tive tissue, whose cells may therefore revert to the undifferentiated, indifferent, embryonal cell type, mesenchymal cells, which may develop into fibrous tissue, cartilage, or bone according to the prevalent nutritive conditions.

Wounds and Injuries of Muscles.—Injuries of muscle may be of the most varied degree of severity, from a slight strain or sprain, twisting, or laceration of a few fibres of the muscle, which results in the so-called myalgia, to complete severance of all the fibres of the muscle.

Myalgia is a temporary condition of pain in the muscle, which is usually neuralgic, and which is caused by a slight traumatism, with possibly an inflammation of the muscle, or may arise from an acute infectious disease, from syphilis, or from some toxic agent, as mercury, alcohol, or lead. The affection is usually but trivial, and is cured spontaneously, especially if the affected part is put at rest by the use of splints or strapping. Local applications of heat and anodyne solutions are useful, and the pain may at times be so severe that hypodermic injections of morphine may be necessary. If the muscle fibres are weakened by disease or degeneration, or if the strain upon the muscle is too great, either from an external force or from too violent and sudden contraction, the muscle may be fractured, either completely or partially. Fractures and lacerations of healthy muscle are rare except in cases of sudden, unexpected, or unusual contractions. Such accidents are more common among soldiers. Certain diseases, however, such as typhoid fever, yellow fever, scarlet fever, and other severe fevers weaken the resistant power of the muscle, which may undergo various degenerative changes which make it more brittle. The rectus abdominis, the rectus femoris, the adductors of the thigh, the calf muscles, the psoas, and the flexors of the forearm are the muscles most frequently fractured. The symptoms of fracture of muscle are quite characteristic, consisting of sudden sharp pain, with a sensation of giving way and powerlessness of the muscle. In case of complete rupture, a gap is immediately formed between the broken ends of the muscle by the contraction of the parts, and this gap, which can easily be palpated, is a characteristic feature of the affection. It is soon filled, however, by an extravasation of blood, which may form a hæmatoma of greater or less extent and hence a prominence in place of the depression. The skin becomes discolored usually from the extravasation of blood. Wherever muscle is lacerated, whether the tear is large or small, blood extravasates into the tissues, except in those cases in which the injury is very near the tendinous extremity of the muscle, where the vascular supply is poor. The interference with the function of the muscle depends upon the extent of the laceration, the use of the muscle being lost in cases of complete rupture. If only a few fibres of the muscle are broken, recovery is usually rapid and complete and the function of the muscle may be quite well restored even when the injury is quite extensive. In these milder cases the only treatment usually necessary is perfect rest of the affected part. If, however, the muscles are completely torn across, it is usually necessary to suture their ends; and where there is a considerable gap between the ends, it may be well to fill in the interval with the muscle from an animal (muscle grafting), or with sutures of chromicized catgut or kangaroo tendon to act as a framework for the reparative material. The interval is at first filled with granulation tissue, even the engrafted muscle undergoing degenerative changes; later a scar tissue is formed, penetrated in places by the regenerated muscle fibres. In spite of the experimental work on muscle grafting previously mentioned, the consensus of opinion among surgeons and pathologists seems to show that, while the function of the muscle may be fairly well restored, muscle fibres are not regenerated in sufficient numbers to fill the intervening space. At times the injury results in the formation of bone in the granulation tissue, following the law of the metaplastic tendencies of the connective tissues. In some cases the muscle remains intact, while the overlying fascia is torn, generally as the result of the imperfect healing of some former wound. In these cases the muscle may protrude through the opening in the fascia, forming a muscle hernia. Féré collected thirty-one cases of muscle hernia in epileptics, fifteen of which were symmetrical, a finding which would seem to indicate a certain nervous influence as a possible etiological factor in these cases. The hernia is distinguished from a neoplasm in the muscle, from an aneurism, etc., by the fact that it disappears entirely or diminishes in size when the muscle is at rest, becoming prominent during the contraction of the muscle. Generally the opening in the fascia can be felt through the skin. The condition may often be attended by considerable inconvenience, pain and loss of function of the affected muscle. Rest and bandaging are usually sufficient to effect a cure in recent cases. In cases of long standing it may be necessary to freshen the edges of the rent and unite them by stitches. It is distinguished from fracture of muscle by the fact that the symptoms usually develop more gradually than those of fracture. It affects the adductor muscles by preference. Muscle may also be more or less completely crushed by external violence. The results of this as well as of other injuries of muscle depend upon several factors. Apparently identical injuries may in one case cause only temporary disturbance of function, in another ossification, and in another paralysis. Young tissues tend to heal more readily than old. The condition of the muscle at the time of the injury, whether at rest or contracted, has a marked influence on the effect of any traumatism. The nerve fibres which may be cut, injured, or compressed may have a vital bearing on the permanency and severity of the functional disturbance. Single or repeated injuries of muscle may have a real or fancied relation to the development of malignant tumors, a fact which may be explained by the assumption that embryonic tumor-tissue germs are latent in the muscle, which are either excited to activity by the irritation produced by the traumatism or permitted to grow because the normal resistance of the tissues is removed or diminished as an effect of the injury.

