Although a considerable number of cases of tumors of the neuromy-arterial glomus has been put on record, the knowledge concerning them is still far from widely diffused in English-speaking countries, and for that reason it seems worth while to summarize the data which have accumulated about them and to record eleven new cases. It is certain that the early recognition and removal of these tumors, especially those which grow beneath the nails, may avert years of pain and misery for the unfortunate victims. Moreover, the further study of these tumors may serve to call attention to the little known but apparently important organs from which they develop and which they so faithfully reproduce on a large scale.

The present study emphasizes the observation that a relatively high proportion of the tumors develop in Jews, a people known to be prone to disturbances of the sympathetic nervous system in the extremities. It also brings out the fact that the great majority of the subungual and finger tumors occur in females, while the tumors occurring elsewhere on the extremities are more frequent in males. The reason for this sex variation is not apparent. The local recurrence of a tumor is recorded, an event which has been reported in only one previous instance. The study also confirms an observation made but once previously, namely, that there may be more than one tumor in the same individual.

**Historical Review**

In 1920 Barré, a French neurologist, reported the case of an eighteen-year-old girl who, following an injury to the terminal phalanx of the right middle finger five years before, developed a tiny tumor beneath the nail which caused agonizing paroxysms of pain radiating up the arm to the neck and trunk on the right side, associated with a Horner syndrome on the right side and variations in the vasomotor re-
flexes on the two sides so that oscillometric readings were 7 on the right and 4.5 on the left. Various measures were tried without relief, including alcohol nerve injections and even division of the digital nerves. The finger nail was elevated and there was a blue spot beneath the elevation. This was explored, the small tumor found and excised, with complete relief of symptoms.

In 1922 Barre published three more cases, including another subungual tumor. In the meantime, he had given the two subungual cases to P. Masson for study. Masson already had another similar subungual tumor which he had obtained in 1916. He was struck by the fact that all three tumors had the same morphology and that all the patients had suffered from paroxysms of pain. He noted that the tumors were made up of a tangled mass of well developed arterioles, some with smooth muscle in their walls, all of which had peculiar "epithelioid" cells arranged about their lumens. Moreover, the supporting framework of the tumors contained large numbers of non-myelinated nerves, some of which were directly continuous with the cytoplasm of the epithelioid cells. All three tumors had large corpuscles of Vater-Pacini compressed and flattened out against their capsules, and these Masson felt must have been responsible for the pain. Believing that such a growth must represent the hypertrophy of some sort of an organ, because of its orderly arrangement and rich nervous connections, he examined serial sections of fingers and came upon peculiar arteriovenous anastomoses which exactly resembled the structure of the tumors. These were found everywhere in the deeper layers of the skin of the fingers, and in greatest numbers where the tactile corpuscles of Wagner-Meissner were present in the papillae. Somewhat similar structures had been described by Ruffini but without all the details noted by Masson, who could not be sure, therefore, that they were the same. Since this structure was a glomus (i.e. a conglomeration or plexus of minute arteries or veins), he felt it should have a distinguishing descriptive term and therefore called it a neuromyo-arterial glomus. Its function is not known, but it is suggested that the glomus is a kind of manometer capable of controlling or modifying arterial and capillary circulation and the interstitial pressure and hence having an effect upon local temperature. The rich nervous mechanism suggests that the regulation occurs through local vasomotor reflexes.

This description, published in 1924, was immediately recognized as accurate and has received widespread acceptance. In France, Martin and Dechaume published two more cases of glomus tumors the next year, and in 1927 Masson and Gery reported four cases away from the nail bed, in the arm and thigh, and in the same journal Prodanoff published another case in the thigh. In 1928, Greig of Edinburgh described three cases in his experience and quoted 23 cases of painful subcutaneous tubercle which he found in the English and Scottish literature, pointing out that the clinical stories were identical with that of glomus tumor. Confirmatory cases were slowly reported from other countries: Switzerland 1927 (Wegelin; Nicod); Rumania 1929 (Stefanescu);
TUMORS OF THE NEUROMYO-ARTERIAL GLOMUS

Argentine 1929 (Facio); Germany 1930 (Genner); Belgium 1931 (Dupont); Spain 1932 (Alvarez Cascos and Costero); and the United States 1932 (Stout).

