, pigmented sweat-gland, the pigment being present both in and between the tubes; p b z, pigmented connective-tissue cells at the border of the tumor; v p, elongated papillæ, in part containing plugs of pigment; in one of the papillary processes an epithelial pearl in colloid degeneration; t, unusually elongated sebaceous and hair-follicle; p l y, tumor tissue, pigment plugs in the lymph-spaces, or the plasmatic channels filled with enlarged pigmented endothelia; p f g, pigment in the adipose tissue between the fat-cells.

In most melano-sarcomas the border layer of the thinned epidermis is intensely pigmented (p), the pigment may even proliferate through its entire thickness (p'), and in the depth surrounds its often hypertrophic papillary processes (at h); then, occupying the centre of the papillæ, it forms heaps of cells in place of their vessels (v p). The pigment in moles or sarcomas is rarely situated in the cell network between the connective tissue trabeculæ (p b z). The tumor is preformed more commonly as a sort of endothelial wart, the alveoli of which are filled or lined with large, often flat pigmented cells (l y).