II. Involuntary Muscle.

Involuntary muscle has a wide distribution, occurring in the walls of the digestive tract, blood-vessels, skin, in the capsules of many organs, and making up the greater part of the structure of the uterus, bladder, and other organs. Its structure is far simpler than that of voluntary, striated muscle, and its pathological changes are therefore less complicated and have received less attention and research. It consists of mononuclear, fusiform cells, cemented together to form bundles or membranes, which are separated by a larger or smaller amount of connective tissue. The pathological processes in non-striated, as in striated muscle, consist of inflammations, degenerations, and tumors. Certain abnormalities may be noted occasionally, such as the presence of striated muscle fibres among the involuntary muscle fibres of the uterus. These may be due to the metaplasia of non-striated into striated muscle or to the misplacement of embryonal cells.

The pathological processes occurring in involuntary muscle have not attracted the attention of investigators as have those of voluntary muscle. This may be explained, in part at least, by the fact that any disturbance in the function of voluntary muscle causes unmistakable symptoms, while in most cases the symptoms of change in involuntary muscle are masked and indefinite and the pathological processes in it are often not recognized until after the death of the patient. In most cases of muscular atrophy, whether neuropathic or myopathic, and in other muscular degenerations the statement is made either that the involuntary muscle was normal or that it was not examined. Certain regressive changes, analogous to those which occur in striated muscle, are, however, observed, having been described especially in connection with inflammations and tumors of the myomatous type. Œdema of non-striped muscle is frequently

noted. Kenntmann described a case of myometritis œdematosa, in which the muscle fibres of the uterus became so soft and œdematous that the uterine wall was perforated by a sound. Microscopical examination of the myometrium in this case showed the muscle bundles separated by large clear spaces, equal in size to the muscle bundles themselves. This condition was especially marked in the vascular middle layer, in which the blood-vessels presented thickened walls, the connective tissue of the intima being especially thickened. The muscle cells appeared cloudy and in places atrophied. Near the vessels the muscle fibres appeared especially narrowed, even the nuclei being atrophied. Large areas were found in which the muscle had undergone pathological degeneration. No solid strands or bundles were found, and the single fibres were so small that they gave the impression of being reduced to fine fibrils, whose single thicker part, we might almost say whose single dimensional part, consisted of the degenerated and poorly stained nucleus. The connective tissue was probably somewhat increased, but not markedly so; still in places where the muscle was most degenerated, some increase of connective tissue could be observed. Similar degenerative changes are frequently observed and described in myomata of the uterus, which have undergone myxomatous or œdematous degenerative changes.

Atrophy of involuntary muscle occurs under conditions similar to those of atrophy of voluntary muscle. A neuropathic form of atrophy of involuntary muscle—although a form which may be considered neuropathic has been mentioned in connection with vitiligo and other skin diseases—has not so far as I have been able to find, been described. The atrophies are largely due to circulatory disturbances, as in the case above described, or to pressure of a fluid or cellular exudate, as in inflammations. No better picture of atrophy of involuntary muscle has been given than that by Kenntmann. Similar atrophy of the involuntary muscles of the skin in skin diseases has been described by Unna, Pospelow, and Lelois and Vidal.