It is of some interest to trace the history of these peculiar tumors back through the years before 1920, when Barré made his first report. In Germany Kolaczek in 1877 reported an undoubted case which developed beneath the great toe nail and included it in the study of a group of tumors which he called angiosarcomas. Kraske in 1880 and again in 1887 stressed the clinical features of these painful subungual "angiosarcomas" which he felt formed a definite clinical entity. Müller continued the series in 1901, changing the name to "perithelioma," and as late as 1927 we find Carstensen reporting a characteristic subungual case as an angiosarcoma, apparently unaware of any work other than the above mentioned German publications.

In France, Chandelux published a paper of great interest in 1882, called "Histological Researches on Painful Subcutaneous Tubercles." In this he reported among others one tumor of the forearm and another of the arm which he described as tubular epitheliomas probably coming from sweat glands but which, judging from the clinical histories and histological drawings, are almost certainly glomic tumors. These tumors were regarded clinically as painful subcutaneous tubercles and the drawings and descriptions bring out the fact that, like all glomic tumors, they were situated in the deeper layers of the skin and were not, in fact, subcutaneous but only subepidermal. Greig of Edinburgh pointed out the fact that the clinical manifestations of the painful subcutaneous tubercle were in every way similar to the histologically proved glomic tumors. It seemed to me, nevertheless, difficult to accept them as glomic tumors because they were described as subcutaneous. Chandelux's paper shows that subcutaneous can mean subepidermal and therefore there need be no further difficulty in accepting some of the tumors called painful subcutaneous tubercles as true glomic tumors.

This term "painful subcutaneous tubercle" was devised by William Wood of Edinburgh in 1812. Wood interested himself greatly in these tumors, and the two articles which he published in that year, together with a third in 1829, contain clear clinical descriptions of the cases which he saw, together with abstracts of a great many others which he gathered from the earlier literature. Greig summarizes his observations as follows: "Wood noted its long duration, its small size, its benignity, its limitation of growth, its firm consistency, its definition and its site. But above all, he noted the character of the pain, which was intermittent, spasmodic, subject to paroxysmal exacerbations and often of excruciating severity. The susceptibility of these tumours to changes of temperature, whether to heat or to cold, was present in two of his cases, and the immediate and permanent relief of all symptoms by excision was recorded with satisfaction. . . . In his third case he notes a very significant fact. This woman, aged twenty-eight, who had suffered from a painful nodule about the middle of the lateral surface of the right leg, stated that it "visibly increased in size during the paroxysms;
and the skin covering it, sometimes at the same time, assumed a purplish or bluish hue. Two other cases reported by Wood also showed changes in size and color during paroxysms of pain. It seems extraordinary that only one of the cases collected by Wood occurred in a finger. This was not subungual but on the ulnar side of the point of the phalanx. Among the early surgeons and anatomists who were familiar with these painful little tumors on the extremities may be mentioned Camper (1760), Morgagni (who quoted a case of Valsalva, 1762), Cheselden (1778), Bisset (1792), Antoine Petit (1799), Dupuytren (1835), and James Paget (1870).

The term painful subcutaneous tubercle appears in Alexis Thomson's monograph "On Neuroma and Neurofibromatosis" in 1900, but it has since become obsolete and is no longer used.

The Normal Glomus

The description of the glomus which was given by Masson has been greatly elaborated by the studies of Popoff, who has made reconstructions from serial sections and whose diagram is shown in the accompanying illustration (Fig. 1). He points out that Sucquet and Hoyer were the first to describe peculiar anastomoses of arteries and veins in the palms and soles and he honors them by naming this peculiar vascular channel, thickened by the presence of epithelioid cells, the Sucquet-Hoyer canal. He finds that the glomus consists of an afferent artery; a Sucquet-Hoyer canal connecting the artery with the vein; pregloemic arterioles nourishing all the constituents of the glomus; a clear periglomic zone, or expansion zone, furnished with a neuroreticular mechanism which controls the function of the Sucquet-Hoyer canal; a specially arranged system of collecting veins and an outer lamellated collagenous zone surrounding the entire glomus. He believes that "the function of the glomus is to control arteriovenous circulation in the digits and to regulate both the local and the general temperature of the body." He states that there is no special relationship of the Pacinian body to the glomus. Popoff studied only the hands and feet. In them he found glomuses in the palmar and lateral parts of the digits, the nail bed, and matrix, the thenar and hypothenar eminence, and the sole near the heel.