Hypertrophy of non-striated muscle frequently occurs and may be physiological or pathological. The best example of the physiological hypertrophy is that found in the pregnant uterus. Pathological hypertrophy occurs as a result of stenosis or obstruction of the intestinal canal and other ducts. This is regarded by Herczel as a true hypertrophy, without increase of the number of cells, although many authors regard it rather as a hyperplasia accompanying the hypertrophy. Hypertrophy of the skin muscles was also described by Unna in keratosis suprafollicularis and in pityriasis rubra and other skin diseases. In elephantiasis streptogenes he found the non-striated muscles enlarged, but not increased in number. Calcification of involuntary muscle was noted by Meslay and Hyeme and others, and Brunings reports a case of fatty degeneration of a myoma, the process corresponding to that in progressive muscular atrophy. True ossification of uterine myomata has also been noted. Liquefaction necrosis of the dermal muscles was noted by Unna in abscesses and a collaginous degeneration of these muscles in erysipelas. Gangrene and other forms of necrosis have also been observed in myomatous tumors, as well as cystic degeneration. Nuclear degenerative changes have also been noted, such as atrophy, vacuolation, granulation, and karyolytic changes. The question of the *regeneration* of involuntary muscle is one which has been considerably discussed, and upon which authors are still at variance. Vignolo-Lutati, in his experimental study of the pathological conditions in the skin muscles, was never able to find karyokinetic division figures, but frequently, especially after the less severe injuries, he found appearances which he interpreted as direct nuclear division. Ziegler states that "there is a new formation of smooth muscle fibres and also a regeneration after traumatic, toxic and chemic injuries, as well as in the hypertrophic new formations of muscle, as in tumors; that this process begins with the karyokinetic division of the nucleus of the muscle cell. However, it is shown by experiment as well as by observation of men that there is very little reproduction of the non-striated muscle fibres, as in the healing of wounds and areas of degeneration, the regeneration soon ceases and the loss of substance in the muscular coats of stomach, intestine and bladder is replaced mostly by connective tissue. The new muscle tissue is formed probably entirely from pre-existing muscle tissue." Moleschott and Piso Borne and Busachi support these conclusions, while Arnold, Aeby, Frey, Neumann, and Virchow favor the view that it may originate from connective-tissue cells, and Kölliker and Förster believe that it develops from embryonal germ cells or formative cells. Tizzoni also found a zone of proliferation near the diseased area in typhoid ulcer of the small intestine; and Baumgartner in cases of tuberculosis found mitoses in the muscle tissue of the arteries, veins, and bronchi near the affected area. Herczel and Baumgartner were unable to find signs of proliferation after their experiments, while Vignolo-Lutati found only direct nuclear division in the skin muscles in his experiments. From all this work we may conclude that regenerative changes occur in non-striped muscle as in striated muscle, both by mitotic and by amitotic nuclear division; but that the result is only a partial replacement of the destroyed muscle tissue, the main portion being replaced by scar tissue.

Inflammatory processes in smooth muscle are exceedingly common, although generally secondary to similar processes in the neighboring tissues. Vignolo-Lutati reports the development of inflammatory changes in the involuntary muscle of the skin as the result of the injection of bacria and also of chemical, thermic, and mechanical irritants. With some variations in degree, the pathological picture in all these experiments was essentially the same. The intermuscular connective tissue was infiltrated with leucocytes, which were either diffusely scattered through the tissue or formed small nodes. The blood-vessels were distended and filled with blood, while the whole tissue appeared œdematous. The muscle fibres were swollen, vacuolated and hydropic, and crowded apart by the exudate. The muscle nuclei were either granular or vacuolated and karyolytic figures were noted in some of the experiments. After the simpler mechanical injuries the nuclei showed direct division, which the authors regarded as preliminary to regeneration of the muscle fibres. Purulent inflammation of the non-striated muscle of the uterus is a very frequent occurrence, while Aristoff notes a case of syphilitic inflammation of the muscle coats of the stomach, extending from the mucosa. Tuberculous nodes have been noted in the non-striped muscle of myomas of the uterus, as well as in involuntary muscle in other localities.

Muscle Tumors.—Certain tumors composed largely of muscle are known as myomas, one class of which consists of striated muscle and are called rhabdomyomas, while the other and more common class of myomas consist of non-striated muscle and are called leiomyomas. The rhabdomyomas have a stroma of connective tissue in which cells and fibres are found which resemble striated muscle cells in various stages of development, degeneration, and regeneration. None of the cells appear as normal, mature striated muscle cells. Many of the cells are small, spindle-shaped cells with a single nucleus or with a few nuclei and with a very faint striation or even showing no transverse striation at all. Others are larger and the striation more distinct, but irregularly arranged, while the nuclei appear at the periphery of the fibre. Some appear granular, with undifferentiated hyperchromatic nuclear substance collected in the centre or near the periphery. Drops of glycogen may be seen in the protoplasm. Sarcomatous, myxomatous, fatty, cartilaginous, or osseous tissue may be mixed with the muscle tissue of these tumors, giving rise to the rhabdomyosarcomas, rhabdomyomyxomas, rhabdomyochondromas, etc. The teratomas also consist in part of muscle tissue closely resembling the atypical striated muscle tissue of the rhabdomyomas. The rhabdomyomas may occur in regions in which striated muscle is normally present, but

are far more common in the kidney, testes, uterus, and other organs in which striated muscle is not normally found. They occur in childhood and even in the newborn, and it is generally conceded that they arise from misplaced embryonic muscle tissue. Fujinami, however, reports an interesting case of a so-called cylindroma and rhabdomyoma in a man of fifty, in the voluntary, skeletal muscle, the tumor showing a distinct endotheliomatous arrangement. There was a hyaline degeneration of certain tumor cells, as well as of the vessel walls and connective-tissue fibres, but especially of the fusiform sarcoma cells. Fujinami believes that the crosss-triped muscle cells arise from the fusiform sarcoma cells.

Leiomyomas are far more common and occur usually in adult life and in the organs consisting of non-striated muscle tissue, as the uterus, prostate and the muscular walls of the stomach and intestine. The tumors consist of strands of fibrous connective tissue, between which are found bundles of non-striated muscle, running in different directions. Although often hypertrophied, the muscle cells are fairly normal and yet sharply separated from the surrounding muscle tissue, either by a connective-tissue capsule or by a different arrangement of the muscle fibres. Blood-vessels run through the tumor mass, the arrangement of the muscle cells of the tumor having often a direct relation to the axis of the blood-vessel. These tumors are regarded as benign tumors, the seriousness of which depends upon the size which they may attain and the organs and tissues upon which they may press. When they occur in the intestine, however, especially in the internal coat, they cause an obstruction which is often fatal. They may also cause hemorrhage in the intestine, although this is not often seen in myoma of the stomach. If situated in the outer coat of the intestine, they may develop for a considerable time before causing any obstruction. Although the leiomyomas are generally regarded as purely benign tumors, Brodowski, Hansemann, and Schmorl describe multiple metastases in tumors which were regarded as pure myomas. Such observations are, however, so rare that the question naturally suggests itself whether some, possibly small, areas of the original muscle tumor may not have been sarcomatous. The occurrence of epithelial or glandular tissue within the muscular tissue of the myoma is noted by Schroeder and Ruge, Recklinghausen, and many

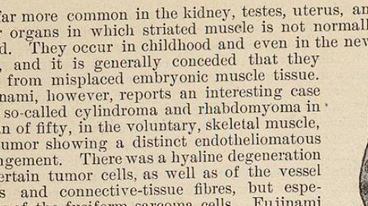

Fig. 3427.—Degeneration of Muscle Fibre (*a*), and Penetration of Fibre by Carcinoma Cells (*b*). (Fujinami.)

others. This may give the tumor an adenomatous or even a carcinomatous character. These adenomatous appearances are found especially in the digestive tract, as in the case reported by Lubarsch, which he regarded as aberrant pancreatic tissue, which had excited the surrounding muscle to new growth. The muscle may undergo also all kinds of degenerative changes, such as calcification, gangrene, necrosis, œdema, inflammation, which may be tuberculous or simply purulent. It may also be so richly vascularized as to give it a telangiectatic or cavernous character. The sarcomatous and the rarer carcinomatous malignant degenerative changes in these tumors have already been mentioned. Steiner has collected from the literature and reported fifty-two cases of

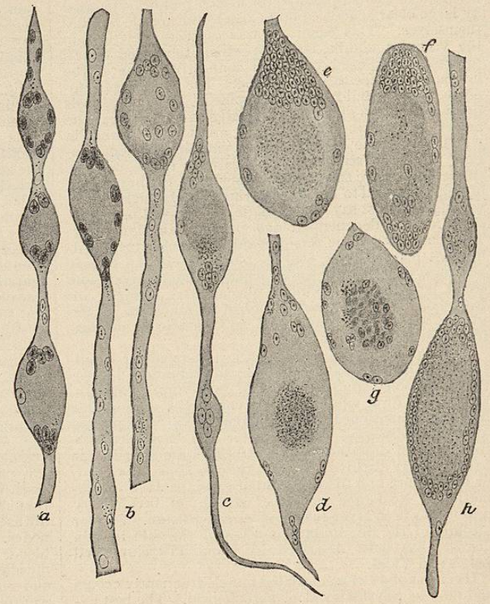

Fig. 3428.—Muscle Forms Found in the Neighborhood of Malignant Tumors. (Fujinami.) *a*, *b*, *c*, *h*, Ampullar degeneration; *d*, *e*, *f*, *g*, giant-cell formation.