The Glomic Tumors

Histopathology: The glomic tumors are composed of a tangled mass of blood vessels enclosed within a capsule. These vessels are lined with a single layer of endothelial cells which are sometimes flattened and sometimes swollen. The endothelial layer is supported by a fibrous layer which may be quite thick but is usually exceedingly delicate, so that it can be seen only with silver or other differential fibrous tissue stains. The rest of the wall varies considerably in thickness and is made up of the peculiar cuboid or rounded "glomus" cells (usually referred to as "epithelioid" cells because Masson so described them) and
smooth muscle, either well differentiated or in an embryonal form, in which the smooth muscle fibers are found within the cytoplasm of the epithelioid cells.

The smooth muscle in some of the vessels, particularly those near the periphery of the tumors, is not infrequently in distinct bundles, which sometimes run parallel with the long axis of the vessel and sometimes tangential to it, but rarely completely surround its lumen. Usually there are epithelioid cells filling in the gap where the muscle is missing, and often there are epithelioid cells external, or internal, or both external and internal to the muscle bundles. Masson believes the ves-

![Diagram of Popoff's Conception of the Glomus](image_url)

FIG. 1. Popoff's Conception of the Glomus

"Diagrammatic presentation of vascular arrangement and the glomus, as found in the ventral surface of the digit. It shows: (1) all the zones of the skin, including that occupied by the glomic apparatus; (2) the afferent artery of the glomus; (3) the coiled type of Suquet-Hoyer canal, characterized by a thick wall; (4) the efferent part of the Suquet-Hoyer canal, entering the primary collecting vein, with the latter appearing as a long wide ruffle encircling the glomus; (5) the relation of the primary collecting vein to other veins; (6) the system of preglomeric arterioles supplying all the constituents of the glomus and emptying into the primary collecting vein, and (7) division of the periarterial nerve trunks, with branches going to the glomus. This diagram serves to explain arteriovenous and trophic disturbances caused by functional disability and organic destruction of either the entire glomus or one of its constituents."

sels that are well provided with muscle are afferent to the glomus. The majority of the vessels, however, have no recognizable smooth muscle fibers either differentiated or undifferentiated.

The glomus cells are quite distinctive. They have well defined cell outlines which are further accentuated by the presence of delicate collagen fibers which separate every cell from its neighbor. The cell cytoplasm is pale, amphophilic, and sometimes vacuolated, which brings into sharp relief the voluminous, centrally placed, globular or ovoid nucleus. It is a rare event to find a mitotic figure. Some of the glomus cells have short smooth muscle fibers within their cytoplasm.

In the subungual tumors most of the vessels have small lumens com-
taining rare erythrocytes. Outside of the nail bed the caliber of the
tumor vessels may vary greatly, and some have dilated lumens similar
to those seen in cavernous hemangiomas.

The collagen fibers which form a meshwork between the epithelioid
cells pass outward to join the stroma of the tumor which lies between
the vascular complexes. This stroma is generally loose-textured and
often shows mucinous degeneration (demonstrated by the mucicarmine
stain).

There are generally bundles of myelinated nerves in or near the
capsule of the tumor which are recognizable with any stain. In addi-
tion we have demonstrated, by the Gros and the Rogers technic, the
presence of numerous slender nerve fibers, seemingly without myelin
sheaths, beneath the capsule especially and to a less extent in the

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**Fig. 2. Case I: Appearance of the Nail and Tip of the Left Middle Finger Deformed by the Subungual Tumor, Dorsal and Lateral Views**

stroma of the tumors. These fibers pass among the epithelioid cells
where both Masson and Mason and Weil have shown that they are in
direct continuity with the cytoplasm of these cells. This direct con-
tinuity we have not been able to demonstrate.