myoma of the stomach and intestine, while those of the uterus and prostate are much more numerous. The multiple dermatomyomas form a most interesting class of cases, in which numerous painful swellings arise in the dermis developed from the non-striated muscle of the blood-vessels, from the arrectores pilorum, or even from the involuntary muscle of the sweat glands. The etiology of the leiomyomas is still in dispute. Although they usually develop late in life, the theory is advanced by some that they are of embryonal origin, the tumor germs remaining latent, until they are excited to activity by some irritation. Others claim that they originate by a metaplasia of the connective tissue. Some claim that

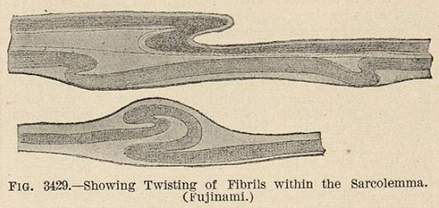

Fig. 3429.—Showing Twisting of Fibrils within the Sarcolemma. (Fujinami.)

the tumor tissue arises from the non-striated muscle of the blood-vessels and others say that the muscle tissue of the organ in which it develops is responsible for its growth. While all these theories have strong supporters, it seems reasonable to conclude that the muscle tissue of

these tumors usually originates from pre-existing muscle tissue, either of blood-vessels or of the organ involved, or from embryonal germs of such tissue which have remained latent until some cause excited them to growth or removed the inhibition which was preventing their development.

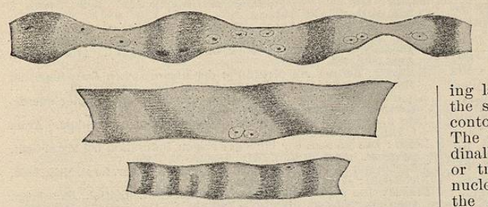

Fig. 3430.—Showing Irregular Contour of Muscle Fibres and Irregular Arrangement of Striation. (Fujinami.)

Among the less important, because less frequent tumors arising in muscle are lipomas, angiomas, fibromas, chondromas, osteomas and myxomas. The structure of these tumors when found in muscle does not differ materially from their structure in other localities.

Carcinoma in muscle is a result of lymphogenous metastasis or of the infiltration of the muscle by the carcinomatous nodules in the neighborhood. The muscle fibres take no part in the formation of the tumor, although they undergo various degenerative changes, and the tumor cells may even penetrate the broken sarcolemma and fill the muscle fibre, as shown in Fig. 3427. From this fact it has been said that the carcinoma cells arise from the muscle cells, but although we recognize the atypical character of origin and growth of tumors, yet it seems unnecessary to assume in this case a mode of origin so remote from the normal type. Inflammatory processes may also be seen in the neighborhood of these tumors. *Sarcoma* is, however, the most common malignant tumor occurring in non-striated muscle. These may be very large and either consist of round cells or of spindle-shaped cells. The sarcoma may be mixed with fat, fibrous tissue, mucoid tissue, etc., forming the liposarcomas, fibro-sarcomas, and myxosarcomas. As in carcinoma, sarcoma cells may penetrate the broken sarcolemma, giving the impression of being formed from the muscle cells. The structure of these tumors does not differ materially from that of analogous tumors in other regions. We are therefore far more concerned at this place with the pathological changes produced in the muscle by the ingrowth of the tumors than with the structure of the tumors themselves, which will be fully treated in another place. Schaeffer, Fujinami, Anzinger, and others have investigated the changes which occur in voluntary striated muscle in the neighborhood of malignant tumors, and have found nearly every possible form of degenerative change. Fujinami asserts that the alterations in the muscle are essentially the same in sarcoma as in carcinoma, while Anzinger believes that degenerative changes are more marked in the neighborhood of carcinomas, while the so-called regenerative changes are seen in greater abundance near sarcomas. All agree that the distinctness of the striation may be greater or less than normal, varying much in different portions of the same preparation.