**Clinical Description:** A review of 62 authentic reported cases includ-
ing the present group shows that these tumors were found in the deeper
portions of the skin of the extremities with one exception, which André-
Thomas found deep in the muscles of the thigh. The distribution of the
other 61 was as follows: upper extremity 45 (subungual 26, rest of hand
5, wrist and forearm 9, arm 4, and acromial region 1); lower extremity
16 (subungual 1, rest of foot 2, leg 3, and buttock and thigh 10). The
sex variation is striking. Of the subungual cases, 17 were in females
and 2 in males, while of the tumors found elsewhere on the extremities
14 were in males and only 6 in females. The age at onset varied from
early childhood to seventy-two years, and the age at which treatment
was first sought from twelve to eighty-two years. However, the aver-
age age at onset of the subungual tumors (21 cases) was twenty-five,

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1 I am indebted to Dr. George F. Laidlaw and Mrs. Anne Holmes Laidlaw for the prepa-
rations demonstrating the neurites.
while the average age at onset for the rest of the tumors (14 cases) was forty-one. The tumors were usually single, but Adair reported one case with four tumors in the mesial aspect of the left forearm and in our case 11 there were two separate tumors in the heel.

The most characteristic symptom of these tumors of the neuromyo-arterial glomus is exquisite and agonizing pain. This may not commence, however, until the tumor has been present for some time (Lortat-Jacob and Brosse, Müller, Paulian et al.), and the tumor may even be removed before any pain is experienced, as in a case reported by Picard.

Sometimes the tumor appears at the site of more or less severe trauma (our Cases I and IV; André-Thomas; Greig, Case 2; Kraske, Case 1; Martin and Dechaume, Cases 1 and 2; Mason and Weil; Masson and Gery, Case 3; Müller), but, as a rule, there is no antecedent history

![Fig. 3. Case IV: Low-power Photomicrograph of the Encapsulated Subungual Tumor Covered by the Elevated Nail Bed](image)

and the first symptom noted is pain. This is burning, piercing, or bursting, and is usually very severe. It comes in paroxysms which may last for a few minutes to several hours. This pain may remain localized or may radiate to surrounding structures or even for a long distance. In several of the subungual tumors pain radiated up the arm to the neck and thorax. In the majority of cases the paroxysms are initiated by pressure, by changes in the weather, and by cold especially. So terrible is the suffering that some patients will go to extremes to protect themselves from the pressure of clothes or contact with cold. But there is no rule about these symptoms: whereas Barré’s second patient always protected his finger by wearing a glove, Bonnet’s patient could not even put on a glove, and whereas Ianichewski and Lebel’s patient got some relief by soaking her finger in hot water, Bonnet’s patient got a little relief from cold water.
When the tumor lies beneath the nail, there is at first no indication of its presence. After a time, which may be months or years, a bluish or reddish discoloration appears beneath the nail, and the latter gradually attains a more exaggerated convexity both laterally and anteroposteriorly. If the tumor is elsewhere on the extremities, it may be colorless, but more often has a bluish or purplish discoloration. It is usually relatively small, from 3 to 5 mm. in diameter; it may reach a diameter of 3 cm. but never more. It may hollow out a cavity in the phalanx and thin the overlying nail. Some patients have obtained temporary relief by shaving the nail away over the growth.

Sometimes there are evidences of associated disturbance of the sympathetic nervous mechanism. Coldness of the affected finger or extremity has been noted by André-Thomas, and by Bonnet; while in the case reported by Paulian et al. the temperature was elevated from $1.5^\circ$ C. to $2^\circ$ C. in the affected hand in comparison with the normal hand. In Case V of our series there was an elevation of $2^\circ$ F. in the affected hand. In Barré's first case the oscillometric reading in the affected hand was 7 and in the opposite hand 4.5. In two of our cases the affected hand showed hyperhidrosis. Barré's first patient had a Horner syndrome on the same side as the subungual tumor and in the case of Paulian et al. there were burning warmth and sweating of the upper extremity and half of the face on the affected side. Occasional reports indicate that the tumor may become blue during attacks of pain (Mason and Weil) or may both become blue and increase in size (Wood, Newbigging, and our Case 2). Whatever the symptoms, the almost universal experience is that they grow progressively worse. It should be remarked, however, that not all patients with glomic tumors suffer pain to such a degree that the examining physician elicits the fact that the pain comes in paroxysms; indeed, this was made clear in the histories of only four of our cases. As a rule, those with subungual tumors suffer more than do those with tumors elsewhere.

Do any other tumors beside glomic tumors produce such paroxysms
of pain and disturbances of the sympathetic nervous mechanism? This question has not been carefully investigated, but in the two following cases which were not glomic tumors the characteristic symptoms were present. The first case, reported in 1873 by Duhring, was that of a man of seventy who had had multiple neurofibromatous skin nodules involving the left arm, shoulder, and adjacent parts of the neck for ten years. For the past three years he had suffered from paroxysmal attacks of pain in the affected parts, made worse by cold, change of weather, mental disturbance, and blows. During the paroxysms the nodules got distinctly redder. Biopsy of one of the nodules showed a fibrous tumor without demonstrable nerves. The other case was described by Chandelux in 1882. A sixteen-year-old girl for two years suffered from paroxysms of pain due to a small subungual fibrous

![Image](image_url)

**Fig. 5. Case VIII: Tumor Lying beneath the Epidermis in the Corium and Extending into the Subcutaneous Tissue**

The tumor is encapsulated and has a broad base. It has many more dilated vessels than the subungual growth shown in Fig. 3.

growth with which there was associated a Pacinian corpuscle. Chandelux ascribed the pain to the Pacinian body, an idea which occurred to Masson many years later. It seems certain, therefore, that, when this syndrome is associated with a tumor, the neoplasm is not invariably a lesion of the neuromyo-arterial glomus.

*Treatment:* No treatment used has succeeded except surgical removal or destruction, and this has been spectacularly successful in relieving the symptoms. The tremendous relief from pain and the gratitude of the patients, many of whom had been suffering for half a lifetime, are recorded by many authors.

It is possible to miss a subungual tumor at operation if the search is not careful enough. This happened in Case III of our series. Two attempts in the Out-Patient-Department failed but finally Dr. B. C. Smith
Fig. 6. Case VIII: One of the tumor vessels cut somewhat tangentially, with a small, empty endothelial-lined lumen surrounded by a somewhat irregularly arranged muscular coat outside of which are the "epithelioid" cells with their clearly defined cell membranes.

Each cell is separated from its neighbor by a delicate collagen fiber.

Fig. 7. Case VIII: One of the tumor vessels cut somewhat tangentially, with its empty endothelial-lined lumen and surrounding "epithelioid" cells.

There is no smooth muscle as such, but within the cytoplasm of a few of these cells are some tiny short smooth muscle fibers. The loose mucoid character of the intervascular stroma is also apparent.
found and removed the tumor, with prompt relief. Only one case of reappearance has been previously reported, by Loutchitch in a Lyon thesis, which is not available. Bonnet refers to it in his paper and says that the operation was by Jaboulay. One of our patients (Case V) had a return of symptoms eight years after excision, and one year later there was a reappearance of the growth in the distal closed space of the left little finger.

**Case Reports**

**Case I:** An Irish maid, thirty-one years old, had suffered for the past two years or more from pain in the tip of the left middle finger which now radiated up the back of the hand. The pain kept her awake at night and was precipitated and accentuated by trauma and weather changes, on the day before menstruation began, at night, and by cold. It burned and ached like a toothache all the time, with periods of exacerbation. Nothing gave any real relief, but heat ameliorated the pain somewhat. It was so severe that the patient wanted the finger amputated. Examination showed a deformed finger tip which the patient believed to be due to an injury in infancy. The tip of the finger was enlarged, the nail more arched laterally, and there was a red, semifluctuant, tender swelling at the tip, extending beneath the nail. Sweating of the finger was observed during examination. X-ray showed a hollowing out of the distal end of the terminal phalanx.

*Operation,* March 3, 1924, Dr. H. Auchincloss. A very finely lobulated, reddish, vascular tumor was found beneath the nail on the radial side and extending over the end of the phalanx on the ulnar side, where it lay beneath the epidermis. The bone was hollowed out. The tumor was excised.

*Result:* Some deformity of finger tip and nail but complete relief of pain which had lasted for sixty-eight months when the patient was last seen.