Atrophy is the most frequent and constant change, due probably, at least in part, to a disturbance in the nutrition of the muscle, but partly also to the diminished functional activity of the muscle, and possibly also to nervous and trophic influences. Peculiar depressions, containing large numbers of muscle nuclei, are often found at the sides and ends of the fibres, giving an irregular contour to the fibre; this is known as lacunar erosion. The muscle fibres may also break up, either longitudinally into slender fibrils containing rows of nuclei, or transversely into segments containing groups of nuclei. Fujinami also notes a peculiar twisting of the muscle fibrils within the sarcolemma. Zenker's necrosis, cloudy swelling, vacuolation, proliferation of nuclei, both by mitotic and by amitotic processes, with marked alterations in the nuclear form, are frequently observed in the neighborhood of these tumors. Fujinami regards all these changes as essentially degenerative in character, in spite of the fact that certain multinuclear forms resembling the myoblasts of regenerating muscle are frequently seen. Anzinger and others regard these giant-cell forms as abortive attempts at regeneration. While more work is needed on this point, there seems little doubt that at certain stages of the process degenerative forms occur which closely resemble the regenerative forms of voluntary muscle, although the conditions are such that no attempt at regeneration is to be expected.

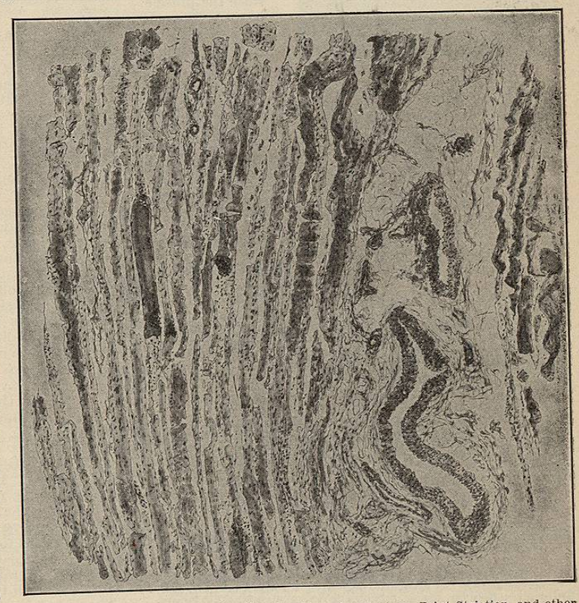

Fig. 3431.—This Figure Shows the Atrophy, Irregular Contour, Faint Striation, and other Degenerative Changes in the Muscle and the Inflammatory Process in the Intermuscular Connective Tissue in the Neighborhood of a Malignant Tumor. (Anzinger.)

The perimysium of the voluntary muscle in the neighborhood of these malignant growths is often hyperplastic and shows leucocytic infiltration, hemorrhage, œdema, fat infiltration. Endarteritis and periarteritis are frequent occurrences.

The penetration of mast cells and leucocytes and even of tumor cells into the muscle cells is one of the most interesting points mentioned in the study of these cases. Fujinami has figured a number of muscle cells containing a larger or smaller number of tumor cells and states that the tumor cells may be derived from the degenerating muscle cells. This idea is refuted by Schaeffer, although supported by Schroeder, Neumann, Bardeleben, and others. Schaeffer states that there may be a great similarity between the tumor tissue and the muscle tissue, which makes confusion possible, and that the tumor cells may penetrate the muscle fibres. The origin and etiology of these tumors in muscle, as in other tissues, are still obscure; but it seems more reasonable to regard the appearance of the tumor cells within the sarcolemma as a result of the passage of these cells through a broken sarcolemma, especially as they are accompanied in this position by leucocytes and mast cells, than to believe that the tumor cells are formed from the contractile substance of the muscle fibre by its degeneration.

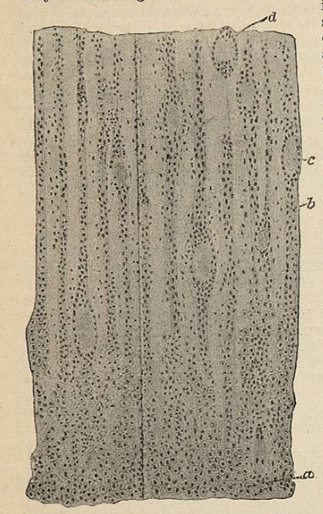

FIG. 3432.—Atrophied Muscle with Circumscribed Dilatations and Nuclear Proliferation in the Neighborhood of the Tumor Mass. (Fujinami.) *a*, Carcinoma cells; *b*, atrophic muscle; *c*, ampullar portion, beginning of giant cell formation; *d*, giant cells.

Lydia M. DeWitt.

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MUSCLES, ANOMALIES OF.—The muscular system of man is subject to many variations, all of which are interesting from a morphological point of view, and many are important surgically. Not only do muscles vary as to form and attachment, but supernumerary and rudimentary muscles are not infrequent. Again, some may be absent in a certain number of individuals, *e.g.*, the pyramidalis, palmaris longus, etc.

Many muscles are mere rudiments of those which exist in a well-developed condition in the lower animals, and there is, in fact, no muscular variation in man which has not a corresponding normal condition in some animal lower in the scale.

In the present article space forbids the giving of any extended account of muscular variations, for it is a subject on which volumes have been written. It is intended to describe only the commoner and more important anomalies, especially mentioning those whose relation to arteries renders them of surgical interest. The reader who wishes to obtain a fuller knowledge of the subject is referred to Wood, Turner, and others, in the *Journal of Anatomy and Physiology*; J. Wood, "Proceedings of the Royal Society," 1864–69; "Guy's Hospital Reports"; "St. Thomas' Hospital Reports"; Macalister's "Catalogue of Muscular Anomalies," in Trans. Royal Irish Academy, 1872; W. Gruber, in the *Mem. of Acad.*, St. Petersburg, and Virchow's *Archiv f. klin. Med.*; Henle, "Handbuch, Muskellehre"; Hallett, *Edin. Med. Jour.*, 1845; Krause, "Handbuch," 1880; Testut, "Les Anomalies Musculaires chez l'Homme," Paris, 1884; also various papers in the *Journal of Anatomy and Physiology*.

MUSCLES OF THE HEAD AND NECK.—*Occipito-Frontalis* varies much as to size and position. The *occipitalis* occasionally approaches the median line, and may be divided into several portions. Some of its fibres may be continuous with the posterior auricular muscle.

The *Frontalis* may send slips to the nasal and superior maxillary bones. Theile says that it generally sends a bundle of fibres to the external angular process of the frontal bone. Its fibres have been described as normally continuous with the levator labii superioris alæque nasi.

Auricular Muscles.—Very various as to their development. The retrahens is very often of large size, and its tendon frequently arises from the neighborhood of the external occipital protuberance; in such cases its belly is

very fleshy, and may be divided into two portions. It is sometimes connected with the transversus nuchæ. Cruveilhier has described a deep *musculus auricularis anticus*, which goes beneath the superior from the zygoma to the outer surface of the tragus. The anterior auricular muscle is often very much diminished in size, and its fibres may be very indistinct.

Muscles of the Nose.—Absence of the pyramidalis has been observed. The compressors and dilators are often so feebly developed as to be seen only with a magnifying glass.

The *Musculus Anomalus* (Albinus) is a slip described as being frequently present. Lying beneath the levator labii superioris alæque nasi, and arising with it from the nasal process of the superior maxillary bone, it is inserted into the same bone near the origin of the compressor naris.

Muscles of the Face.—Zygomaticus Major. Frequently double. The second head may arise in the neighborhood of the infra-orbital foramen or from the masseteric fascia below the zygoma. It is sometimes absent.

Zygomaticus Minor. Frequently absent. It may be inserted into the fascia of the cheek. It may be fused with the levator labii superioris proprius, zygomaticus major, or frontalis. It is not infrequently double; the second head may arise in common with the levator labii superioris proprius. Sometimes it arises from the orbicularis palpebrarum, and it may be inserted into the levator labii superioris proprius or levator labii superioris alæque nasi, or both.

Levator Labii Superioris Proprius occasionally sends a slip to the zygomaticus minor. The writer has twice seen this muscle arise by two heads, the extra head arising from the malar bone. In both these cases the zygomaticus minor was present.

Risorius (Santorini). Often absent. Santorini describes it as double, and even triple. It has been seen to arise from the zygoma, external ear, fascia over the mastoid process, and the skin over the upper portion of the sterno-mastoid.

Depressor Anguli Oris (triangularis menti). Santorini described a muscle, the *transversus menti*, which is sometimes found arising from the inner border of the depressor, and passing downward and inward across the mesial line below the chin to the corresponding part of the opposite side.

Muscles of the Orbit.—Levator Palpebræ. Sometimes absent or fused with the superior rectus. Budge describes the *tensor trochleæ*, which is a muscular slip given off from the levator to the trochlea.