**Case II:** A Jewish housewife, thirty-eight years old, first noticed tingling and pain
in the tip of the left little finger following a severe crash of thunder when she was pregnant, thirteen years before admission. The symptoms gradually grew worse until there was a steady pain in the distal end of the finger on the radial side, which was subject to sudden paroxysms of agonizing exacerbation, during which the pain would radiate up the arm to the left chest. During these attacks the patient noticed that the finger tip was bluer and more swollen than usual. She had been treated by baking, massage, and alcohol injections of the digital nerves, but without relief. Her whole life had become dominated by this trouble. Examination by Dr. H. Auchincloss showed blueness and tenderness on firm pressure of the radial side of the left little finger. The nail was ridged here, and x-ray examination showed a cup-shaped depression of the corresponding portion of the terminal phalanx. All of the nails of the affected hand were longer, and the whole hand was more congested and vascular than the unaffected side. There were many pigmented spots on the shoulders and trunk.

Operation, April 5, 1934, Dr. R. L. Moore. The tumor was excised. It lay beneath the nail in a cup-shaped cavity in the bone. It was pallid, encapsulated, and measured $5 \times 3$ mm.

Result: The wound was painful for a few days. After that the wound healed and there was complete relief of symptoms at the end of one year.

Case III: An American laundress, forty-three years old, first came to the clinic Aug. 3, 1922, complaining that four weeks before she had noticed a reddened area beneath the base of the nail of the right ring finger, toward the ulnar side. This area was painful and soon turned blue. Examination showed that it was tender and the nail over it was loose. In the belief that it was an infection, an incision was made into the paronychium and a piece of nail was removed on Aug. 10. This gave no relief; instead the pain grew progressively worse so that the patient was unable to sleep. On Feb. 29, 1924, two lateral incisions were made on either side of the nail and some of the matrix was removed but was not sent for examination. There was some temporary amelioration of the pain, but in three weeks it was worse than ever, and the patient could neither sleep nor work. Examination showed a blue area $2 \times 3$ mm. on the medial side of the base of the nail which was exquisitely tender. There was atrophy of disuse in the phalanges and hand and stiffness of the joints.

Operation, April 1, 1924, Dr. B. C. Smith. The bluish tumor, area $2 \times 3$ mm., was excised.

Result: Complete relief of pain. The patient was last seen April 29, 1924.

Case IV: A Jewess (?), twenty-eight years old, had suffered a severe crushing injury to her finger eight years before. Five years later severe pain began in the same finger, becoming increasingly more severe and radiating up the arm. At that time it was thought to be an infection and the nail was removed. This had no effect and the pain continued.

Operation, Dec. 9, 1930, Dr. Wagner. A tumor mass 1 cm. in diameter was excised from beneath the nail. It was apparently encapsulated and had eroded a cavity in the phalanx, to the periosteum of which it was attached.

Result: Complete relief of symptoms which had persisted for fifty-two months.

(From Dr. J. E. McWhorter of the Hospital for Ruptured and Crippled.)

Case V: An Austrian Jewess, thirty years old, had suffered for eight years from pain in the left little finger, which had increased during the past five years. If the finger was pressed there would be a few seconds free interval followed by an intense paroxysm of pain. The patient was kept awake at night by the pain and had become very nervous. Examination showed redness and swelling in the distal closed space of the left little finger, which made it look clubbed and gave an indefinite sensation of a mass. X-ray showed no bone deformity.

Operation, April 10, 1926, Dr. L. Carp. In the distal closed space mesially was a grayish-white, hard, rounded mass, partly embedded in a cavity in the bone and attached to what was thought to be a nerve. It was 1 cm. in diameter and was excised.

Result: The wound healed and the patient was relieved of pain. Eight years later she returned complaining of hyperesthesia in the scar, and nervousness, although she did not have the old paroxysms. The symptoms grew constantly worse, pain radiated
up along the medial aspect of the forearm to the elbow and to the mesial aspect of the fourth finger. Examination showed sweating and 2° F. increase in temperature of the left hand, hyperesthesia and hyperalgesia in the region of the scar. There was marked atrophy of the tissues of the left little finger but x-ray did not show much bony atrophy. In the region of the scar was a vague thickening.

Operation, March 23, 1935, Dr. B. C. Smith. A portion of the scar and an adherent pale encapsulated tumor mass were excised. The tumor was partly embedded in a cup-shaped depression in the phalanx and was 4 mm. in diameter.