The muscles of the eyeball are very constant. The two heads of the *rectus externus* have been seen separate to their insertion, forming a double muscle. Absence of the outer head has been noted by Macalister, and Curnow describes it as giving slips to the outer wall of the orbit and lower eyelid.

Transversus Orbitæ (Bochdalek). This is an arched slip of muscular fibres passing from the orbital plate of the ethmoid across the upper surface of the eyeball to the outer wall of the orbit (Quain). Macalister suggests that it is a deep, displaced slip of the palpebral fibres of the orbicularis.

Obliquus Inferior Accessorius is a slip going from the inferior rectus to the inferior oblique. The writer has seen a slip going from the inferior oblique to the superior rectus.

Muscles of Mastication.—Masseter. Monro has described a bursa as occasionally occurring between the two portions of this muscle, and Hyrtl has once seen a bursa between the masseter and the capsule of the inferior maxillary articulation.

Temporal. Henke says that sometimes the temporal muscle, and sometimes the deep portion of the masseter, is attached to the fore and back part of the interarticular fibro-cartilages of the lower jaw, or from the borders muscular fibres arise which are inserted into one or other of the afore-mentioned muscles. In many cases these fibres form a well-developed muscular belly, the *musculus temporalis minor*, which is inserted into the bottom of the sigmoid notch of the lower jaw (Henle). The writer has occasionally seen a deep slip from the temporal muscle attached to the pterygo-maxillary ligament. This slip is sometimes pierced by the internal maxillary artery.

Pterygoideus Externus. A considerable portion may be inserted into the capsule of the inferior maxillary articulation. When the pterygoideus proprius is present the upper head is of small size.

Pterygoideus Proprius. This is a muscle which is not infrequently seen arising from the infratemporal crest of the sphenoid and part of the great wing itself; it then passes over the external pterygoid to the lower part of the external pterygoid plate, or to the tuberosity of the palate and superior maxillary bones. It sometimes receives a slip from the upper head of the external pterygoid, and a portion of the upper head of the muscle may arise from it. The writer has occasionally seen the pterygoideus proprius inserted into the pterygo-maxillary ligament and alveolar process of the upper jaw (see Fig. 3433). In one case it sent a slip over the internal pterygoid to be inserted into the inferior maxilla near its angle. Externally this muscle is tendinous, and deep down, muscular; sometimes it is tendinous along the inner border only. When the pterygoideus proprius is present, the upper head of the external pterygoid is generally much diminished.

Pterygospinosus (Thane). This name is given to a muscular slip occasionally seen springing from the spine of the sphenoid and inserted into the hinder margin of the outer pterygoid plate, between the external and internal pterygoid muscles; the parts are frequently connected by fibrous tissue, and sometimes by bone.

MUSCLES OF THE NECK.—*Platysma Myoides.* This muscle varies considerably in its development. It is sometimes well developed, thick and red, and at other times its fibres are pale, thin, and hardly to be seen. It has been reported absent by Macalister. The platysma may reach over the clavicle as far as the fourth rib. It sometimes fails to reach as far as the clavicle; in such cases it is reduced in extent at other parts as well. It may have an insertion into the thyroid cartilage or the sternum. When well developed it has been seen attached to the lower jaw above and to the clavicle below. The upper part of the platysma is occasionally joined by a slip from the mastoid process, or from the occipital bone. The two muscles not infrequently cross each other in the median line. The writer has seen the lower fibres continuous with some fibres of the musculus sternalis. Fasciculi in connection with this muscle have been traced to the axilla. The platysma is the principal representative in man of the skin muscle (*panniculus carnosus*) of the lower animals. In most mammals with loose skins these tegumentary muscles are well developed; *e.g.*, in the hedgehog, porcupine, porpoise, etc.

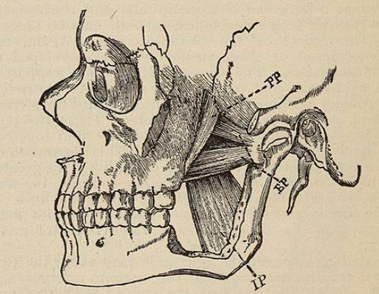

FIG. 3433.—*PP*, Pterygoideus proprius; *EP*, external, and *IP*, internal pterygoid muscle. (Shepherd.)

Occipitalis Minor. This is the name given to a bundle of muscular fibres arising from the fascia over the upper