Case VI: This patient was a Russian Jew, fifty-nine years old (history unreliable). Following an injury with a stick of wood eighteen months before, a growth appeared, which had been ulcerated for four weeks. Examination showed a mass like exuberant granulation tissue, 1.4 cm. in diameter, projecting from an ulcerated base on the dorsal surface of the forearm five inches above the wrist. The question of pain and tenderness is not noted.

Operation, Jan. 31, 1929, excision by Dr. G. U. Carneal. The wound healed. The patient was last seen Aug. 23, 1929.

Case VII: An Irish engineer, fifty-six years old, came complaining of a growth, of one year's duration, on the ulnar side of the left forearm between the middle and lower thirds. At first it was painless but later it became tender and painful, the pain apparently coming sometimes in paroxysms. Examination showed a growth 1.5 cm. in diameter, which was deep purple and had injected vessels in the overlying skin. It was tender.

Operation, June 8, 1932, excision by Dr. J. S. Lockwood.

Result: The wound healed and the pain disappeared.

Case VIII: The patient was a French salesman, sixty-five years old. Forty-three years before, he had first noticed a dark swelling on the volar surface of the ulnar side of the right forearm at the junction of the lower and middle thirds. This remained stationary until two months before admission, when it began to increase in size at its base. When hit, the growth was painful. Examination by Dr. J. P. Webster showed a purplish rounded swelling 1.3 cm. in diameter with shiny skin over its crown. It was soft, col-

Fig. 9. Case IV: Photomicrograph of a Frozen Section Stained by a Modified Gros Technic, Showing the Large Number of Nerve Fibers Passing from the Capsule Along the Stroma between the Tumor Vessels with Their Epithelioid Cells
<table>
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<tbody>
<tr>
<td>I</td>
<td>F.</td>
<td>31</td>
<td>Subungual, left middle finger</td>
<td>30?</td>
<td>Red</td>
<td>3 mm.</td>
<td>Extreme</td>
<td>Yes</td>
<td>Heat</td>
<td>Cold, change of weather, trauma, menses</td>
<td>Back of hand</td>
<td>Suspected</td>
<td>Yes (68 mos.)</td>
<td>Sweating of finger on examination</td>
<td></td>
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<tr>
<td>II</td>
<td>F.</td>
<td>38</td>
<td>Subungual, left little finger</td>
<td>13</td>
<td>Blue</td>
<td>5x3 mm.</td>
<td>Extreme</td>
<td>Yes</td>
<td>Nothing</td>
<td>Pressure</td>
<td>Up arm to chest</td>
<td>No</td>
<td>Yes (12 mos.)</td>
<td>Sweelling and blueness increased with paroxysms of pain</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>F.</td>
<td>43</td>
<td>Subungual, rt. ring finger</td>
<td>1½</td>
<td>Blue</td>
<td>2x3 mm.</td>
<td>Extreme</td>
<td>?</td>
<td>?</td>
<td>Pressure</td>
<td>—</td>
<td>No</td>
<td>No</td>
<td>Yes (1 mo.)</td>
<td>2 previous unsuccessful explorations</td>
</tr>
<tr>
<td>IV</td>
<td>F.</td>
<td>28</td>
<td>Subungual</td>
<td>8</td>
<td>?</td>
<td>1 cm.</td>
<td>Extreme</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>Up arm</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (52 mos.)</td>
<td></td>
</tr>
<tr>
<td>Case</td>
<td>Sex</td>
<td>Age</td>
<td>Site</td>
<td>Ante-Op. Duration Yrs.</td>
<td>Color</td>
<td>Size</td>
<td>Pain</td>
<td>Paroxysms</td>
<td>Pain Relieved by</td>
<td>Made Worse by</td>
<td>Radiation</td>
<td>Previous Injury</td>
<td>Phalanx Excavated</td>
<td>Cured by Excision</td>
<td>Remarks</td>
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<tr>
<td>V</td>
<td>F.</td>
<td>30</td>
<td>Distal closed space, left little finger</td>
<td>8</td>
<td>Red</td>
<td>1 cm.</td>
<td>Extreme</td>
<td>Yes</td>
<td>Nothing</td>
<td>Pressure</td>
<td>—</td>
<td>No</td>
<td>Yes</td>
<td>—</td>
<td>At first</td>
</tr>
<tr>
<td>VI</td>
<td>M.</td>
<td>59</td>
<td>Forearm</td>
<td>1½</td>
<td>Red (ulcerated)</td>
<td>1.4 cm.</td>
<td>?</td>
<td>?</td>
<td>—</td>
<td>—</td>
<td>Yes</td>
<td>—</td>
<td>Yes (7 mos.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VII</td>
<td>M.</td>
<td>56</td>
<td>Forearm</td>
<td>1</td>
<td>Purple</td>
<td>1.5 cm.</td>
<td>Marked</td>
<td>Yes</td>
<td>?</td>
<td>Pressure</td>
<td>—</td>
<td>No</td>
<td>—</td>
<td>Yes (2 wks.)</td>
<td></td>
</tr>
<tr>
<td>VIII</td>
<td>M.</td>
<td>65</td>
<td>Forearm</td>
<td>43</td>
<td>Purple</td>
<td>1.3 cm.</td>
<td>Marked</td>
<td>?</td>
<td>?</td>
<td>Pressure</td>
<td>—</td>
<td>No</td>
<td>—</td>
<td>Yes (3 yrs.)</td>
<td>Compressible</td>
</tr>
<tr>
<td>IX</td>
<td>M.</td>
<td>59</td>
<td>Gluteal region</td>
<td>2</td>
<td>Blue</td>
<td>7 mm.</td>
<td>Extreme</td>
<td>?</td>
<td>?</td>
<td>Pressure</td>
<td>—</td>
<td>No</td>
<td>—</td>
<td>Yes (2 wks.)</td>
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lapsed on pressure, and projected 1.3 cm. At the base over an area 2 × 3 cm. was a slight fusiform swelling which was quite tender on pressure.

**Operation, Jan. 23, 1931**, excision by Dr. C. J. Kraissl.

**Result:** Cure of tumor. The patient died of rheumatic endocarditis May 18, 1934.

**Case IX:** An Irish-American motorman, fifty-nine years old, had had a bluish tumor in the left gluteal region for two years. It gave no trouble until two days before admission, when it suddenly began to be painful and the pain grew constantly worse. It was so tender that the patient could not sit on the left side. Examination showed a growth 7 mm. in diameter which raised the skin in the middle of the left gluteal region, was bluish, extended to the subcutaneous fat, and was very tender.

**Operation, June 18, 1931,** excision by Dr. H. Weyrauch, supervised by Dr. L. Rousselot.

**Result:** The wound healed and the pain was cured.

**Case X:** The patient was a male, age unknown. No history known.

At the base over an area 2 × 3 cm. was a tumor about 6 × 10 mm. was removed from the skin of the leg. No history known. (Contributed by Dr. M. Melicow of the Squier Urological Clinic.)

**Case XI:** A Jewess, twenty-five years old, had suffered for several years from painful and tender areas on the lateral and planter aspects of the same heel. Local therapeutic measures including electricity had failed to give relief.

**Operation, Aug. 15, 1931,** Dr. D. Bull. A nodule was palpated on the lateral aspect and this was excised. It was about 6 mm. in diameter and bluish when exposed.

**Result:** The pain and tenderness persisted on the planter surface of the heel. X-ray treatment was tried without success. Although no tumor could be palpated, Dr. Bull excised the heel fat pad, Feb. 13, 1932, and found a soft, smooth, purplish tumor resembling the first one. Eleven days after this operation the wound had healed and there was no more pain or tenderness.

**Summary**

Eleven cases of tumor of the neuromyo-arterial glomus are described and other reported cases are reviewed, emphasizing anew their small size, slow growth, benign character, subepidermal situation, distribution on the extremities especially beneath the finger nails, their association with paroxysms of severe pain and occasionally with manifestations of disturbance of the sympathetic nervous system, and their characteristic morphology. An historical review shows that before they were accurately described and named by P. Masson they were reported under a number of different names, such as angiosarcoma, perithelioma and painful subcutaneous tubercle. Simple excision has resulted in immediate cure of the symptoms in every case, but it is possible for the tumor to reappear long after operation.

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Rejected Cases


